June 28, 2019

City of Chicago, Department of Public Health
Attn: Environmental Permitting and Inspections
333 South State Street, Room 200
Chicago, IL 60604

Via email to: EnvComments@cityofchicago.org; Jennifer.Hesse@cityofchicago.org
Dave.Graham@cityofchicago.org

Re: American Zinc Recycling Corp. Variance Request – Rules and Regulations for Control of Emissions from the Handling and Storage of Bulk Solid Materials – Part D

To Whom It May Concern:

Thank you for the opportunity to comment on the application of American Zinc Recycling Corp. ("AZR") for a variance from the Department of Health's Rules and Regulations for Control of Emissions from the Handling and Storage of Bulk Material Piles ("Rules"). These comments are submitted on behalf of the Natural Resources Defense Council ("NRDC") and our thousands of members and activists in the City of Chicago, including those who reside on Chicago's southeast side.[1] These comments are also submitted on behalf of the Southeast Environmental Task Force ("SETF")[2] and the Chicago South East Side Coalition to Ban Petcoke[3], community-based organizations that are dedicated to the health, safety and welfare of the people who live, work and recreate in the Calumet region. For the reasons set forth below, the requested variance would perpetuate practices that have a significant, adverse and disproportionate impact on the community and environment, and must be denied.

According to information derived from the demographic feature of U.S. EPA's ECHO database, there are 3,607 people who live within a one-mile radius of the applicant's facility.[4] Eighty-five percent of the people who live within this one mile radius are Hispanic (71%) or African-American (15%). U.S. EPA's ECHO database also indicates a total of 1,121 households in this one-mile radius, with a total population of 1,101 children 17 years and younger.[5]

The applicant's facility is located adjacent to the Calumet River. The Calumet River is used extensively by recreational watercraft. Traffic to-and-from the applicant's facility must use Torrence Avenue, a busy public road that connects residential areas in South Deering to residential areas in Hegewisch. Torrence Avenue is also the dividing line

[1] https://www.nrdc.org/
[2] http://setaskforce.org/
[3] https://www.facebook.com/SSCBP60617/
[4] https://echo.epa.gov/detailed-facility-report?fid=110000434352. Please note: On May 1, 2017, the corporate name "Horsehead Corporation" was changed to American Zinc Recycling Corp.
[5] According to ECHO, 71,487 people live within 3 miles of the facility, 80% of whom are African-American (36%) or Hispanic (44%). This source also indicates a total of 25,266 households in this three-mile radius, with a total population of 19,389 children age 17 years and younger.

between industrial properties including AZR to the east and the Indian Ridge Marsh[6] and Big Marsh natural areas to the west.[7] Indian Ridge Marsh and Big Marsh are ecologically priceless natural areas owned by the Chicago Park District, which attract members of the public to participate in hiking, biking, birding and other recreational activities at the sites.

This description is in stark contrast to AZR's proffered description of the surrounding area, in which the company focuses on its industrial neighbors while omitting the nearby natural areas and downplaying the people who live next to this concentration of heavy industry. Indeed, AZR's failure to meet the requirement to describe the "population and geographic area affected by, or potentially affected by, the process or activity" is the first reason CDPH should deny the requested variance.

There Are Longstanding, Unresolved Concerns About the Release of Dust – Including Manganese – from the AZR Facility

On April 14, 2014, the U.S. EPA – Region 5 issued a Notice of Violation to Horsehead Corporation alleging several categories of violations of particulate matter standards. A true and accurate copy of this Notice of Violation is attached to these comments and labeled as Exhibit One. These alleged violations include the failure to develop and implement a fugitive particulate matter control plan, the failure to comply with PM10 contingency measures plan required by the facility permit, the failure to have any fugitive controls for Iron Rich Material piles on the property and the failure to have an operating permit for the Iron Rich Material storage piles. Consistent with Horsehead's existing Title V Permit, the NOV identifies the following four sources of fugitive particulate emissions at the facility – facility roadways, carbon storage pile, carbon handling by a conveyor and iron-rich material handling. U.S. EPA alleged that Horsehead failed to include Iron Rich Material storage piles in permit applications and failed to obtain an operating permit for the Iron Rich Material Storage Piles. U.S. EPA characterized the environmental impact of violations included this description of the impacts of manganese:

> These violations have also likely resulted in increased emissions of Hazardous Air Pollutants (HAPs), including, but not limited to, manganese, lead and cadmium. Chronic inhalation exposure of manganese results impacts the nervous systems and results in slower visual reaction time and impaired eye-hand coordination. Inhalation exposure also causes respiratory effects such as bronchitis, dyspnea during exercise, and an increase susceptibility to infectious lung disease.

Upon information and belief, this NOV is still pending and has not been resolved.

On May 13, 2019, CDPH conducted an inspection of AZR. A true and accurate copy of the resulting draft inspection report is attached to these comments and labeled as Exhibit Two. The CDPH inspector summarized his findings as follows:

[6] https://www.chicagoparkdistrict.com/parks-facilities/indian-ridge-marsh-park-park-no-565
[7] https://www.chicagoparkdistrict.com/parks-facilities/big-marsh-park-park-no-564

"Today's inspection revealed the following:

1) I observed accumulation of coke material on the roof of the coke loading station structure (Please see photo # 01). Brad [the facility plant manager] doesn't know how long this accumulated material has been on the roof.

2) I observed Accumulation of particulate dust material deposited on the ground, outside the building BC #3 (rail car loading station building), and BC #10. The accumulated dust was deposited between the two buildings (see photo #s 02, 03, &04);

3) I observed accumulation of material on the walls, beams, pipes and other structures of BC #3 (Please see photo #s 05, 06 , & 07);

4) I observed WOX dust emissions from BC #3 (rail car loading station building) (Please see photo #s 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18 &19);

5) I observed conveyor material close to the river (Please see photo # 20).

6) The built coke storage building has not been put to use as at the time of this inspection.

American Zinc Recycling companies will be served with notic of violation # E000035472 for the municipal code violations 11-4-760 (a) (Handling of material susceptible of becoming windborne); 11-4-770 rule 3.0(17) (violation of bulk material rule, "Spilled Material")."

Upon information and belief, this Notice of Violation is still pending and has not been resolved.

Earlier this year, the City adopted amended Rules to address the problem of harmful dust pollution from industrial sources, stopping short of banning neurotoxic manganese as called for by our groups. Dust pollution can cause permanent harm to people's lungs, significantly limit the use and enjoyment (and market value) of private property as well as public parks, and inhibit the growth of plants and wildlife.[8] In these amendments, the City imposed additional requirements to address manganese emissions from handlers of bulk materials. One critical feature of the amended Rules is to require all manganese operations to be enclosed. The Final Rules, Section 5.0, require: "The operations covered by this full enclosure requirement include, but are not limited to, all piles, conveyors, transfer points, and processing areas."

[8] Comments of NRDC et al. ("Comments") at 3-7, available at http://www.cityofchicago.org/content/dam/city/depts/cdph/environmental_health_and_food/PetCoke_Public_Comments/NRDC_SETF_Alliance_for_the_Great_Lakes_ELPC_Faith_in_Place_RHAMC_and_Sierra_Club_Recvd_2-7-14.pdf.

Notably, AZR objected to the amended Rules, including the application of the enclosure requirement to its IRM-related operations.[9] The City responded with its justification for mandating enclosure. AZR argued that Iron Rich Material should be excluded from the enclosure requirement because it only contains a "de minimis" concentration of manganese, approximately 4%.[10] In removing the previously proposed 1% threshold in the original definition of manganese-bearing materials, the City responded:

> The Final Rules no longer include a de minimis exception for manganese content. As pointed out by the NGOs, even if a material contains a low amount of manganese by weight, the material could still pose a risk if handled in large quantities and not sufficiently controlled.[11]

AZR also suggested that, instead of indoor storage, the rules require the IRM to be sheltered by a three-sided barrier and be subject to the application of water and chemical stabilizers, among other controls. In response, the City underscored its conclusions to an earlier AZR request to avoid PM monitoring altogether, stating:

> AZR's request for a variance from the requirement to install PM10 monitors failed to demonstrate that IRM, when crushed and processed outdoors, does not have the potential to produce fugitive dust that might lead to adverse impacts.[12]

AZR is now repackaging these earlier objections in the current variance request. Like AZR's earlier requests to avoid PM-10 monitoring and enclosure mandates, the City must deny AZR's variance request.

AZR Handles Large Quantities of Manganese

On page 4 of its variance request, AZR asserts that Iron Rich Material only contains 1-2% of manganese. However, AZR never acknowledges the total quantity of manganese that it handles, including the manganese that is a component of large, outdoor storage piles.

As an initial matter, CDPH has every reason to be skeptical about the variance claim that IRM contains 1-2% of manganese. On page 4 of its April 13, 2018 comments on CDPH's proposed Rules, AZR asserted IRM contains roughly 4% manganese.[13] On page 2 of its own 2018 Safety Data Sheet, AZR stated that manganese oxide was present in IRM at a concentration of 4-6%. A true and accurate copy of this Safety Data Sheet is

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[9] Available at: https://www.chicago.gov/content/dam/city/depts/cdph/environmental_health_and_food/Com_AmericanZincRecycling_6132018.pdf

[10] Id. at 3.

[11] Available at: https://www.chicago.gov/content/dam/city/depts/cdph/InspectionsandPermitting/CDPH_Resp_Com_BulkMaterialAmendments_January2019.pdf, pp. 14-16.

[12] Id.

[13] Available at: https://www.chicago.gov/content/dam/city/depts/cdph/InspectionsandPermitting/AZR_VarianceRequest_4252019.pdf

attached to these comments and labeled as Exhibit Three. This Exhibit also includes ArcelorMittal's Safety Data Sheet for EAF Dust, which is also a manganese-containing material managed at AZR. Page 7 of this Safety Data Sheet indicates that EAF Dust is a hazardous material subject to U.S. Department of Transportation Regulations, 49 CFR 172.101, underscoring the importance of responsible transport and conveyance of this material.[14]

As demonstrated by the following table, regardless of whether IRM contains 1, 2, 4, 5 or 6% manganese, AZR appears to be handling large quantities of manganese. As AZR acknowledges on page 4 of its application, AZR "…produces approximately 76,000 cubic-yards of IRM annually, and at any given time, there are several piles of IRM stored outside the facility…"

Using AZR's own data, it's possible to characterize the volume of manganese processed at the AZR facility on an annual basis. The volume of manganese can be characterized as follows:

Manganese % in IRM	1%	2%	4%	5%	6%
Manganese Volume in Cubic Yards	760	1,520	3,040	3,800	4,560
Manganese in U.S. Tons (cubic area x 1.4)[15]	1,077	2,154	4,309	5,386	6,463

CDPH should deny AZR's variance request because it has not accurately, consistently characterized the quantity of manganese that its facility handles, as required by the variance provision. As a threshold matter, there is no reliable, empirically-verifiable basis to assess the manganese the facility handles. Moreover, even a cursory analysis of the available information suggests AZR is handling anywhere from 1,077 to 6,463 tons of manganese each year, stored in multiple outdoor piles.

AZR's Own Safety Data Sheet Acknowledges the Hazards Posed by Iron Rich Materials, Especially IRM's Manganese Component

AZR produces a Safety Data Sheet for Iron Rich Material. AZR's Safety Data Sheet is developed to fulfill requirements of Regulation (EC) No. 1907/2006 concerning the Registration, Evaluation, Authorization and Restriction of Chemicals, commonly known

[14] Depending on its source and other characteristics, Arc Furnace Dust can be a listed K061 hazardous waste, a characteristic hazardous waste or non-hazardous. See: https://rcrapublic.epa.gov/rcraonline/results.xhtml?param=K061+waste . There isn't adequate information in AZR's variance application for a third party to make this determination.

[15] In order to convert cubic yards to tons, the density of dry gravel was inserted and this calculator was used: https://www.thecalculatorsite.com/conversions/common/cubic-yards-tons.php

as the EU Reach requirements.[16] Similar in format to the MSDS used in the U.S., Safety Data Sheets are designed to describe hazards, handling and storage techniques, exposure controls, toxicology and epidemiology. AZR has developed a Safety Data Sheet for Iron Rich Material to meet this EU requirement. AZR's own Safety Data Sheet clearly evidences the hazards posed by Iron Rich Material and, more specifically, the risks posed by IRM's manganese component.

Iron Rich Material is a black granular material with no odor.[17] IRM contains multiple metallic constituents; of these, the only one which is identified as hazardous is manganese oxide which, in turn, is described as 4-6% of the volume of the material.[18] As the only hazardous component, manganese oxide is the only component which must be specifically listed on the product label, along with the signal word "warning" and a statement: "May cause damage to organs through prolonged or repeated exposure if inhaled."[19] Other precautionary statements warn against breathing dust and fumes.[20]

Page 3 of AZR's Safety Data Sheet characterizes the symptoms and effects of exposure to IRM, which are almost exclusively attributed to the risks posed by manganese exposure. AZR cautions:

> This product contains Manganese compounds. Manganese can attach the central nervous system, causing symptoms similar to Parkinson's Disease. Chronic manganese exposures can lead to neurological problems such as apathy, drowsiness, weakness, spastic gait, paralysis, and other neurological problems resembling Parkinsonism. These symptoms can become progressive and permanent if not treated.

Other potential health effects of IRM exposure identified by AZR include coughing and breathing difficulties, stinging and tearing of the eyes and gastrointestinal irritation.[21]

Because of these potential hazards, safe handling requires protective equipment to avoid inhalation, ingestion and dermal contact.[22] AZR-recommended personal exposure controls include respirators, gloves, goggles and post-handling washing.[23] AZR further recommends handling should occur in a well-ventilated space where there is a high efficiency exhaust system for "minimizing dust emissions."[24] AZR's Safety Data Sheet recommends a cyclone system, dust filters and double stage cassette filters to minimize dust emissions.[25]

On page 9 of AZR's Safety Data Sheet, AZR details ecotoxicity information, including ecotox thresholds for manganese for rainbow trout, daphnia and algae. These ecotox

[16] Exhibit 2, p. 1.
[17] Id. at 1.
[18] Id. at 2.
[19] Id. at 1.
[20] Id.
[21] Id. at 2.
[22] Id. at 6.
[23] Id.
[24] Id. at 5.
[25] Id.

thresholds are important because AZR's Calumet facility operates in the midst of waterways and wetlands.

Manganese is present in significant quantities at the AZR facility and, according to AZR's own Safety Data Sheet, poses significant potential hazards to human health and the environment.

Despite Its Fugitive Dust Plan, AZR Experiences Recurrent PM Spikes in Fence Line Monitors

AZR has a Fugitive Dust Plan[26], but AZR's Plan alone is not adequate to prevent recurrent spikes in PM levels recorded by fence line monitors.

CDPH appropriately requires that facilities like AZR have the capacity to prevent, detect and respond to potential releases of windborne material. To this end, CDPH mandates the development and implementation of a proactive fugitive dust plan. Every fugitive dust plan must contain some required elements, but CDPH also expressly allows flexibility for businesses to develop plans that make the most sense based on their unique operations.[27] However, the actual success of a fugitive dust plan is not left to guesswork. For CDPH, the most reliable means to demonstrate the success of a fugitive dust plan for operators, regulators and residents is through uniform, empirically verifiable PM monitoring. It is not an exaggeration to state that PM monitoring is the lynchpin of the CDPH protocol. As stated by CDPH:

> The requirement for fugitive dust monitoring is a critical component of the regulations to ensure that the facility's dust control measures are working. CDPH inspectors cannot observe facility operations on a daily basis. And facility workers who are occupied in doing their jobs may not always realize when there is a dust problem. Therefore, the PM monitors are important for alerting facility operators when there might be an issue with their dust control systems. They are also important to ensure compliance with the fugitive dust prohibition, as well as to give neighbors a level of comfort in knowing the air is being monitored.[28]

AZR began monitoring for PM-10 on February 22, 2019. The newly available data from fence line monitors shows recurrent spikes in PM-10 levels at the perimeter of the AZR facility. Two tables summarizing this data from March and April, 2019 are attached to these comments and labeled as Exhibit 4. From these AZR-generated tables, the PM spikes can be characterized in the following manner:

[26] Consolidated Fugitive Dust Plan and Operating Program for Fugitive Particulate Matter for American Zinc Recycling (Chicago Plant), January 31, 2019, Revision 6.
[27] City of Chicago Department of Public Health, Official Response to Public Comments on the Proposed Rules and Regulations For The Handling and Storage of Bulk Material Piles, March 13, 2014, p.21.
[28] Id. at 23.

3/4/2019

Time stamp	Wind Speed	Wind Direction	Std. Dev. Wind Direction	Gust (3-second)	Temp	Precip	PM10 North	PM10 East	PM10 West	PM10 South
CST	Mph	deg	deg	Mph	°F	In.	µg/m3	µg/m3	µg/m3	µg/m3
10:00	10.4	268.3	17.5	17.9	3.1	0	91	99	17	34
11:00	10.4	265.4	21.4	22.7	5.1	0	258	76	23	19
12:00	11.6	265.5	17.4	21.5	6.7	0	137	70	19	20
13:00	11.7	265.7	18.0	20.9	8.8	0	96	111	21	13
14:00	11.5	268.8	13.7	22.1	10.7	0	60	79	AN	18
15:00	12.0	264.4	17.8	21.5	12.0	0	138	67	18	14

3/6/2019

Time stamp	Wind Speed	Wind Direction	Std. Dev. Wind Direction	Gust (3-second)	Temp	Precip	PM10 North	PM10 East	PM10 West	PM10 South
CST	Mph	deg	deg	Mph	°F	In.	µg/m3	µg/m3	µg/m3	µg/m3
13:00	7.7	236.0	27.9	20.3	25.3	0	131	31	28	24
14:00	10.0	236.6	26.9	22.7	27.1	0	310	57	39	47
15:00	10.1	252.2	20.8	20.3	29.4	0	117	25	17	23
16:00	9.2	257.3	18.8	17.9	30.6	0	AN	29	24	24
17:00	10.6	253.9	17.5	21.5	31.0	0	92	33	17	27
18:00	9.5	251.5	21.0	20.9	31.0	0	115	30	20	24

3/9/2019

Time stamp	Wind Speed	Wind Direction	Std. Dev. Wind Direction	Gust (3-second)	Temp	Precip	PM10 North	PM10 East	PM10 West	PM10 South
CST	Mph	deg	deg	Mph	°F	In.	µg/m3	µg/m3	µg/m3	µg/m3
9:00	12.6	122.5	16.2	23.3	35.8	0	142	142	47	46
10:00	12.2	124.2	16.8	20.9	38.2	0	155	101	47	49
11:00	13.3	125.5	18.9	26.2	40.4	0	277	172	56	58
12:00	12.4	126.0	17.2	27.4	41.4	0	287	74	45	38
13:00	13.7	124.8	17.1	23.9	41.8	0	196	67	53	38
14:00	15.4	116.2	19.0	29.8	41.9	0.01	289	88	57	45

3/12/2019

Time stamp	Wind Speed	Wind Direction	Std. Dev. Wind Direction	Gust (3-second)	Temp	Precip	PM10 North	PM10 East	PM10 West	PM10 South
CST	Mph	deg	deg	Mph	°F	In.	µg/m3	µg/m3	µg/m3	µg/m3
20:00	9.9	150.5	17.3	19.7	44.1	0	112	6	23	13
21:00	10.6	152.7	17.5	23.9	44.1	0	151	8	17	19
22:00	7.8	162.5	20.1	17.9	44.1	0	65	16	12	10
23:00	8.3	164.2	21.2	20.3	44.3	0	48	8	14	13
0:00	9.4	168.0	22.7	20.9	44.2	0	128	13	19	14

3/13/2019

Time stamp	Wind Speed	Wind Direction	Std. Dev. Wind Direction	Gust (3-second)	Temp	Precip	PM10 North	PM10 East	PM10 West	PM10 South
CST	Mph	deg	deg	Mph	°F	In.	µg/m3	µg/m3	µg/m3	µg/m3
18:00	8.9	153.2	19.1	19.7	60.8	0	192	10	15	10
19:00	8.6	148.8	17.5	15.5	60.5	0	122	12	16	15
20:00	6.0	134.6	20.5	12.5	59.1	0	84	9	11	10
21:00	11.5	149.0	13.5	18.5	60.5	0	124	4	14	9

3/19/2019

Time stamp	Wind Speed	Wind Direction	Std. Dev. Wind Direction	Gust (3-second)	Temp	Precip	PM10 North	PM10 East	PM10 West	PM10 South
CST	Mph	deg	deg	Mph	°F	In.	µg/m3	µg/m3	µg/m3	µg/m3
15:00	6.5	218.0	30.0	14.9	48.8	0	737	63	13	33
16:00	5.8	220.0	32.8	13.7	49.5	0	55	17	9	17
17:00	5.8	222.0	36.2	14.9	49.3	0	61	13	14	10
18:00	4.4	220.2	32.2	14.3	47.6	0	985	11	17	12
19:00	3.0	199.4	16.0	7.8	45.7	0	985	20	15	13
20:00	2.5	162.3	16.6	5.4	44.7	0	218	44	38	64
21:00	2.8	162.4	20.3	6.0	43.3	0	365	38	27	28
22:00	3.7	158.5	17.1	9.0	42.5	0	178	16	27	27

3/26/2019 --- 3/27/2019

Time stamp	Wind Speed	Wind Direction	Std. Dev. Wind Direction	Gust (3-second)	Temp	Precip	PM10 North	PM10 East	PM10 West	PM10 South
CST	Mph	deg	deg	Mph	°F	In.	µg/m3	µg/m3	µg/m3	µg/m3
22:00	3.2	155.4	16.0	6.0	35.1	0	102	67	43	51
23:00	4.5	164.1	14.3	9.6	34.5	0	159	43	26	27
0:00	1.4	193.0	8.2	4.2	33.1	0	42	28	29	43
1:00	1.7	167.8	12.5	4.7	32.7	0	69	14	39	14
2:00	2.9	173.6	12.1	6.0	32.5	0	39	13	14	15
3:00	2.9	172.1	12.7	5.4	32.3	0	92	11	17	15
4:00	3.0	169.3	17.4	6.0	32.1	0	AN	25	19	18
5:00	2.8	171.2	20.0	6.0	32.2	0	127	20	24	19
6:00	2.9	177.5	19.9	7.8	32.2	0	122	78	45	65
7:00	4.1	167.0	21.7	10.8	33.8	0	173	72	44	267
8:00	5.8	170.4	20.9	12.5	37.9	0	268	111	34	503
9:00	6.6	181.5	24.9	13.7	42.6	0	156	103	23	349
10:00	7.6	202.6	27.1	18.5	46.2	0	139	146	17	198
11:00	8.5	204.7	23.1	17.9	48.6	0	183	124	24	198
12:00	7.8	203.2	26.2	16.1	51.1	0	393	39	17	27
13:00	8.6	197.5	20.6	19.7	53.2	0	171	112	21	211
14:00	8.7	189.8	22.8	18.5	55.3	0	149	102	22	97
15:00	9.1	191.0	28.0	19.7	56.7	0	116	69	18	113
16:00	8.8	190.7	24.8	21.5	57.1	0	155	47	14	35
17:00	8.5	188.3	26.4	20.3	56.9	0	105	27	12	21
18:00	8.0	183.4	21.9	19.1	55.3	0	150	20	15	18

19:00	6.8	169.4	21.7	14.9	54.0	0	119	52	27	34
20:00	8.0	175.8	23.7	21.5	53.7	0	101	23	19	24
21:00	9.0	191.9	25.8	19.7	52.7	0	129	26	14	24
22:00	5.9	224.7	29.2	20.3	51.2	0.03	211	24	26	17
23:00	5.2	210.3	31.2	17.9	46.3	0.1	148	11	14	16

4/1/2019

Time stamp	Wind Speed	Wind Direction	Std. Dev. Wind Direction	Gust (3-second)	Temp	Precip	PM10 North	PM10 East	PM10 West	PM10 South
CST	Mph	deg	deg	Mph	°F	In.	µg/m3	µg/m3	µg/m3	µg/m3
11:00	8.4	206.6	29.7	19.7	42.0	0	146	24	18	14
12:00	8.6	200.1	28.6	20.9	43.5	0	115	50	13	21
13:00	10.3	201.3	29.4	23.3	45.1	0	148	40	12	18
14:00	10.0	210.8	32.8	23.3	46.1	0	184	39	14	18
15:00	10.1	199.6	25.4	21.5	46.8	0	105	32	11	20
16:00	10.2	204.3	32.4	21.5	47.1	0	167	11	7	8
17:00	10.1	197.9	28.7	23.3	47.3	0	101	11	10	8

4/2/2019

Time stamp	Wind Speed	Wind Direction	Std. Dev. Wind Direction	Gust (3-second)	Temp	Precip	PM10 North	PM10 East	PM10 West	PM10 South
CST	Mph	deg	deg	Mph	°F	In.	µg/m3	µg/m3	µg/m3	µg/m3
11:00	7.7	220.3	30.8	17.3	52.9	0	129	41	24	30
12:00	10.1	236.9	34.0	24.5	55.2	0	170	48	38	31
13:00	11.0	239.3	28.8	25.7	55.7	0	158	68	35	46
14:00	11.5	240.0	30.5	26.2	54.9	0	212	87	69	86

4/8/2019

Time stamp	Wind Speed	Wind Direction	Std. Dev. Wind Direction	Gust (3-second)	Temp	Precip	PM10 North	PM10 East	PM10 West	PM10 South
CST	Mph	deg	deg	Mph	°F	In.	µg/m3	µg/m3	µg/m3	µg/m3
20:00	4.0	221.9	33.1	10.8	66.6	0	203	15	19	16
21:00	4.8	223.5	33.0	14.9	65.9	0	158	17	15	11
22:00	6.4	233.6	28.9	15.5	65.9	0	109	14	14	11

4/22/2019

Time stamp	Wind Speed	Wind Direction	Std. Dev. Wind Direction	Gust (3-second)	Temp	Precip	PM10 North	PM10 East	PM10 West	PM10 South
CST	Mph	deg	deg	Mph	°F	In.	µg/m3	µg/m3	µg/m3	µg/m3
6:00	5.4	173.6	22.3	12.0	57.6	0	179	46	39	48
7:00	7.1	171.9	22.5	14.9	60.9	0	195	71	37	40
8:00	7.2	160.5	21.4	16.1	62.8	0	142	68	53	46
9:00	8.0	175.3	22.6	19.1	67.3	0	91	59	30	40
10:00	9.1	181.0	23.8	19.1	71.5	0	143	78	32	51
11:00	8.9	178.6	25.0	22.1	73.6	0	148	92	38	74
12:00	9.9	194.8	23.4	23.9	75.8	0	164	66	25	48
13:00	10.3	181.2	27.4	24.5	77.9	0	221	114	58	88
14:00	11.9	179.1	29.4	26.8	77.8	0	206	138	57	108
15:00	9.3	180.4	26.3	23.3	77.9	0	96	69	31	72
16:00	10.4	181.3	26.7	26.2	78.8	0	145	66	28	47
17:00	9.9	191.5	24.1	24.5	77.2	0	147	60	18	21
18:00	6.6	201.6	31.4	19.7	74.6	0	275	45	27	25
19:00	4.5	192.7	17.6	13.1	68.7	0.23	129	45	33	39

4/28/2019

Time stamp	Wind Speed	Wind Direction	Std. Dev. Wind Direction	Gust (3-second)	Temp	Precip	PM10 North	PM10 East	PM10 West	PM10 South
CST	Mph	deg	deg	Mph	°F	In.	µg/m3	µg/m3	µg/m3	µg/m3
13:00	5.8	71.4	27.7	11.4	45.6	0	3	2	286	42
14:00	6.9	61.4	27.1	13.1	46.9	0	4	0	204	15

Even a basic analysis of this data reveals that the highest PM readings are consistently detected at downwind fence line monitors (that is, after the prevailing wind has blown across the AZR facility). Moreover, these results do not align with AZR's speculation that its monitored PM levels may be attributable to other sources to the south and east of its facility. Using a one-hour PM10 threshold of 150 µg/m3, AZR's south monitor only exceeded this threshold on 6 days. AZR's east monitor only recorded a PM10 level in excess of this 150 µg/m3 threshold on one day. By contrast, AZR's north monitor exceeded this PM10 threshold on 20 days. Moreover, while it appears the highest readings (985 µg/m3 for a two hour period, and 737 µg/m3 for a one hour period on March 19th) may correspond with a kiln cleanout as claimed by AZR, this does not explain recurrent levels above this threshold for protracted periods of time on several other days at AZR's north monitor.

AZR's existing practices are inadequate to prevent releases of particulate matter. These releases must be addressed through more foolproof methods, especially because of the significant quantity of toxic manganese that is inherent in facility operations. Enclosing all manganese-related operations, including IRM stockpiles, is a straightforward approach to eliminate releases of manganese-containing PM. The City's requirement for full enclosure of all piles, conveyors, transfer points, and processing areas is essential to

address longstanding health and safety concerns about fugitive emissions from the AZR facility.

Temporary Surface Crusting Is an Inadequate Dust Control Strategy for Iron Rich Materials.

In its variance request, AZR claims that Iron Rich Material develops a protective one-inch "crust" within "a few weeks", which eventually becomes a four-to five inch crust that prevents airborne releases.[29] This simple claim is at odds with foundational CDPH conclusions about the ways that releases occur before, during and after material is stockpiled. As asserted by CDPH, there are four categories of material and handling and storage activities that create airborne dust as part of the outdoor storage of materials - bulldozing and grading, material dropping operations, equipment operations on the surfaces of stockpiles and vehicle travel on paved roads.[30] That is, the City's analysis includes all of the operations that are connected to stockpiling material, and is not limited to the conditions of the stockpiled material after "a few weeks." Moreover, it does not appear that AZR provides information about the duration that any load of IRM spends in outdoor storage, making it extremely difficult to assess how often crusting even occurs.

The NGO commentators urge CDPH to evaluate the full range of operations that are connected to stockpiling in evaluating AZR's claims. CDPH's own May 13, 2019 inspection suggests the sources of fugitive dust can be found throughout facility operations. As to the stockpiles themselves, the NGO commentators assert that CDPH cannot begin to evaluate AZR's crusting claims without detailed information demonstrating the duration that individual IRM loads are left undisturbed in stockpiles.

Rookwood Is Not the Only Other AZR Facility. CDPH Should Require AZR To Provide Information About the Full Range of Modern Bulk Storage Facilities As Part Of Evaluating The Feasibility of Establishing Enclosures.

In its variance request, AZR cites to performance data from Rockwood, TN Facility. However, Rockwood is not the only AZR U.S. facility. AZR also operates an EAF dust recycling facility in Barnwell, South Carolina, as well as facilities in Mooresboro, North Carolina and Palmerton and Elwood City, Pennsylvania. [31] An aerial photograph of the Barnwell facility is featured on AZR's website, along with a caption touting the facility as AZR's first greenfield facility, constructed in 2010. The aerial photograph of the Barnwell facility is notable for the absence of outdoor storage piles. It is also a stark contrast with the brown-stained aerial photograph of the Chicago facility found on U.S. EPA's ECHO website. The same observation can be made about the Palmerton and Elwood facilities.[32] The NGO commentators encourage CDPH to request information

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[29] Available at: https://www.chicago.gov/content/dam/city/depts/cdph/InspectionsandPermitting/AZR_VarianceRequest_4252019.pdf

[30] City of Chicago Department of Public Health, Official Response to Public Comments on the Proposed Rules and Regulations For The Handling and Storage of Bulk Material Piles, March 13, 2014, p.4.

[31] http://azr.com/

[32] http://azr.com/facilities/

from AZR about the Barnwell facility as well as other more modern facilities as part of evaluating assertions about the impracticability of establishing enclosures for bulk materials. This analysis should include a description of the population density and inventory of natural resources in proximity to other similar facilities.

AZR's Variance Request Must Be Denied

The scope of the Commissioner's authority and responsibility is broad, extending to "…any matter, material or substance susceptible to being windborne and for the handling, transportation, disposition or other operation with respect to any material subject to being windborne."[33] As pointed out by CDPH in its March 13, 2014 Response To Public Comments, the intent in establishing regulations is to protect public health and the environment from activities that have the potential to cause windborne dust, even "…existing businesses that are lawfully operating under current Chicago land use laws."[34] Because of the toxicity and prevalence of manganese, the City acted prudently when it mandated additional measures to address manganese risks to human health and the environment.

AZR is the exact facility that should be subject to the full requirements of the City's regulations, including enclosure. AZR has been a regulatory priority based on its fugitive emissions for several years. AZR handles a significant volume of manganese, a substance it acknowledges poses significant potential risks. Despite enforcement and emerging evidence of PM emission spikes, AZR continues to use of outdoor storage piles for large volumes of manganese-containing materials. Under these circumstances, enclosure is an appropriate requirement. To date, AZR has not chosen to incorporate this 19th century technology at its 1940's vintage facility. This is unfortunate, and it is long overdue that this most basic industrial hygiene measure is incorporated into AZR's business plan.

For the reasons described in this letter, we respectfully request that the Commissioner deny AZR's request for a variance. Please do not hesitate to contact us if you have any questions.

[33] Municipal Code of Chicago 11-4-770.
[34] City of Chicago Department of Public Health, Official Response to Public Comments on the Proposed Rules and Regulations For The Handling and Storage of Bulk Material Piles, March 13, 2014, at 3.

Sincerely,

/s/ Keith Harley

Keith Harley
Attorney for the Southeast Environmental Task Force
Chicago Legal Clinic, Inc.

/s/ Meleah Geertsma

Meleah Geertsma
Senior Attorney
Natural Resources Defense Council

/s/ Nancy C. Loeb and Debbie Chizewer

On behalf of Southeast Side Coalition to Ban Petcoke
Nancy C. Loeb, Director
Debbie Chizewer, Montgomery Foundation Environmental Law Fellow
Environmental Advocacy Clinic
Northwestern Pritzker School of Law

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 5
77 WEST JACKSON BOULEVARD
CHICAGO, IL 60604-3590

APR 14 2014

REPLY TO THE ATTENTION OF:

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

John Marta
Plant Manager
Horsehead Corporation
2701 E. 114th Street
Chicago, Illinois 60617

Re: Notice and Finding of Violation
Horsehead Corporation
Chicago, Illinois

Dear Mr. Marta:

The U.S. Environmental Protection Agency is issuing the enclosed Notice and Finding of Violation (NOV/FOV) to Horsehead Corporation (you) under Section 113(a) of the Clean Air Act, 42 U.S.C. § 7413(a). We find that you are violating the Illinois State Implementation Plan at your Chicago, Illinois facility.

Section 113 of the Clean Air Act gives EPA several enforcement options. These options include issuing an administrative compliance order, issuing an administrative penalty order and bringing a judicial civil or criminal action.

We are offering you an opportunity to confer with us about the violations alleged in the NOV/FOV. The conference will give you an opportunity to present information on the specific findings of violation, any efforts you have taken to comply and the steps you will take to prevent future violations. In addition, in order to make the conference more productive, we encourage you to submit to us information responsive to the NOV/FOV prior to the conference date.

Please plan for your facility's technical and management personnel to attend the conference to discuss compliance measures and commitments. You may have an attorney represent you at this conference.

The EPA contact in this matter is Alexandra Letuchy. You may call her at (312) 886-6035 to request a conference. You should make the request within 10 calendar days following receipt of this letter. We should hold any conference within 30 calendar days following receipt of this letter.

Sincerely,

George T. Czerniak
Director
Air and Radiation Division

cc: Eric Jones
Manager of the Compliance Unit
Bureau of Air
Illinois Environmental Protection Agency

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 5

IN THE MATTER OF:	)	
	)	
Horsehead Corporation	)	**NOTICE AND FINDING OF**
Chicago, Illinois	)	**VIOLATION**
	)	
	)	**EPA-5-14-IL-10**
Proceedings Pursuant to	)	
the Clean Air Act	)	
42 U.S.C.§ § 7401 et seq	)	

NOTICE AND FINDING OF VIOLATION

The U.S. Environmental Protection Agency (EPA) is issuing this Notice and Finding of Violation (NOV/FOV) to Horsehead Corporation (Horsehead) to notify you that we have found violations of the Clean Air Act, 42 U.S.C. §§ 7401-7671q (CAA), and the Illinois State Implementation Plan (SIP) at the facility located at 2701 East 114th Street, Chicago, Illinois (Facility). The relevant statutory and regulatory background, factual background, notice and finding of violations, and environmental impact of these violations are set forth in detail below.

This NOV/FOV is issued in accordance with Section 113(a)(1) and (a)(3) of the Act, 42 U.S.C. § 7413(a)(1) and (a)(3), which authorize the Administrator to take certain enforcement actions after notifying a person that it is in violation of the Act. The authority to issue this NOV/FOV has been delegated by the Administrator to the Regional Administrator and re-delegated to the Director of the Air and Radiation Division for Region 5 of the EPA.

Relevant Statutory and Regulatory Background

Title V Requirements

1. Title V of the Act, 42 U.S.C. §§ 7661-7661f, established an operating permit program for major sources of air pollution. Section 502(d) of the Act, 42 U.S.C. § 7661a (d), provides that each state must submit to the EPA a permit program meeting the requirements of Title V.

2. In accordance with Section 502(b) of the Act, 42 U.S.C. § 7661a (b), the EPA promulgated regulations implementing Title V of the Act. *See* 57 Fed. Reg. 32295 (July 21, 1992). Those regulations are codified at 40 C.F.R. Part 70.

3. Section 502(a) of the Act, 42 U.S.C. § 7661a (a), and 40 C.F.R. § 70.7(b) provide that, after the effective date of any permit program approved or promulgated under Title V of the Act, no source subject to Title V may operate except in compliance with a Title V permit. *See also* 40 C.F.R. § 70.7(b).

4. Section 503 of the CAA, 42 U.S.C. § 7661c (a), requires that each Title V permit include enforceable emission limitations and standards, a schedule of compliance, and other conditions necessary to assume compliance with applicable requirements, including those contained in a state implementation plan.

5. The rule at 40 C.F.R. § 70.6(b)(1) provides that Title V permits are federally enforceable and that all terms and conditions of a Title V permit are enforceable by the EPA.

6. The rule at 40 C.F.R § 70.2 defines "major source" as, among other things, any stationary source belonging to a single major industrial grouping and that directly emits or has the potential to emit greater than 100 tons per year (tpy) or more of any air pollutant subject to regulation. *See also* 42 U.S.C. § 7661(2)(A).

7. The rule at 40 C.F.R. § 70.5(a) provides that "for each part 70 source, the owner or operator shall submit a timely and complete permit application in accordance with this section."

8. The rule at 40 C.F.R. § 70.5(c) specifies the information to be provided in a permit application for that application to be considered complete. The required information includes all emissions of pollutants for which the source is major, and all emissions of regulated air pollutants. A permit application shall describe all emissions of regulated air pollutants emitted from any emissions unit, except where such units are exempted under this paragraph (c) of this section. For insignificant activities which are exempted because of size or production rate, a list of such insignificant activities must be included in the application.

9. The rule at 40 C.F.R. § 70.5(d) requires that the permit application contain a certification by a responsible official of its truth, accuracy, and completeness.

10. The EPA approved of the Illinois' Title V program on December 4, 2001. 66 Fed. Reg. 62946. The approved Illinois Title V program is known as the Illinois Clean Air Act Permit Program (CAAPP).

Title V Permit

11. The Illinois Environmental Protection Agency (IEPA) issued a CAAPP Permit, Application No.: 96030189 (Title V Permit), to Horsehead on May 15, 2002.

12. The significant emission units in the Title V Permit and their associated emission capture equipment that are relevant to this FOV/NOV are:

Emission Unit	Description	Commenced Construction	Emission Control Equipment
Process Emission Source	Carbon Material Pneumatic Displacement Transfer System	11/93	Bag Collector 15
	Carbon Material Bin	11/93	Bag Collector 16
	Curing and Blending Building	1/92	Bag Collectors 11A, 11B, and 12
	Feed Handling System	3/87	Bag Collectors 2, 7, 8, 9, and 13
	Crude Zinc Oxide Bin	3/87	Bag Collectors 5, 6
	Iron Rich Material Transfer Area	6/93	Bag Collector 14
	Iron-Rich Material Kilns Discharge Area	4/87	Bag Collector 1
Waelz Kiln System	Rotary Kiln 1 and 2	Kiln 1 3/42 Kiln 2 4/93	Product Collectors 3 and 10
Fugitive Particulate Emissions	Facility Roadways		
	Carbon Storage Pile		
	Carbon Handling by a Conveyor		
	Iron-Rich Material Handling		

13. Condition 5.1.1. of the Title V Permit states that Horsehead is a major source of NOx emissions as defined by Title V of the CAA.

14. Condition 5.2.3.a. of the Title V Permit states that the facility shall operate under the provisions of a fugitive particulate matter operating program prepared by the Permittee and submitted to Illinois EPA for its review.

15. Condition 5.2.3.b. of the Title V Permit states that the fugitive particulate matter operating program shall be amended from time to time by the Permittee so that the operating program is current.

16. Condition 5.2.8. of the Title V Permit states that the facility is required to prepare and submit a contingency measure plan reflecting the PM_{10} emission reductions as set forth in 35 Illinois Administrative Code (IAC) 212.703.

17. Condition 7.1.5. of the Title V Permit states that the Permittee shall operate and maintain bag collectors controlling the process emission sources, including periodic inspection, routine maintenance, and prompt repair of defects, if any, that assures compliance with the conditions of the process emission sources section.

18. Condition 7.1.6. of the Title V Permit states that the particulate matter (PM) emission limits for the Curing and Blending building are 1.0 lb/hr and 4.4 tpy. This condition also states: "the above limitation was established in permit 85120055, pursuant to Title I of the CAA, Major Stationary Sources Construction and Modification and 40 C.F.R. 52.21, Prevention of Significant Deterioration (PSD). These limits ensure that the construction and/or modification addressed in the aforementioned permit does not constitute a new major source or major modification pursuant to these rules."

19. Condition 7.1.6. of the Title V Permit also states that the total emissions limit for the carbon material pneumatic displacement transfer system, carbon material bin, feed handling system, crude zinc oxide bin, iron-rich material transfer area, and the iron-rich material kilns discharge area shall not exceed 35.1 tons per year. This condition also states that "the above limitations are being established in this permit pursuant to Title I of the CAA, specifically 35 IAC Part 203, Major Stationary Sources Construction and Modifications and/or 40 C.F.R. 52.21, PSD. The source has requested that the IEPA established emissions limitation and other appropriate terms and conditions in this permit that limit the PM emission from the affected process emission source operation below the levels that would trigger the applicability of these rules, consistent with the information provided in the CAAPP application."

20. Condition 7.1.9.a.i. of the Title V Permit states that the permittee shall maintain records of periodic inspection of the bag collectors with the date, name of individual performing the inspection, and the nature of the inspection for the bag collectors controlling the process emission sources.

21. Conditions 7.1.9.a.ii. of the Title V Permit states that the permittee shall maintain records of prompt repair of defects of the bag collectors controlling process emissions with the identification and description of defect, effect on emissions, date identified, date repaired, and nature of repair.

22. Condition 7.1.9.b. of the Title V Permit states that the permittee shall maintain records of the inlet flow rates per respective bag collector controlling process emissions.

23. Condition 7.1.12.a. of the Title V Permit states that compliance with Condition 7.1.6. for the process emission units shall be based on an emissions calculation that accounts for bag collector inlet flow rate and bag collector efficiency.

24. Condition 7.2.9. e.i. of the Title V Permit states that the permittee shall maintain records of prompt repair of defects of the bag collectors controlling emissions from Kilns 1 and 2 with the identification and description of defect, effect on emissions, date identified, date repaired, and nature of repair.

25. Conditions 7.2.9.e.ii. of the Title V Permit states that the permittee shall maintain records of prompt repair of defects of the bag collectors controlling emissions from Kiln 1 and Kiln 2 with the identification and description of defect, effect on emissions, date identified, date repaired, and nature of repair.

26. Condition 7.4.2. of the Title V Permit states that the sources of fugitive emissions are facility roadways, carbon storage piles, carbon-handling by a conveyor and iron-rich material handling.

PSD Requirements

27. The PSD provisions of Part C of Title I of the Act require preconstruction review and permitting of stationary sources in attainment/unclassifiable areas. 42 U.S.C. §§ 7470-7492. Pursuant to applicable regulations, if a major stationary source located in an attainment area is planning to make a major modification, then that source must obtain a PSD permit before beginning actual construction. 40 C.F.R. § 52.21. To obtain this permit, the source must, among other things, undergo a technology review and apply Best Available Control Technology (BACT), perform a source impact analysis, perform an air quality analysis and modeling, submit appropriate information and conduct additional impact analyses as required.

28. Section 165(a) of the Act, 42 U.S.C. § 7475(a) prohibits the construction and subsequent operation of a "major emitting facility" in an area designated as attainment or unclassifiable unless a permit has been issued that is consistent with the requirements of Section 165 and the facility employs BACT for each pollutant subject to regulation under the Act that is emitted from the facility.

29. On June 19, 1978, EPA issued regulations implementing the federal PSD program at 40 C.F.R. § 52.21. 43 Fed. Reg. 26,388, 26, 403 (June 19, 1978) (federal PSD program). Since that time, the federal PSD regulations have been revised, with subsequent revisions incorporated under 40 C.F.R. § 52.21et seq.

30. Sections 110(a) and 161 of the CAA, 42 U.S.C. §§ 7410(a) and 7471, require each state to adopt a state implementation plan (SIP) that contains emission limitations and such other measures as may be necessary to prevent significant deterioration of air quality in areas designated as attainment or unclassifiable.

31. The requirements of 40 C.F.R. §52.21(j) through (r) apply to the construction of any new major stationary source or the major modification of any existing major stationary source, except as this section otherwise provides. 40 C.F.R. § 52.21(a)(2)(ii).

32. The rule at 40 C.F.R. § 52.21(r)(1) states that any owner or operator who constructs or operates a source or modification not in accordance with the application submitted pursuant to this section or with the terms of any approval to construct, or any owner or operator of a source or modification subject to this section who commences construction after the effective date of these regulations without applying for and receiving approval hereunder, shall be subject to appropriate enforcement action.

33. "Major Stationary Source" for the purpose of PSD means any of the stationary sources of air pollution in 40 C.F.R. § 52.21(b)(1)(iii) which emits, or has the potential to emit, 100 tpy or more of a regulated NSR pollutant. 40 C.F.R. § 52.21(b)(1)(i)(a).

34. "Major modification" means any physical change in or change in the method of operation of a major stationary source that would result in a significant emissions increase of a regulated NSR pollutant and a significant net emissions increase of that pollutant from the major stationary source. 40 C.F.R. § 52.21(b)(2)(i).

35. "Net emissions increase" means, with respect to any regulated NSR pollutant emitted by a major stationary source, the amount by which the sum of the following exceeds zero: (a) The increase in emissions from a particular physical change or change in the method of operation at a stationary source as calculated pursuant to 40 C.F.R. § 52.21(a)(2)(iv); and (b) Any other increases and decreases in actual emissions at the major stationary source that are contemporaneous with the particular change and are otherwise creditable. 40 C.F.R. § 52.21(b)(3)(i).

36. "Significant emissions increase" means, for a regulated NSR pollutant, an increase in emissions that is significant for that pollutant. 40 C.F.R. § 52.21(b)(40).

37. "Significant" means, in reference to a net emissions increase or the potential of a source to emit a rate of emissions that would equal or exceed any of the following rates: PM, 25 tpy; PM_{10}, 15 tpy; and PM2.5, 10 tpy. 40 C.F.R § 52.21(b)(23)(i).

Additional Illinois SIP Provisions

38. The rule at 35 IAC 201.144 states that no person shall cause or allow the operation of any existing emission source or any existing air pollution control equipment without first obtaining an operating permit from the Agency.

39. The rule at 35 IAC 212.324(a)(1)(B) states that this section shall apply to any process emission unit located in an area in the vicinity of Lake Calumet in Cook County.

40. The rule at 35 IAC 212.324(f) states that for any process emission unit subject to 35 IAC 212.324(a), the owner or operator shall maintain and repair all air pollution control equipment in a manner that assures that the emission limits and standards in this Section shall be met at all times. Proper maintenance shall include visual inspections of air pollution control equipment; maintenance of an adequate inventory of spare parts, and expeditious repairs.

41. The rule at 35 IAC 212. 324(g)(1) requires written records of inventory and documentation of inspection, maintenance, and repairs of all air pollution control equipment kept in accordance with 35 IAC 212.324(f).

Relevant Factual Background

42. Horsehead owns and operates an EAF dust processing facility located at 2701 East 114th Street in Chicago, Illinois (the Facility). The facility operates two Waelz kilns that convert EAF dust at high temperatures to crude zinc oxide and iron rich material.

43. Horsehead is located in Cook County, Illinois, and is located in the vicinity of Lake Calumet. The Lake Calumet Area was designated as a PM10 nonattainment area prior to September 8, 2005. On that date, EPA redesignated the area as attainment for PM10. *See also* 70 *Fed. Reg.* 55612.

44. On August 1, 2012, and again on March 31, 2014, EPA conducted inspections of the facility.

45. On November 14, 2012, EPA issued an information request to the Company pursuant to Section 114 of the CAA, 42 U.S.C. § 7414.

46. In response to the information request, Horsehead failed to provide a copy of current and past fugitive particulate matter operating program. Horsehead stated in the 2011 CAAPP Compliance Report that the facility was in the process of developing the program to be submitted to IEPA and was out of compliance with the requirements at Condition 5.2.3.a. of the Title V Permit. EPA obtained a copy of the operating program for fugitive particulate matter control in May of 2013.

47. Horsehead stated in the 2011 CAAPP Compliance Report that the facility was out of compliance with the PM_{10} contingency measure plan requirements at Condition 5.2.8. of the Title V Permit.

48. In response to the information request, Horsehead stated that the company manually records the differential pressure readings at the bag collectors on a weekly basis. The records showed that the normal operating range is a 4 – 8 inches water column at each bag collector. The table below, from May 1, 2009 to November 26, 2012, provides: the percentage of weekly differential pressure readings missed and the percentage of daily differential pressure readings that deviated from the normal operating range. No information was provided for bag collector15.

Bag Collector	% of Missed Readings	% of Out of Range Readings
1	6.9	88.4
11A	6.9	64.3
11B	6.9	81.5
16	6.9	100.0
2	18.3	100.0
12	18.6	100.0
14	18.6	100.0
3	15.5	21.3
10	15.5	69.7
7	5.8	97.1
8	5.8	42.0
17	5.8	99.6
9	19.2	96.4
13	18.8	87.1

49. In response to the information request, Horsehead provided measured inlet volumetric flow rates for each bag collector controlling process emission sources. Horsehead also provided baghouse capacities and fan capacities for each bag collector. Horsehead did not provide inlet volumetric flow rates for bag collector 15 or 16. The measured inlet volumetric flow rates for each bag collector were significantly lower than the baghouse capacity and fan capacity for each bag collector.

50. In response to the information request, Horsehead provided records of inspections and repairs for the bag collectors and product collectors. From May 1, 2009 to November 26, 2012, only one inspection was conducted on bag collectors 3, 10, 9, 13, and 8. No documented inspections have occurred on the remaining bag collectors. The records provided did not contain the name of the individual performing the inspections or the nature of the inspections.

51. The repair records provided did not contain the effect on emissions or the date of repairs. The records also did not consistently contain the identification and description of defects and nature of repairs.

52. During the EPA inspection on August 1, 2012, Horsehead personnel stated that iron rich material was stored in piles on the property and that there were no fugitive controls for the piles.

Notice and Finding of Violations

Violations of the Title V Permit and the Illinois SIP

53. By failing to prepare a fugitive particulate matter operating program, operate according to the program, and periodically amend the program, Horsehead violated Condition 5.2.3.a. of the Title V Permit.

54. By failing to submit a PM10 contingency measure plan, Horsehead violated Condition 5.2.8. of the Title V Permit.

55. By failing to inspect the bag collectors on a periodic basis, by failing to operate the bag collectors within a differential pressure range that indicates normal operation, failing to measure differential pressure on a weekly basis, and failing to repairs defects at the bag collectors indicated by differential pressure, Horsehead violated Condition 7.1.5. of the Title V Permit and 35 IAC 212.324(f).

56. By failing to include all required elements in the inspection records, Horsehead violated Conditions 7.1.9.a.i. and 7.2.9.e.i. of the Title V Permit and 35 IAC 212.324(g)(1).

57. By failing to include all required elements in the maintenance records, Horsehead violated Conditions 7.1.9.a.ii. and 7.2.9.e.ii. of the Title V Permit.

58. From at least 2010 to 2012, Horsehead has exceeded the PM emission limits in Condition 7.1.6., as evidenced by the bag collector efficiency in the Title V Permit and the discrepancies between the measured inlet flow rates and the bag collector capacities and fan capacities.

59. By failing to include the Iron Rich Material storage piles in the 1996 and 2006 permit applications and failing to submit correct information, Horsehead violated 40 C.F.R. § 70.5(a), 70.5(c), and 70.5(d).

60. By failing to obtain an operating permit for the Iron Rich Material storage piles, Horsehead violated and 35 IAC 201.144.

Violations of PSD

61. From at least 2010 to 2012, Horsehead's operation of the process emission sources has resulted in a significant net emissions increase of PM in violation of 40 C.F.R. § 52.21, as evidenced by the bag collector efficiency in the Title V Permit and the discrepancies between the measured inlet flow rates and the bag collector capacities and fan capacities.

Environmental Impact of Violations

62. These violations have caused excess emissions of PM. PM, especially fine particulates contains microscopic solids or liquid droplets, which can get deep into the lungs and cause serious health problems. PM exposure contributes to irritation of the airways, coughing, and difficulty breathing, decreased lung function, aggravated asthma, chronic bronchitis, irregular heartbeat, nonfatal heart attacks and premature death in people with heart or lung disease.

63. These violations have also likely resulted in increased emissions of Hazardous Air Pollutants (HAPs), including, but not limited to, manganese, lead, and cadmium. Chronic inhalation exposure of manganese results impacts the nervous systems and results in slower visual reaction time and impaired eye-hand coordination. Inhalation exposure also causes respiratory effects such as bronchitis, dyspnea during exercise, and an increase susceptibility to infectious lung disease. In children, low levels of lead in the blood can result in permanent damage to the brain and nervous system, leading to behavior and learning problems, lower IQ, hearing problems, slowed growth, and anemia. In adults, lead has nervous system effects, cardiovascular effects, and causes decreased kidney function. The acute affect on cadmium inhalation causes bronchial and pulmonary irritation. Chronic inhalation can cause kidney disease, bronchiolotis, and emphysema. HAP emissions may also cause harmful environmental and ecological effects.

4/14/14
Date

George T. Czerniak
Director
Air and Radiation Division

CERTIFICATE OF MAILING

I, Loretta Shaffer, certify that I sent a Notice and Finding of Violation, EPA-5-14-IL-10, by Certified Mail, Return Receipt Requested, to:

John A. Marta
Plant Manager
Horsehead Corporation
2701 East 114th Street
Chicago, Illinois 60617

I also certify that I sent copies of the Notice of Violation by first-class mail to:

Eric Jones, Manager
Compliance Unit
Bureau of Air
Illinois Environmental Protection Agency
P.O. Box 19506
Springfield, Illinois 62794

On the 14 day of APRIL 2014.

Loretta Shaffer
Program Technician
AECAB, PAS

CERTIFIED MAIL RECEIPT NUMBER: 7009 1680 0000 7676 2632

CITY OF CHICAGO

DEPARTMENT OF PUBLIC HEALTH
PERMITTING AND ENFORCEMENT

NARRATIVE EVALUATION

INSPECTION DATE: 05/13/2019
SITE NAME: American Zinc Recycling Corp
SITE ADDRESS: 2701 E 114TH ST, CHICAGO, IL 60617
SITE CODE: American Zinc Recycling Corp
PERMIT #: ENVAIR112615

TIME: 2:00 pm
EMPLOYEE:EMMANUEL ADESANYA

COUNTY:COOK / CHICAGO
INSPECTION #: 1344141

SUMMARY

I carried out the routine inspection of American Zinc Recycling (AZC). Michael Enos (CDPH environmental engineer) was with me during this inspection. Today was mostly cloudy, temperature: high 56 degree F, low 44 degree F, wind: NE at 9 mph gust 0 mph, according to Weather Underground. Upon arrival we met Brad D. Sutek (The Facility plant Manager), and Ruth Grissman (Office manager/Environmental Specialist) Brad took us around the facility for today's inspection, after a brief meeting. Summary of the facility PROCESS DESCRIPTION, according Brad D. Sutek: The facility receives metal-bearing wastes (electric furnace ash), which are blended with carbon-bearing material and conveyed to the Waelz kilns (two kilns are active at this facility). The Kilns convert electric arc furnace dust and other metal-bearing materials via a high temperature metal recovery process into two useful products: crude zinc oxide ("CZO") and Iron-Rich Material ("IRM"). Reduction and re-oxidation take place inside the kiln. Metcoke is used in this process. The CZO product is collected by means of product collection system, IRM product is discharged from the other end of the kiln. The main products are WOX (Zinc Oxide - Waelz Oxide, used by zinc industries as raw material in the production of high grade zinc) and IRM (Iron Rich Matrials) used by cement industries.

Today's inspection revealed the following:
1) I observed accumulation of coke material on the roof of the coke loading station structure (Please see photo # 01). Brad doesn't know how long this accumulated material has been on the roof;
2) I observed Accumulation of particulate dust material deposited on the ground, outside the building BC # 3 (rail car loading station building), and BC # 10. The accumulated dust was deposited between the two buildings (see photo #s 02, 03, & 04);
3) I observed accumulation of material on the walls, beams, pipes and other structures of BC # 3 (Please see photo #s 05, 06, & 07);
4) I observed WOX dust emissions from BC # 3 (rail car loading station building (Please see photo #s 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18 & 19);
5) I observed conveyor material close to the river (Please see photo # 20),
6) The built coke storage building has not been put to use as at the time of this inspection.

American Zinc Recycling companies will be served with notice of violation # E000035472 for the municipal codes violations 11-4-760 (a) (Handling of material susceptible to becoming windborne); 11-4-770 rule 3.0(17) (Violation of bulk material rule, "Spilled Material"). Hearing date pending for 9/5/2019. Follow up inspection the week of June 24, 2019. See the attachments

REPORT COMPLETED?	☑ YES	☐ NO		NOV ISSUED?	☑ YES	☐ NO
INVESTIGATION COMPLETED?	☑ YES	☐ NO		ATTACHMENTS?	☑ YES	☐ NO

I, EMMANUEL ADESANYA, an employee of the City of Chicago, Department of Public Health, declare that I have conducted an inspection of the above mentioned property on the date indicated. I further declare that the observations set forth on the report are true and accurate.

82

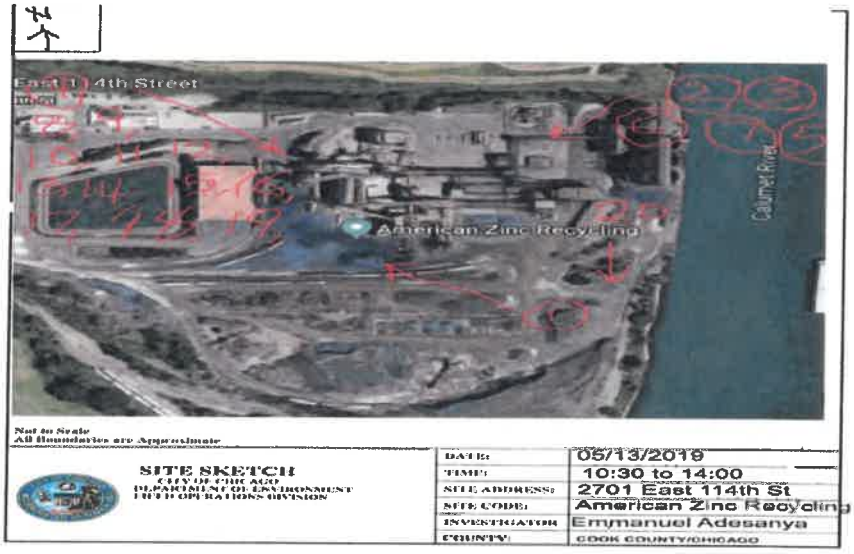
STAR #

SIGNATURE

DATE: 05/13/2019
SITE: 2701 E 114TH ST
SITE CODE: American Zinc Recycling Corp
PERMIT #: ENVAIR112615

TIME: 5/13/2019 2:00:00PM
INSPECTOR: EMMANUEL ADESANYA
COUNTY: COOK / CHICAGO
INSPECTION #: 1344141

COMMENTS:



COMMENTS:

DATE: 05/13/2019
SITE: 2701 E 114TH ST
SITE CODE: American Zinc Recycling Corp
PERMIT #: ENVAIR112615

TIME: 5/13/2019 2:00:00PM
INSPECTOR: EMMANUEL ADESANYA
COUNTY: COOK / CHICAGO
INSPECTION #: 1344141

COMMENTS: Photo # 01 Direction: NW Comments: Accumulation of coke material on the roof of coke loading station.

DATE: 05/13/2019
SITE: 2701 E 114TH ST
SITE CODE: American Zinc Recycling Corp
PERMIT #: ENVAIR112615

TIME: 5/13/2019 2:00:00PM
INSPECTOR: EMMANUEL ADESANYA
COUNTY: COOK / CHICAGO
INSPECTION #: 1344141

COMMENTS: Photo # 018 Direction: SE Comments: Emissions of particulate dust from openings on wall, door, pipes of BC # 3 (rail car loading station building) and BC # 10 building.

DATE: 05/13/2019
SITE: 2701 E 114TH ST
SITE CODE: American Zinc Recycling Corp
PERMIT #: ENVAIR112615

TIME: 5/13/2019 2:00:00PM
INSPECTOR: EMMANUEL ADESANYA
COUNTY: COOK / CHICAGO
INSPECTION #: 1344141

COMMENTS: Photo # 02 Direction: SW Comments: Accumulation of particulate dust on the ground, outside BC # 3 (rail car loading station building) and BC # 10.

DATE: 05/13/2019
SITE: 2701 E 114TH ST
SITE CODE: American Zinc Recycling Corp
PERMIT #: ENVAIR112615

TIME: 5/13/2019 2:00:00PM
INSPECTOR: EMMANUEL ADESANYA
COUNTY: COOK / CHICAGO
INSPECTION #: 1344141

COMMENTS: Photo # 03 Direction: SW Comments: Accumulation of particulate dust on the ground, outside BC # 3 (rail car loading station building) and BC # 10.

DATE: 05/13/2019
SITE: 2701 E 114TH ST
SITE CODE: American Zinc Recycling Corp
PERMIT #: ENVAIR112615

TIME: 5/13/2019 2:00:00PM
INSPECTOR: EMMANUEL ADESANYA
COUNTY: COOK / CHICAGO
INSPECTION #: 1344141

COMMENTS: Photo # 04 Direction: SE Comments: Accumulation of particulate dust on the ground, outside BC # 3 (rail car loading station building) and BC # 10.

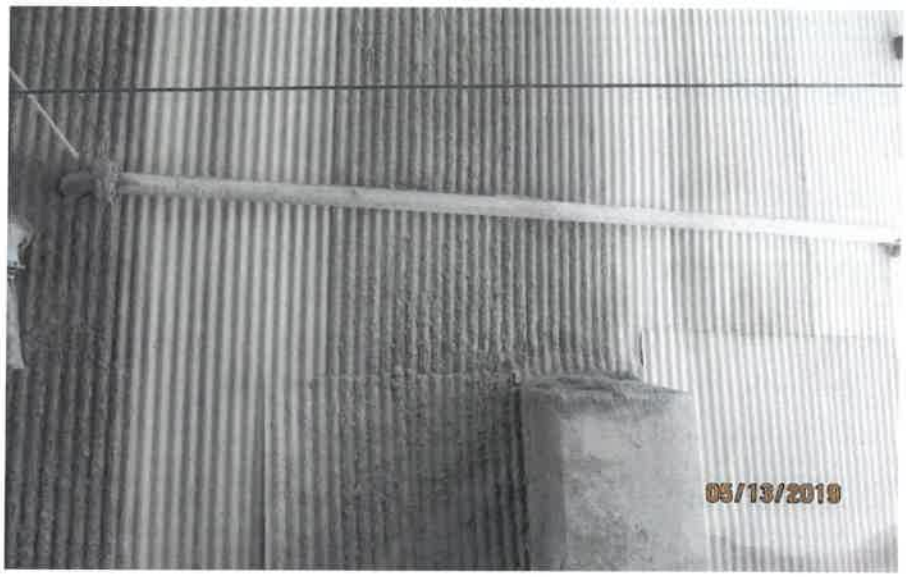
DATE: 05/13/2019
SITE: 2701 E 114TH ST
SITE CODE: American Zinc Recycling Corp
PERMIT #: ENVAIR112615

TIME: 5/13/2019 2:00:00PM
INSPECTOR: EMMANUEL ADESANYA
COUNTY: COOK / CHICAGO
INSPECTION #: 1344141

COMMENTS: Photo # 05 Direction: SW Comments: Accumulation of particulate dust on the ground, outside BC # 3 (rail car loading station building) & BC # 10. Also on walls, beams, pipes & other outside structures.

DATE: 05/13/2019
SITE: 2701 E 114TH ST
SITE CODE: American Zinc Recycling Corp
PERMIT #: ENVAIR112615

TIME: 5/13/2019 2:00:00PM
INSPECTOR: EMMANUEL ADESANYA
COUNTY: COOK / CHICAGO
INSPECTION #: 1344141



COMMENTS: Photo # 06 Direction: SW Comments: Accumulation of particulate dust on the ground, outside BC # 3 (rail car loading station building) & BC # 10. Also on walls, beams, pipes & other outside structures.

DATE: 05/13/2019
SITE: 2701 E 114TH ST
SITE CODE: American Zinc Recycling Corp
PERMIT #: ENVAIR112615

TIME: 5/13/2019 2:00:00PM
INSPECTOR: EMMANUEL ADESANYA
COUNTY: COOK / CHICAGO
INSPECTION #: 1344141

COMMENTS: Photo # 07 Direction: SW Comments: Accumulation of particulate dust on the ground, outside BC # 3 (rail car loading station building) & BC # 10. Also on walls, beams, pipes & other outside structures.

DATE: 05/13/2019
SITE: 2701 E 114TH ST
SITE CODE: American Zinc Recycling Corp
PERMIT #: ENVAIR112615

TIME: 5/13/2019 2:00:00PM
INSPECTOR: EMMANUEL ADESANYA
COUNTY: COOK / CHICAGO
INSPECTION #: 1344141

COMMENTS: Photo # 08 Direction: SE Comments: Emissions of particulate dust from openings on wall, door, pipes of BC # 3 (rail car loading station building) and BC # 10 building.

DATE: 05/13/2019
SITE: 2701 E 114TH ST
SITE CODE: American Zinc Recycling Corp
PERMIT #: ENVAIR112615

TIME: 5/13/2019 2:00:00PM
INSPECTOR: EMMANUEL ADESANYA
COUNTY: COOK / CHICAGO
INSPECTION #: 1344141

COMMENTS: Photo # 09 Direction: SE Comments: Emissions of particulate dust from openings on wall, door, pipes of BC # 3 (rail car loading station building) and BC # 10 building.

DATE: 05/13/2019
SITE: 2701 E 114TH ST
SITE CODE: American Zinc Recycling Corp
PERMIT #: ENVAIR112615

TIME: 5/13/2019 2:00:00PM
INSPECTOR: EMMANUEL ADESANYA
COUNTY: COOK / CHICAGO
INSPECTION #: 1344141

COMMENTS: Photo # 10 Direction: SE Comments: Emissions of particulate dust from openings on wall, door, pipes of BC # 3 (rail car loading station building) and BC # 10 building.

DATE: 05/13/2019
SITE: 2701 E 114TH ST
SITE CODE: American Zinc Recycling Corp
PERMIT #: ENVAIR112615

TIME: 5/13/2019 2:00:00PM
INSPECTOR: EMMANUEL ADESANYA
COUNTY: COOK / CHICAGO
INSPECTION #: 1344141

COMMENTS: Photo # 11 Direction: SE Comments: Emissions of particulate dust from openings on wall, door, pipes of BC # 3 (rail car loading station building) and BC # 10 building.

DATE: 05/13/2019
SITE: 2701 E 114TH ST
SITE CODE: American Zinc Recycling Corp
PERMIT #: ENVAIR112615

TIME: 5/13/2019 2:00:00PM
INSPECTOR: EMMANUEL ADESANYA
COUNTY: COOK / CHICAGO
INSPECTION #: 1344141

COMMENTS: Photo # 12 Direction: SE Comments: Emissions of particulate dust from openings on wall, door, pipes of BC # 3 (rail car loading station building) and BC # 10 building.

DATE: 05/13/2019
SITE: 2701 E 114TH ST
SITE CODE: American Zinc Recycling Corp
PERMIT #: ENVAIR112615

TIME: 5/13/2019 2:00:00PM
INSPECTOR: EMMANUEL ADESANYA
COUNTY: COOK / CHICAGO
INSPECTION #: 1344141

COMMENTS: Photo # 13 Direction: SE Comments: Emissions of particulate dust from openings on wall, door, pipes of BC # 3 (rail car loading station building) and BC # 10 building.

DATE: 05/13/2019
SITE: 2701 E 114TH ST
SITE CODE: American Zinc Recycling Corp
PERMIT #: ENVAIR112615

TIME: 5/13/2019 2:00:00PM
INSPECTOR: EMMANUEL ADESANYA
COUNTY: COOK / CHICAGO
INSPECTION #: 1344141

COMMENTS: Photo # 14 Direction: SE Comments: Emissions of particulate dust from openings on wall, door, pipes of BC # 3 (rail car loading station building) and BC # 10 building.

DATE: 05/13/2019
SITE: 2701 E 114TH ST
SITE CODE: American Zinc Recycling Corp
PERMIT #: ENVAIR112615

TIME: 5/13/2019 2:00:00PM
INSPECTOR: EMMANUEL ADESANYA
COUNTY: COOK / CHICAGO
INSPECTION #: 1344141

COMMENTS: Photo # 15 Direction: SE Comments: Emissions of particulate dust from openings on wall, door, pipes of BC # 3 (rail car loading station building) and BC # 10 building.

DATE: 05/13/2019
SITE: 2701 E 114TH ST
SITE CODE: American Zinc Recycling Corp
PERMIT #: ENVAIR112615

TIME: 5/13/2019 2:00:00PM
INSPECTOR: EMMANUEL ADESANYA
COUNTY: COOK / CHICAGO
INSPECTION #: 1344141

COMMENTS: Photo # 16 Direction: SE Comments: Emissions of particulate dust from openings on wall, door, pipes of BC # 3 (rail car loading station building) and BC # 10 building.

DATE: 05/13/2019
SITE: 2701 E 114TH ST
SITE CODE: American Zinc Recycling Corp
PERMIT #: ENVAIR112615

TIME: 5/13/2019 2:00:00PM
INSPECTOR: EMMANUEL ADESANYA
COUNTY: COOK / CHICAGO
INSPECTION #: 1344141

COMMENTS: Photo # 17Direction: SE Comments: Emissions of particulate dust from openings on wall, door, pipes of BC # 3 (rail car loading station building) and BC # 10 building.

DATE: 05/13/2019
SITE: 2701 E 114TH ST
SITE CODE: American Zinc Recycling Corp
PERMIT #: ENVAIR112615

TIME: 5/13/2019 2:00:00PM
INSPECTOR: EMMANUEL ADESANYA
COUNTY: COOK / CHICAGO
INSPECTION #: 1344141

COMMENTS: Photo # 19 Direction: SE Comments: Emissions of particulate dust from openings on wall, door, pipes of BC # 3 (rail car loading station building) and BC # 10 building.

DATE: 05/13/2019
SITE: 2701 E 114TH ST
SITE CODE: American Zinc Recycling Corp
PERMIT #: ENVAIR112615

TIME: 5/13/2019 2:00:00PM
INSPECTOR: EMMANUEL ADESANYA
COUNTY: COOK / CHICAGO
INSPECTION #: 1344141

COMMENTS: Photo # 20 Direction: South Comments: Material pile very close to the river.

CITY OF CHICAGO
DEPARTMENT OF PUBLIC HEALTH
ENVIRONMENTAL PERMITTING AND INSPECTIONS

CITY OF CHICAGO

OTHER CDPH PERMITS

Permit Number	Permit Type	Expiration Date
ENVAIR1018429	ENV_AIR	
ENVAIR120401	ENV_AIR	
ENVAIR640674	ENV_AIR	
ENVAIR724590	ENV_AIR	
ENVAIR804727	ENV_AIR	

SAFETY DATA SHEET

This safety data sheet complies with the requirements of Regulation (EC) No. 1907/2006, as amended.

SECTION 1. IDENTIFICATION OF THE SUBSTANCE / MIXTURE AND OF THE COMPANY / UNDERTAKING

1.1 Product identifier : **Iron Rich Material**

Product Code(s) : IRM

1.2 Relevant identified uses of the substance or mixture and uses advised against

: Aggregate; Water filtration; Cement making.
Use pattern: professional use
No restrictions on use known.

1.3 Details of the supplier of the safety data sheet:

American Zinc Recycling
4955 Steubenville Pike, Suite 405
Pittsburgh, Pennsylvania, USA
15205
Email: info@azr.com
Website: http://azr.com/american-zinc

Telephone : +1 (724) 773-2223

1.4 Emergency Telephone Number

: +1 (703) 527-3887 (Chemtrec - U.S.)

SECTION 2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

Black solid (slag-like granules). No odour.

Most important hazards:
Continuous long-term exposure above the permissible exposure limits are suspected to cause nervous system damage with neurological effects. Occupational exposure to the substance or mixture may cause adverse effects. For further information, please refer to section 11 of the SDS.

This mixture is classified as hazardous in accordance with Regulation (EC) No 1272/2008. Classification:
Specific target organ toxicity, repeated exposure - Category 2; H373

2.2 Label elements

Hazard pictogram(s)

Hazardous components which must be listed on the label:
Manganese oxide

Signal word:
Warning!

Hazard statements:
H373 - May cause damage to organs through prolonged or repeated exposure if inhaled.

SAFETY DATA SHEET

This safety data sheet complies with the requirements of Regulation (EC) No. 1907/2006, as amended.

Precautionary statements:
P260 - Do not breathe dust or fumes.
P314 - Get medical advice/attention if you feel unwell.
P501 - Dispose of contents/container in accordance with local regulation.

Supplemental Hazard Statements:
None required according to Regulation (EC) No. 1272/2008.

2.3 Other hazards

Other hazards which do not result in classification:
Mild respiratory irritant. May cause gastrointestinal irritation. Iron particles in the eye may leave a "rust ring" or brownish stain on the cornea.

PBT assessment:
This mixture contains no substance(s) above reportable levels which are considered to be persistent, bioaccumulating nor toxic (PBT), or very persistent and very bioaccumulating (vPvB).

SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Not applicable

3.2 Mixtures

High Temperature Metal Recovery (HTMR) product. Contains inorganic substances in granular form.

The following substances shall be indicated according to legislation:

Chemical name	CAS #	EC No.	Concentration	CLP Classification
Wüstite	1345-25-1	215-721-8	**38.0 - 48.0**	Not hazardous (self classified)
Magnetite	1317-61-9	215-277-5	**20.0 - 30.0**	Not hazardous (self classified)
Forsterite	15118-03-3	239-169-2	**5.0 - 20.0**	Not hazardous (self classified)
Akermanite	14567-90-9	Not specifically listed.	**5.0 - 20.0**	Not hazardous (self classified)
Iron	7439-89-6	231-096-4	**4.0 - 8.0**	Not hazardous (self classified)
Gehlenite	1302-56-3	Not specifically listed.	**2.0 - 7.5**	Not hazardous (self classified)
Manganese oxide	1344-43-0	215-695-8	**4.0 - 6.0**	STOT RE 1; H372 (self classified)
Franklinite	12063-19-3	235-052-5	**0.3 - 2.5**	Not hazardous (self classified)

For the full text of the H phrases not mentioned in this Section or in Section 2, see Section 16.

SECTION 4. FIRST-AID MEASURES

4.1 Description of first aid measures

Ingestion : Do NOT induce vomiting. Rinse mouth. Never give anything by mouth to an unconscious person. When symptoms persist or in all cases of doubt, seek medical advice.

Inhalation : If inhaled, move to fresh air. If breathing is difficult, give oxygen by qualified medical personnel only. If breathing stops, provide artificial respiration. Get medical advice/attention if you feel unwell.

Skin contact : For skin contact, wash with soap and water while removing contaminated clothing. Get medical advice/attention if you feel unwell. Launder clothing before reuse.

SAFETY DATA SHEET

This safety data sheet complies with the requirements of Regulation (EC) No. 1907/2006, as amended.

Eye contact : Rinse immediately with plenty of water, also under the eyelids. Get medical advice/attention if you feel unwell.

4.2 Most important symptoms and effects, both acute and delayed

: May cause damage to organs through prolonged or repeated exposure if inhaled. This product contains Manganese compounds. Manganese can attack the central nervous system, causing symptom's similar to Parkinson's Disease. Chronic manganese exposures can lead to neurological problems such as apathy, drowsiness, weakness, spastic gait, paralysis, and other neurological problems resembling Parkinsonism. These symptoms can become progressive and permanent if not treated.
Mild respiratory irritant. May cause coughing and breathing difficulties. Inhalation of fumes may result in metal fume fever, a flu-like illness. Symptoms of metal fume fever may include fever, fatigue, vomiting, muscle aches and shortness of breath.
Dust contact with the eyes can lead to mechanical irritation. Symptoms may include stinging and tearing.
Ingestion may cause gastrointestinal irritation, nausea, vomiting and diarrhea.
Iron particles in the eye may leave a "rust ring" or brownish stain on the cornea.

4.3 Indication of any immediate medical attention and special treatment needed

: Provide general supportive measures and treat symptomatically.

SECTION 5. FIRE-FIGHTING MEASURES

5.1 Extinguishing media

Suitable extinguishing media

: Use media suitable to the surrounding fire such as water fog or fine spray, alcohol foams, carbon dioxide and dry chemical.

Unsuitable extinguishing media

: None known.

5.2 Special hazards arising from the substance or mixture

: Not considered flammable.
In the event of fire the following can be released: Metal oxides.

5.3 Advice for firefighters

Protective equipment for fire-fighters

: Firefighters must use standard protective equipment including flame retardant coat, helmet with face shield, gloves, rubber boots, and in enclosed spaces, SCBA.
Firefighters should wear proper protective equipment and self-contained breathing apparatus with full face piece operated in positive pressure mode.

Special fire-fighting procedures

: No special requirements under ordinary conditions of use and with adequate ventilation.

SECTION 6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures

: Wear suitable protective equipment.

6.2 Environmental precautions

: None required under normal conditions.

6.3 Methods and material for containment and cleaning up

: Sweep up and shovel into suitable containers for disposal. Avoid dust formation.

6.4 Reference to other sections

: Refer to protective measures listed in sections 7 and 8. Refer to Section 13 for disposal of material.

SAFETY DATA SHEET

This safety data sheet complies with the requirements of Regulation (EC) No. 1907/2006, as amended.

SECTION 7. HANDLING AND STORAGE

7.1 Precautions for safe handling

: Use with adequate ventilation. Wear suitable protective equipment during handling. Do not breathe dust or fume. Do not ingest. Avoid contact with skin, eyes and clothing. Avoid and control operations which create high vapor or dust concentrations. Wash thoroughly after handling.

7.2 Conditions for safe storage, including any incompatibilities

: None known.

7.3 Specific end use(s) : Aggregate; Water filtration; Cement making

SECTION 8. EXPOSURE CONTROLS / PERSONAL PROTECTION

8.1 Control Parameters

Exposure Limits:

Chemical Name	Exposure Limits	Type	Notes
Wüstite	5 mg/m³ (respirable dust); 10 mg/m³ (inhalable) (TWA) 20 mg/m³ (inhalable) (STEL)	Austria (OEL)	None.
	5 mg/m³ (fumes) (TWA)	Finland (OEL)	(as Fe)
	5 mg/m³ (fumes) (TWA)	France (OEL)	(as Fe)
	10 mg/m³ (TWA) 10 mg/m³ (STEL)	Greece (OEL)	(as Fe)
	6 mg/m³ (respirable dust) (TWA)	Hungary (OEL)	None.
	5 mg/m³ (respirable dust) (TWA) 10 mg/m³ (respirable dust) (STEL)	Poland (OEL)	(as Fe)
	1.5 mg/m³ (TWA)	Slovak Republic (OEL)	None.
	5 mg/m³ (dust and fume) (TWA)	Spain (OEL)	(as Fe)
	5 mg/m³ (fumes) (TWA) 10 mg/m³ (fumes) (STEL)	The United Kingdom (WELs)	(as Fe)
Magnetite	5 mg/m³ (fumes) (TWA)	Finland (OEL)	(as Fe)
	5 mg/m³ (fumes) (TWA)	France (OEL)	(as Fe)
	10 mg/m³ (TWA) 10 mg/m³ (STEL)	Greece (OEL)	(as Fe)
	5 mg/m³ (respirable dust) (TWA) 10 mg/m³ (respirable dust) (STEL)	Poland (OEL)	(as Fe)
	5 mg/m³ (dust and fume) (TWA)	Spain (OEL)	(as Fe)
	5 mg/m³ (fumes) (TWA) 10 mg/m³ (fumes) (STEL)	The United Kingdom (WELs)	(as Fe)
Forsterite	None known.	European Union (OEL)	None.
Akermanite	None known.	European Union (OEL)	None.

SAFETY DATA SHEET

This safety data sheet complies with the requirements of Regulation (EC) No. 1907/2006, as amended.

Iron	5 mg/m³ (fumes) (TWA)	Finland (OEL)	(as Fe)
	5 mg/m³ (fumes) (TWA)	France (OEL)	(as Fe)
	5 mg/m³ (respirable dust) (TWA) 10 mg/m³ (respirable dust) (STEL)	Poland (OEL)	(as Fe)
	5 mg/m³ (dust and fume) (TWA)	Spain (OEL)	(as Fe)
	5 mg/m³ (fumes) (TWA) 10 mg/m³ (fumes) (STEL)	The United Kingdom (WELs)	(as Fe)
Gehlenite	None known.	European Union (OEL)	None.
Manganese oxide	0.02 mg/m³ (respirable dust) (TWA)	Finland (OEL)	(as Mn)
	1 mg/m³ (fumes) (TWA)	France (OEL)	(as Mn)
	0.2 mg/m³ (inhalable) (exposure factor 8); 0.02 mg/m³ (respirable dust) (exposure factor 8) (TWA)	Germany (OEL)	(as Mn)
	0.2 mg/m³ (inhalable); 0.05 mg/m³ (respirable dust) (TWA)	Poland (OEL)	(as Mn)
	N/Av	Switzerland (OEL)	N/Av
	0.5 mg/m³ (TWA) 1.5 mg/m³ (STEL)	The United Kingdom (WELs)	(as Mn)
Franklinite	None known.	European Union (OEL)	None.

Biological Exposure Indices:

No biological exposure limits noted for the ingredient(s) .

Derived No Effect Level (DNEL):
No information available.

Predicted No Effect Concentration (PNEC):
No information available.

8.2 Exposure controls

Ventilation and engineering measures

: Use with adequate ventilation. Apply technical measures to comply with the occupational exposure limits. Where reasonably practicable this should be achieved by the use of local exhaust ventilation and good general extraction.
The local exhaust ventilation system should be high efficiency (84%).
Recommended cyclone/filter (for minimizing dust emissions) efficiency:
70-90% (cyclones);
50-80% (dust filters);
85-95% (double stage, cassette filters)
Process enclosure should be considered, especially in potentially dusty units.
In case of insufficient ventilation wear suitable respiratory equipment.

SAFETY DATA SHEET

This safety data sheet complies with the requirements of Regulation (EC) No. 1907/2006, as amended.

Respiratory protection : Respirator must be worn if exposed to dust. The filter class for the respirator must be suitable for the maximum expected contaminant concentration (gas/vapour/aerosol/particulates) that may arise when handling the product. If this concentration is exceeded, self-contained breathing apparatus must be used.
Recommended Filter type:
dust filter-half mask P1 (efficiency 75%)
dust filter-half mask P2 (efficiency 90%)
dust filter-half mask P3 (efficiency 95%)
dust filter-full mask P1 (efficiency 75%)

Skin protection : Gloves are recommended. The suitability for a specific workplace should be discussed with the producers of the protective gloves. Gloves are recommended to be ≥ 90% efficient. Choose body protection according to the amount and concentration of the dangerous substance at the work place.

Eye / face protection : Wear as appropriate: Goggles; Safety glasses with side shields

Other protective equipment

: Ensure that eyewash stations and safety showers are close to the workstation location. Other equipment may be required depending on workplace standards.

General hygiene considerations

: Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin, eyes and clothing. Do not breathe dust or fume. Do not eat, drink or smoke when using this product. Wash hands and face before breaks and immediately after handling the product. Wash contaminated clothing before reuse.

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

Appearance : Black solid. (Ash)
Odour : No odour.
Odour threshold : None.
pH : No information available.
Flash point : None.
Flashpoint (Method) : Not applicable.
Lower flammable limit (% by vol.)

: None.

Upper flammable limit (% by vol.)

: None.

Flammability (solid, gas) : The product is not flammable.
Auto-ignition temperature

: None.

Decomposition temperature

: No information available.
Oxidizing properties : None known.
Explosive properties : Not explosive
Initial boiling point and boiling range

: > 1000°C (1830°F)
Melting/Freezing point : > 1000°C (1830°F)
Relative density : 1.44
Solubility in water : insoluble
Other solubility(ies) : No information available.
Vapour pressure : No information available.
Vapour density : No information available.

SAFETY DATA SHEET

This safety data sheet complies with the requirements of Regulation (EC) No. 1907/2006, as amended.

Partition coefficient: n-octanol/water
: No information available.

Viscosity : Not applicable.

Evaporation rate (BuAe = 1)
: No information available.

9.2 Other Information

Volatiles (% by weight) : No information available.

Volatile organic Compounds (VOC's)
: No information available.

Other physical/chemical comments
: No additional information.

SECTION 10. STABILITY AND REACTIVITY

10.1 Reactivity : Not normally reactive.

10.2 Chemical stability : Stable under normal conditions.

10.3 Possibility of hazardous reactions
: Hazardous polymerization does not occur.

10.4 Conditions to avoid : Do not use in unventilated areas without proper protection. Refer to protective measures listed in sections 7 and 8.

10.5 Incompatible materials
: None known.

10.6 Hazardous decomposition products
: None known.
In the event of fire the following can be released: Metal oxides

SECTION 11. TOXICOLOGICAL INFORMATION

11.1 Information on Toxicological effects:

Acute toxicity : According to the classification criteria of the European Union, this product is not considered as being an acutely toxic chemical.

Skin corrosion/Irritation : According to the classification criteria of the European Union, this product is not considered as being a skin corrosive or irritant.

Serious eye damage/irritation
: According to the classification criteria of the European Union, the product is not considered as being an eye irritant.

Respiratory or skin sensitisation
: According to the classification criteria of the European Union, this product is not considered as being an allergic respiratory sensitiser.
According to the classification criteria of the European Union, this product is not considered as being an allergic skin sensitiser.

Germ cell mutagenicity : Contains no ingredient listed as a mutagen.

Carcinogenicity : Contains no ingredient listed as a carcinogen.

Reproductive toxicity : Contains no ingredient listed as toxic to reproduction.

STOT-single exposure : According to the classification criteria of the European Union, this product is not expected to cause target organ toxicity through a single exposure.

STOT-repeated exposure : According to the classification criteria of the European Union, this product is not expected to cause target organ toxicity through repeated exposures.

Aspiration hazard : According to the classification criteria of the European Union, this product is not considered as being an aspiration hazard to humans.

SAFETY DATA SHEET

This safety data sheet complies with the requirements of Regulation (EC) No. 1907/2006, as amended.

Toxicological data : No data is available on the product itself.

See below for individual ingredient acute toxicity data.

Chemical name	LC_{50} (4hr) inh, rat	LD_{50} (Oral, rat)	LD_{50} (Rabbit, dermal)
Wüstite	No information available.	> 10 000 mg/kg	No information available.
Magnetite	No information available.	> 5000 mg/kg	No information available.
Forsterite	No information available.	No information available.	No information available.
Akermanite	No information available.	No information available.	No information available.
Iron	No information available.	98 600 mg/kg	No information available.
Gehlenite	No information available.	No information available.	No information available.
Manganese oxide	> 5.35 mg/L (dust) (No mortality)	> 2000 mg/kg (No mortality)	No information available.
Franklinite	No information available.	No information available.	No information available.

Routes of exposure : Inhalation; Skin contact; Eye contact; Ingestion

Effects of acute exposure : *Inhalation:* May cause irritation of the mucous membranes. Inhalation of dust may cause shortness of breath, tightness of the chest, a sore throat and cough.

Skin contact: No adverse effects due to skin contact are expected.

Eye contact: Dust contact with the eyes can lead to mechanical irritation. Symptoms may include stinging and tearing.

Ingestion: Ingestion may cause gastrointestinal irritation, nausea, vomiting and diarrhea.

Potential Chronic Health Effects
: Pneumoconiosis, or "dusty lung" disease, may result from chronic exposure to any dust. Repeated or prolonged inhalation of fine dusts may cause an increase in mucous production.

Other important hazards : None known or reported by the manufacturer.

SECTION 12. ECOLOGICAL INFORMATION

12.1 Toxicity : No data is available on the product itself.

The following tables list individual ingredient ecotoxicity data for fish, daphnia and algae.

SAFETY DATA SHEET

This safety data sheet complies with the requirements of Regulation (EC) No. 1907/2006, as amended.

Ecotoxicity data:

Ingredients	CAS No	Toxicity to Fish		
		LC50 / 96h	NOEC / 21 day	M Factor
Wüstite	1345-25-1	> 50 000, < 100 000 mg/L (Zebra fish) (Read-across)	No information available.	None.
Magnetite	1317-61-9	No information available.	No information available.	None.
Forsterite	15118-03-3	No information available.	No information available.	None.
Akermanite	14567-90-9	No information available.	No information available.	None.
Iron	7439-89-6	> 10 000 mg/L (Zebra fish)	No information available.	None.
Gehlenite	1302-56-3	No information available.	No information available.	None.
Manganese oxide	1344-43-0	> 100 mg/L (Rainbow trout)	No information available.	None.
Franklinite	12063-19-3	No information available.	No information available.	None.

Ingredients	CAS No	Toxicity to Daphnia		
		EC50 / 48h	NOEC / 21 day	M Factor
Wüstite	1345-25-1	> 100 mg/L (Daphnia magna) (Read-across)	No information available.	None.
Magnetite	1317-61-9	No information available.	No information available.	None.
Forsterite	15118-03-3	No information available.	No information available.	None.
Akermanite	14567-90-9	No information available.	No information available.	None.
Iron	7439-89-6	> 100 mg/L (Daphnia magna)	5.9 mg/L	None.
Gehlenite	1302-56-3	No information available.	No information available.	None.
Manganese oxide	1344-43-0	> 100 mg/L (Daphnia magna)	No information available.	None.
Franklinite	12063-19-3	No information available.	No information available.	None.

SAFETY DATA SHEET

This safety data sheet complies with the requirements of Regulation (EC) No. 1907/2006, as amended.

Ingredients	CAS No	Toxicity to Algae		
		EC50 / 96h or 72h	NOEC / 96h or 72h	M Factor
Wüstite	1345-25-1	No information available.	No information available.	None.
Magnetite	1317-61-9	No information available.	No information available.	None.
Forsterite	15118-03-3	No information available.	No information available.	None.
Akermanite	14567-90-9	No information available.	No information available.	None.
Iron	7439-89-6	No information available.	No information available.	None.
Gehlenite	1302-56-3	No information available.	No information available.	None.
Manganese oxide	1344-43-0	> 100 mg/L/72hr (Green algae)	32 mg/L/72hr	None.
Franklinite	12063-19-3	No information available.	No information available.	None.

12.2 Persistence and degradability

: Biodegradation is not applicable to metals/inorganic substances.

12.3 Bioaccumulation potential

: No data is available on the product itself.

12.4 Mobility in soil : No data is available on the product itself.

12.5 Results of PBT and vPvB assessment

: This mixture contains no substance(s) above reportable levels which are considered to be persistent, bioaccumulating nor toxic (PBT), or very persistent and very bioaccumulating (vPvB).

12.6 Other Adverse Environmental effects

: No other adverse environmental effects (e.g. ozone depletion, photochemical ozone creation potential, endocrine disruption, global warming potential) are expected from this component.

SECTION 13. DISPOSAL CONSIDERATIONS

13.1 Waste Treatment Methods:

Handling for Disposal : Handle in accordance with good industrial hygiene and safety practice. Refer to protective measures listed in sections 7 and 8.

Methods of Disposal : Dispose of in accordance with the European Directives on waste and hazardous waste. Waste must be classified and labelled prior to recycling or disposal. According to the European Waste Catalogue, Waste Codes are not product specific, but application specific. Waste codes should be assigned by the user based on the application for which the product was used.

SAFETY DATA SHEET

This safety data sheet complies with the requirements of Regulation (EC) No. 1907/2006, as amended.

SECTION 14. TRANSPORTATION INFORMATION

Regulatory Information	14.1 UN Number	14.2 UN proper shipping name	14.3 Transport hazard class(es)	14.4 Packing Group	*Label*
ADR/RID	None.	Not regulated	Not regulated	None	
EU ADR/RID Classification Code	Not applicable.				
EU ADR / RID Hazard Identification Number	Not applicable.				
ADR/RID Additional information	Not classified as dangerous for conveyance in the meaning of the regulations for the transport of dangerous goods by road and rail.				
ICAO/IATA	None.	Not regulated.	Not regulated	None	
ICAO/IATA Additional Information	None.				
IMDG	None.	Not regulated.	Not regulated	None	
IMDG Additional information	None.				

14.5 Environmental hazards : This product does not meet the criteria for an environmentally hazardous mixture, according to the IMDG Code. See ECOLOGICAL INFORMATION, Section 12.

14.6 Special precautions for user

: Avoid and control operations which create dust.

14.7 Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code

: This information is not available.

SAFETY DATA SHEET

This safety data sheet complies with the requirements of Regulation (EC) No. 1907/2006, as amended.

SECTION 15. REGULATORY INFORMATION

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

: Classification according to Regulation (EC) No. 1272/2008 on the classification of hazardous substances and mixtures.

Authorisations
Regulation (EC) No. 1907/2006, REACH Annex XIV Substances subject to authorisation, as amended:
None of the components are specifically listed.

Restrictions on use
Regulation (EC) No. 1907/2006, REACH Annex XVII Substances subject to restriction on marketing and use, as amended:
None of the components are specifically listed.

Directive 2012/18/EU (Seveso III) on the control of major-accident hazards involving dangerous substances:
None.

Directive 98/24/EC on the protection of the health and safety of workers from risks related to chemical agents at work:
Manganese oxide (CAS # 1344-43-0)

Directive 94/33/EC on the protection of young people at work:
Manganese oxide (CAS # 1344-43-0)

This safety data sheet complies with the requirements of Regulation (EC) No. 1907/2006, as amended [including Regulation (EU) 2015/830].

Follow national regulation for work with chemical agents.

German legislation on water endangering substances VwVwS - Water contaminating class (Germany): 2 (self classified)

15.2 Chemical safety assessment

: A chemical safety assessment has not been carried out by the Manufacturer of this product.

SAFETY DATA SHEET

This safety data sheet complies with the requirements of Regulation (EC) No. 1907/2006, as amended.

SECTION 16. OTHER INFORMATION

Legend : ADR: European Agreement concerning the International Carriage of Dangerous Goods by Road
CAS: Chemical Abstract Services
EC: European Community
EC50: Effective Concentration 50%
EN: European Standard
HSDB: Hazardous Substances Data Bank
IATA: International Air Transport Association
IBC: Intermediate Bulk Container
ICAO: International Civil Aviation Organisation
IMDG: International Maritime Dangerous Goods
Inh: Inhalation
LC: Lethal Concentration
LD: Lethal Dose
NOEC: No observable effect concentration
OECD: Organisation for Economic Co-operation and Development
OEL: National occupational exposure limits
RID: Regulations concerning the International Carriage of Dangerous Goods by Rail
RTECS: Registry of Toxic Effects of Chemical Substances
SDS: Safety Data Sheet
STEL: Short Term Exposure Limit
TWA: Time Weighted Average
WEL: Workplace Exposure Limit

Information Source :
1. Material Safety Data Sheet from manufacturer.
2. Canadian Centre for Occupational Health and Safety, CCInfoWeb Databases, 2018 (Chempendium, RTECs, HSDB, INCHEM).
3. European Chemicals Agency, Classification Legislation, 2018.
4. OECD - The Global Portal to Information on Chemical Substances - eChemPortal, 2018.

Preparation Date (dd/mm/yyyy) : 01/12/2017

Reviewed Date SDS (dd/mm/yyyy) : 16/02/2018

Revision No. : 2

Revision Information : All sections modified.

H-Phrases (Full text) : H372 - Causes damage to organs (a,b,c) through prolonged or repeated exposure.
H373 - May cause damage to organs (a,b,c) through prolonged or repeated exposure.

Other special considerations for handling : Provide adequate information, instruction and training for operators.

SAFETY DATA SHEET

This safety data sheet complies with the requirements of Regulation (EC) No. 1907/2006, as amended.

Prepared for: American Zinc Recycling 4955 Steubenville Pike, Suite 405 Pittsburgh, PA, USA 15205 Telephone: +1 (724) 773-2223 Direct all enquiries to: American Zinc Recycling	AZR AMERICAN ZINC RECYCLING Delivering a Sustainable Future
Prepared by: ICC The Compliance Center Inc. http://www.thecompliancecenter.com	icc ComplianceCenter

DISCLAIMER

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END OF DOCUMENT

SDS ID No.: 9964

Safety Data Sheet (SDS)

EAF Dust

Section 1 – Identification

1(a) Product Identifier Used on Label: EAF Dust

1(b) Other Means of Identification: EAF Baghouse Dust, Electric Arc Furnace Dust, EAF Drop Out Box Material, 9964

1(c) Recommended Use of the Chemical and Restrictions on Use: None

1(d) Name, Address, and Telephone Number:

ArcelorMittal Dofasco, Inc.
P.O Box 2460
Hamilton, Ontario, Canada L8N 3J5

Phone number : 1-905-548-7200 x 4051 (By-Product Sales)

1(e) Emergency Phone Number: 1-760-476-3962 (3E Company Code: 333211)

Section 2 – Hazard(s) Identification

2(a) Classification of the Chemical: EAF Dust is considered a hazardous material according to the criteria specified in REACH [REGULATION (EC) No 1907/2006] and CLP [REGULATION (EC) No 1272/2008] and OSHA 29 CFR 1910.1200 Hazard Communication Standard. The categories of Health Hazards as defined in "GLOBALLY HARMONIZED SYSTEM OF CLASSIFICATION AND LABELLING OF CHEMICALS (GHS), Third revised edition ST/SG/AC.10/30/Rev. 3" United Nations, New York and Geneva, 2009 have been evaluated. Refer to Section 3, 8 and 11 for additional information.

2(b) Signal Word, Hazard Statement(s), Symbols and Precautionary Statement(s):

Hazard Symbol	Hazard Classification	Signal Word	Hazard Statement(s)
	Carcinogenicity - 2 Reproductive Toxicity - 1A Single Target Organ Toxicity (STOT) Repeat Exposure - 1	Danger	Suspected of causing cancer. May damage fertility or the unborn child. Causes damage to central nervous system, and lungs through prolonged or repeated exposure.
	Skin Irritation - 1A Eye Irritation - 1		May cause respiratory irritation. Causes severe skin burns and serious eye damage.
	STOT Single Exposure - 3		

Precautionary Statement(s):

Prevention	Response	Storage/Disposal
Do not breathe dusts or sprays. Wear protective gloves/protective clothing/eye protection/face protection. Do not eat, drink or smoke when using this product. Wash thoroughly after handling. Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Use only outdoors or in well ventilated areas Wash thoroughly after handling.	If exposed, concerned or feel unwell: Get medical advice/attention. Call a poison center or doctor/physician. If inhaled: Remove person to fresh air and keep comfortable for breathing. Immediately call a poison center or doctor/physician. If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a poison center or doctor/physician. If on skin (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower. Wash contaminated clothing before reuse. If swallowed: Rinse mouth. Do NOT induce vomiting.	Dispose of contents in accordance with Federal, Provincial/State and Local regulations. Store locked up.

2(c) Hazards not Otherwise Classified: None Known

2(d) Unknown Acute Toxicity Statement (Mixture): None Known

Section 3 – Composition/Information on Ingredients

3(a-c) Chemical Name, Common Name (Synonyms), CAS Number and Other Identifiers, and Concentration:

Chemical Name	CAS Number	EC Number	% weight
Iron Oxides	1345-25-1 1309-38-2 1309-37-1	215-721-8 215-169-8 215-168-2	20-35

Section 3 – Composition/Information on Ingredients (continued)

3(a-c) Chemical Name, Common Name (Synonyms), CAS Number and Other Identifiers, and Concentration (continued):

Chemical Name	CAS Number	EC Number	% weight
Zinc Oxide and Zinc Compounds	1314-13-2 7440-66-6	215-222-5 231-175-3	5-40
Calcium Oxide and Calcium compounds	1305-78-8 7440-70-2	215-138-9 231-179-5	5-25
Magnesium Oxide and Magnesium Compounds	14452-57-4 7439-95-4	238-438-1 231-104-6	5-10
Silicon Oxides and Compounds	7631-86-9	231-545-4	2-7
Manganese oxide and Manganese Compounds	7439-96-5 1344-43-0	231-105-1 215-695-8	1-5
Aluminum Oxide (Alumina)	1344-28-1	215-691-6	1-5
Chromium	7440-47-3	231-157-5	0.1-1
Lead Oxide and Lead Compounds	1317-36-8 1309-60-0 7439-92-1	215-267-0 215-267-0 231-100-4	0.1-1

EC- European Community CAS- Chemical Abstract Service

Section 4 – First-aid Measures

4(a) Description of Necessary Measures: If exposed, concerned or feel unwell: Get medical advice/attention. Call a poison center or doctor/physician.

- **Inhalation** If inhaled: Remove person to fresh air and keep comfortable for breathing. Immediately call a poison center or doctor/physician.
- **Eye Contact:** If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a poison center or doctor/physician.
- **Skin Contact:** If on skin (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower. Wash contaminated clothing before reuse.
- **Ingestion:** If swallowed: Rinse mouth. Do NOT induce vomiting.

4(b) Most Important Symptoms/Effects, Acute and Delayed (Chronic):

Acute effects:

- **Inhalation:** Excessive exposure to high concentrations of dust may cause irritation to the mucous membranes of the upper respiratory tract.
- **Eye:** Excessive exposure to high concentrations of dust may cause irritation to the eyes.
- **Skin:** Skin contact with dusts may cause irritation or sensitization, possibly leading to dermatitis. Skin contact with metallic dusts may cause physical abrasion.
- **Ingestion:** Ingestion of dust may cause nausea and/or vomiting.

Chronic Effects:

Individuals with chronic respiratory disorders (i.e., asthma, chronic bronchitis, emphysema, etc.) may be adversely affected by any airborne particulate matter exposure. Persons with pre-existing skin disorders may be more susceptible to dermatitis.

4(c) Immediate Medical Attention and Special Treatment: Treat symptomatically.

Section 5 – Fire-fighting Measures

5(a) Suitable (and Unsuitable) Extinguishing Media: Use extinguishers appropriate for surrounding materials.

5(b) Specific Hazards Arising from the Chemical: Not applicable for solid product.

5(c) Special Protective Equipment and Precautions for Fire-fighters: Self-contained NIOSH approved respiratory protection and full protective clothing should be worn when fumes and/or smoke from fire are present. Heat and flames cause emittance of acrid smoke and fumes. Do not release runoff from fire control methods to sewers or waterways. Firefighters should wear full face-piece self-contained breathing apparatus and chemical protective clothing with thermal protection. Direct water stream will scatter and spread flames and, therefore, should not be used.

Section 6 - Accidental Release Measures

6(a) Personal Precautions, Protective Equipment and Emergency Procedures: For spills involving finely divided particles, clean-up personnel should be protected against contact with eyes and skin. If material is in a dry state, avoid inhalation of dust. Personnel should be protected against contact with eyes and skin. Fine, dry material should be removed by vacuuming or wet sweeping methods to prevent spreading of dust. Avoid using compressed air. Do not release into sewers or waterways.

6(b) Methods and Materials for Containment and Clean Up: Collect material in appropriate, labeled containers for recovery or disposal in accordance with Federal, Provincial/State, and Local regulations. Follow applicable OSHA regulations (29 CFR 1910.120) and all other pertinent Provincial/State and Federal requirements.

Section 7 - Handling and Storage

7(a) Precautions for Safe Handling: Do not eat, drink or smoke when using this product. Wash thoroughly after handling. Do not breathe dusts. Wear protective gloves / protective clothing / eye protection / face protection. Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Use only outdoors or in a well ventilated area. Avoid direct contact on skin, eyes or on clothing. Emergency safety showers and eye wash stations should be present.

7(b) Conditions for Safe Storage, Including any Incompatibilities: Whenever feasible, store locked up.

Section 8 - Exposure Controls / Personal Protection

8(a) Occupational Exposure Limits (OELs): The following exposure limits are offered as reference, for an experience industrial hygienist to review.

Ingredients	OSHA PEL [1]	ACGIH TLV [2]	NIOSH REL [3]	MOL [4]
Iron Oxides	10 mg/m³ (as iron oxide fume)	5.0 mg/m³	5.0 mg/m³ (as iron oxide dust and fume)	5.0 mg/m³ (as respirable fraction)
Zinc Compounds	5.0 mg/m³ (as zinc oxide fume) 15 mg/m³ (as total dust) 5.0 mg/m³ (as respirable fraction)	2.0 mg/m³ (as zinc oxide)	10 mg/m³ (as total dust) 5.0 mg/m³ (as respirable dust)	2.0 mg/m³ (as respirable) "STEL" 10 mg/m³ (as respirable fraction)
Calcium Oxide	5.0 mg/m³	2.0 mg/m³	2.0 mg/m³	2.0 mg/m³
Magnesium Oxide	15 mg/m³	10 mg/m³	NE	10 mg/m³ (as inhalable fraction)
Silica, Fused	(10.0 mg/m³)/(%SiO_2 + 2) (as respirable fraction)	10 mg/m³ (as inhalable fraction[5], PNOS[6]) 3.0 mg/m³ (as respirable fraction[7], PNOS)	0.05 mg/m³	0.1mg/m³ as respirable fraction)
Manganese oxide and Manganese Compounds	"C" 5.0 mg/m³ (as Fume & Mn compounds)	0.2 mg/m³	"C" 5.0 mg/m³ 1.0 mg/m³ (as fume) "STEL" 3.0 mg/m³	0.2 mg/m³
Aluminum Oxide	15 mg/m³ (as total dust, PNOR[8]) 5.0 mg/m³ (as respirable fraction, PNOR)	1.0 mg/m³ (as respirable fraction, Aluminum metal and insoluble compounds)	NE	1.0 mg/m³ (as respirable fraction, Aluminum metal and insoluble compounds)
Chromium	0.5 mg/m³ (as Cr II & III, inorganic compounds) 1.0 mg/m³ (as Cr, metal) 0.005 mg/m³ (as Cr VI, inorganic compounds & certain water insoluble) "AL" 0.0025 mg/m³ (as Cr VI, inorganic compounds & certain water insoluble)	0.5 mg/m³ (as Cr III, inorganic compounds) 0.5 mg/m³ (as Cr, metal) 0.05 mg/m³ (as Cr VI, inorganic compounds) 0.01 mg/m³ (as Cr VI, inorganic compounds & certain water insoluble)	0.5 mg/m³ (as Cr II & III, inorganic compounds) 0.5 mg/m³ (as Cr, metal) 0.001 mg/m³ (as Cr VI, inorganic compounds & certain water insoluble)	0.5 mg/m³ (as Cr III & metal) 0.05 mg/m³ (as water-soluble Cr VI) 0.01 mg/m³ (as insoluble Cr VI)
Lead Oxide and Lead Compounds	0.05 mg/m³ [9] "AL" 0.03 mg/m³	0.05 mg/m³	0.05 mg/m³ [10]	0.05 mg/m³

NE - None Established

1. OSHA PELs (Permissible Exposure Limits) are 8-hour TWA (time-weighted average) concentrations unless otherwise noted. A ("C") designation denotes a ceiling limit, which should not be exceeded during any part of the working exposure unless otherwise noted. An Action level (AL) is used by OSHA and NIOSH to express a health or physical hazard. They indicate the level of a harmful or toxic substance/activity, which requires medical surveillance, increased industrial hygiene monitoring, or biological monitoring. Action Levels are generally set at one half of the PEL but the actual level may vary from standard to standard. The intent is to identify a level at which the vast majority of randomly sampled exposures will be below the PEL.
2. Threshold Limit Values (TLV) established by the American Conference of Governmental Industrial Hygienists (ACGIH) are 8-hour TWA concentrations unless otherwise noted. ACGIH TLVs are for guideline purposes only and as such are not legal, regulatory limits for compliance purposes. A Short Term Exposure Limit (STEL) is defined as the maximum concentration to which workers can be exposed for a short period of time (15 minutes) for only four times throughout the day with at least one hour between exposures.
3. The National Institute for Occupational Safety and Health Recommended Exposure Limits (NIOSH-REL) - Compendium of Policy and Statements. NIOSH, Cincinnati, OH (1992). NIOSH is the federal agency designated to conduct research relative to occupational safety and health. As is the case with ACGIH TLVs, NIOSH RELs are for guideline purposes only and as such are not legal, regulatory limits for compliance purposes.
4. Ontario Ministry of Labour. Employers are required under section 4 of Regulation 833, Control of Exposure to Biological or Chemical Agents (the "Regulation"), to limit the exposure of workers to specified hazardous biological or chemical agents in accordance with the values set out in the "Ontario Table" (which is Table 1 in the Regulation) or, if the agent is not listed in the Ontario Table, the ACGIH Table that is incorporated by reference in the Regulation.
5. Inhalable fraction. The concentration of inhalable particulate for the application of this TLV is to be determined from the fraction passing a size-selector with the characteristics defined in the ACGIH 2015 TLVs ® and BEIs ® (Biological Exposure Indices) Appendix D, paragraph A.
6. PNOS (Particulates Not Otherwise Specified). Particulates identified under the PNOS heading are "nuisance dusts" containing no asbestos and <1% crystalline silica.
7. Respirable fraction. The concentration of respirable dust for the application of this limit is to be determined from the fraction passing a size-selector with the characteristics defined in ACGIH 2015 TLVs ® and BEIs ® Appendix D, paragraph C.
8. PNOR (Particulates Not Otherwise Regulated). All inert or nuisance dusts, whether mineral, inorganic, or organic, not listed specifically by substance name are covered by a limit which is the same as the inert or nuisance dust limit of 15 mg/m³ for total dust and 5 mg/m³ for the respirable fraction.
9. OSHA considers "Lead" to mean metallic lead, all inorganic lead compounds (lead oxides and lead salts), and a class of organic compounds called soaps; all other lead compounds are excluded from this definition. The OSHA PEL and other OSHA requirements can be found in 29 CFR 1910.1025. The OSHA PEL (8-hour TWA) for lead in "non-ferrous foundries with less than 20 employees" is 0.075 mg/m³.
10. NIOSH considers "Lead" to mean metallic lead, lead oxides, and lead salts (including organic salts such as lead soaps but excluding lead arsenate). The NIOSH REL for lead (10-hour TWA) is 0.05 mg/m³; air concentrations should be maintained so that worker blood lead remains less than 0.060 mg Pb/100 g of whole blood.

Section 8 - Exposure Controls / Personal Protection (continued)

8(b) Appropriate Engineering Controls: Local exhaust ventilation should be used to control the emission of air contaminants. General dilution ventilation may assist with the reduction of air contaminant concentrations. Emergency eye wash stations and deluge safety showers should be available in the work area.

8(c) Individual Protection Measures:

- **Respiratory Protection:** Seek professional advice prior to respirator selection and use. Follow OSHA respirator regulations (29 CFR 1910.134) and, if necessary, use only a NIOSH-approved respirator. Select respirator based on its suitability to provide adequate worker protection for given working conditions, level of airborne contamination, and presence of sufficient oxygen. Concentration in air of the various contaminants determines the extent of respiratory protection needed. Half-face, negative-pressure, air-purifying respirator equipped with P100 filter is acceptable for concentrations up to 10 times the exposure limit. Full-face, negative-pressure, air-purifying respirator equipped with P100 filter is acceptable for concentrations up to 50 times the exposure limit. Protection by air-purifying negative-pressure and powered air respirators is limited. Use a positive-pressure-demand, full-face, supplied air respirator or self contained breathing apparatus (SCBA) for concentrations above 50 times the exposure limit. If exposure is above the IDLH (immediately dangerous to life or health) for any of the constituents, or there is a possibility of an uncontrolled release or exposure levels are unknown, then use a positive-demand, full-face, supplied air respirator with escape bottle or SCBA.

  Warning! Air-purifying respirators both negative-pressure, and powered-air do not protect workers in oxygen-deficient atmospheres.
- **Eyes**: Wear eye protection/face protection. A face shield should be used when appropriate to prevent contact with splashed materials. Chemical goggles, face shields or glasses should be worn to prevent eye contact. Contact lenses should not be worn where industrial exposure to this material is likely.
- **Skin**: Persons handling this product should wear appropriate clothing to prevent skin contact. Take off contaminated clothing and wash before reuse. Contaminated work clothing should not be allowed out of the workplace. Wear protective gloves.
- **Other protective equipment**: An eyewash fountain and deluge shower should be readily available in the work area.

Section 9 - Physical and Chemical Properties

9(a) Appearance (physical state, color, etc.): Solid (metal chunks and dust).

9(b) Odor: no odor

9(c) Odor Threshold: NA

9(d) pH: Level will be elevated if material becomes wet

9(e) Melting Point/Freezing Point: NA

9(f) Initial Boiling Point and Boiling Range: NA

9(g) Flash Point: NA

9(h) Evaporation Rate: NA

9(i) Flammability (solid, gas): Not flammable

9(j) Upper/Lower Flammability or Explosive Limits: NA

9(k) Vapor Pressure: NA

9(l) Vapor Density (Air = 1): NA

9(m) Relative Density: NA

9(n) Solubility(ies): ND

9(o) Partition Coefficient n-octanol/water: NA

9(p) Auto-ignition Temperature: ND

9(q) Decomposition Temperature: ND

9(r) Viscosity: ND

NA - Not Applicable

ND - Not Determined for product as a whole

Section 10 - Stability and Reactivity

10(a) Reactivity: Not Determined (ND)

10(b) Chemical Stability: EAF Dust is stable under normal storage and handling conditions.

10(c) Possibility of Hazardous Reaction: None Known

10(d) Conditions to Avoid: Calcium oxide will react with water to form calcium hydroxide.

10(e) Incompatible Materials: Will react with strong acids to form hydrogen. Iron oxide dusts in contact with calcium hypochlorite evolve oxygen and may cause an explosion.

10(f) Hazardous Decomposition Products: Oxides of carbon, metal oxides and toxic vapors may be releases at elevated temperatures.

Section 11 - Toxicological Information

11 Information on Toxicological Effects: The following toxicity data has been determined for **EAF Dust** by using the information available for its components applied to the guidance on the preparation of an SDS under the GHS requirements of OSHA and the EU CPL:

Hazard Classification	Hazard Category		Hazard Symbols	Signal Word	Hazard Statement
	EU	OSHA			
Eye Damage/Irritation (covers Categories 1, 2A and 2B)	1	1[c]		**Danger**	Causes serious eye damage.
Skin Irritation (covers Categories 1A, 1B, 1C, and 2)	1A	1A[b]		**Danger**	Causes severe skin burns.

Section 11 - Toxicological Information (continued)

11 Information on Toxicological Effects (continued):

Hazard Classification	Hazard Category EU	Hazard Category OSHA	Hazard Symbols	Signal Word	Hazard Statement
Carcinogenicity (covers Categories 1A, 1B and 2)	2	2[g]		**Warning**	Suspected of causing cancer.
Toxic Reproduction (covers Categories 1A, 1B & 2	1A	1A[h]		**Danger**	May damage fertility or the unborn child.
Specific Target Organ Toxicity (STOT) Following Single Exposure (covers Categories 1-3)	3	3[i]		**Warning**	May cause respiratory irritation.
STOT Following Repeated Exposure (covers Categories 1 & 2)	1	1[j]		**Danger**	Causes damage to central nervous system, and lungs through prolonged or repeated exposure.

* NR Not Rated - Available data does not meet criteria for classification.

The Toxicological data listed below are presented regardless to classification criteria. Individual hazard classification categories where the toxicological information has met or exceeded a classification criteria threshold are listed above.

a. No LC_{50} or LD_{50} has been established for **EAF Dust**. The following data has been determined for the components:

- **Iron Oxide:** LD_{50}= >10,000 mg/kg (Oral/ Rat)
- **Zinc Oxide:** Rat LD_{50} >5000 mg/kg (Oral)
- **Carbon:** LD_{50}= >10,000 mg/kg (Oral/ Rat)
- **Lead Oxide:** Rat LD_{50} > 2000 mg/kg (REACH) (Oral), Rat LC_{50} > 5.05 mg/L (REACH) No data (IUCLID)(Inhalation)

b. No Skin (Dermal) Irritation data available for **EAF Dust** as a mixture. The following Skin (Dermal) Irritation data has been determined for the components:

- **Iron Oxide:** Moderately irritating.
- **Magnesium Dioxide:** Severe skin irritant in human (HSDB).

c. No Eye Irritation data available for **EAF Dust** as a mixture. The following Eye Irritation information was found for the components:

- **Iron Oxide:** Severely irritating; may cause burns. Human Corrosive (IUCLID).
- **Calcium Oxide:** Rabbit Irritating (REACH).
- **Magnesium dioxide**: Severe eye irritant in human (HSDB).
- **Potassium Oxide:** Causes eye burns.

d. No Skin (Dermal)/Respiratory Sensitization data available for **EAF Dust** as a mixture or its individual components.

e. No Aspiration Hazard data available for **EAF Dust** as a mixture or its individual components.

f. No Germ Cell Mutagenicity data available for **EAF Dust** as a mixture. The following Germ Cell Mutagenicity information was found for the components:

- **Iron Oxide:** Both positive and negative data.

g. Carcinogenicity: IARC, NTP, and OSHA do not list **EAF Dust** as carcinogens. The following Carcinogenicity information was found for the components:

- **Iron Oxide:** IARC-3, TLV-A4
- **Chromium (as metal and trivalent chromium compounds)** – IARC Group 3 carcinogens, not classifiable as to their human carcinogenicity.
- **Lead**: NTP-R, IARC - 2B, EPA - Probable human carcinogen and ACGIH - A3
- **Inorganic Lead Compounds** - IARC 2A, NTP 2

h. No Toxic Reproduction data available for **EAF Dust** as a mixture. The following Toxic Reproduction data was found for the components:

- **Lead:** Male rats oral 60 day NOEL 250 mg/L. Effects on testes (lowest dose). Mouse Reproduction study effects at 0.5% only dose tested. Rat Teratology study LOEL 0.05% Birth weight, size and effects on testis. Reproductive, endocrine and growth effects have been reported.
- **Lead Oxide:** Developmental tox study in rats Inhalation. Lead levels in blood indicative of lead poisoning.

i. No Specific Target Organ Toxicity (STOT) following a Single Exposure data available for **EAF Dust** as a mixture. The following STOT following a Single Exposure data was found for the components:

- **Iron Oxide:** May cause lung irritation.
- **Calcium Oxide**: Can cause respiratory tract irritation, skin and eye irritation.

j. No Specific Target Organ Toxicity (STOT) following Repeated Exposure data was available for **EAF Dust** as a whole. The following STOT following Repeated Exposure data was found for the components:

- **Iron Oxide**: Some pulmonary and lung effects reported from Iron oxide exposure in humans.
- **Manganese:** Inhalation of metal fumes - Degenerative changes in human Brain; Behavioral: Changes in motor activity and muscle weakness (Whitlock *et al.,* 1966).
- **Lead:** Rat Oral 6 mo NOEL 0.0015 mg/kg CNS Testes and Kidney Effects. Rat inhalation – immunosuppression, Dermal – percutaneous absorption
- **Lead Oxide:** Lead effect include CNS, Reproduction Development.

Section 11 - Toxicological Information (continued)

11 Information on Toxicological Effects (continued):

The above toxicity information was determined from available scientific sources to illustrate the prevailing posture of the scientific community. The scientific resources includes: The American Conference of Governmental Industrial Hygienist (ACGIH) Documentation of the Threshold Limit Values (TLVs) and Biological Exposure indices (BEIs) with Other Worldwide Occupational Exposure Values 2009, The International Agency for Research on Cancer (IARC), The National Toxicology Program (NTP) updated documentation, the World Health Organization (WHO) and other available resources, the International Uniform Chemical Information Database (IUCLID), European Union Risk Assessment Report (EU-RAR), Concise International Chemical Assessment Documents (CICAD), European Union Scientific Committee for Occupational Exposure Limits (EU-SCOEL), Agency for Toxic Substances and Disease Registry (ATSDR), Hazardous Substance Data Bank (HSDB), and International Programme on Chemical Safety (IPCS), European Union Classification, Labeling and Packaging. (EU CPL), Regulation on Registration, Evaluation, Authorization and Restriction of Chemicals (REACH), International Uniform Chemical Information Database (IUCLID), TOXicology Data NETwork (TOXNET), European Risk Assessment Reports (EU RAR).

The following health hazard information is provided regardless to classification criteria and is based on the individual component(s):

Acute Effects by Component:

- **IRON OXIDE:** Iron is harmful if swallowed, causes skin irritation, and causes eye irritation. Contact with iron oxide has been reported to cause skin irritation and serious eye damage.
- **ZINC OXIDE:** Not Reported/ Not Classified
- **CALCIUM OXIDE:** Calcium oxide is an eye and skin irritant.
- **MAGNESIUM OXIDE:** Headache, cough, sweating, nausea and fever may be caused by exposure to freshly formed fumes. The symptoms of metal fume fever do not become manifest until 4-12 hours after exposure.
- **AMORPHOUS SILICA (SILICON DIOXIDE):** Not Reported/ Not Classified
- **MANGANESE OXIDE:** Manganese oxide is harmful if swallowed.
- **ALUMINUM OXIDE:** Inhalation may cause cough.
- **CHORMIUM, CHROMIUM OXIDE AND HEXAVALENT CHROME:** Hexavalent chrome causes damage to gastrointestinal tract, lung, severe skin burns and eye damage, serious eye damage, skin contact may cause an allergic skin reaction. Inhalation may cause allergic or asthmatic symptoms or breathing difficulties.
- **LEAD OXIDES:** Acute exposure to lead can be manifested as abdominal pain, nausea, constipation, anorexia, or vomiting; and, in severe cases coma or death.

Delayed (chronic) Effects by Component:

- **IRON OXIDE:** Chronic inhalation of excessive concentrations of iron oxide dusts may result in the development of a benign lung disease, called siderosis, which is observable as an X-ray change. No physical impairment of lung function has been associated with siderosis. Inhalation of excessive concentrations of ferric oxide may enhance the risk of lung cancer development in workers exposed to pulmonary carcinogens. Iron oxide is listed as a Group 3 (not classifiable) carcinogen by the International Agency for Research on Cancer (IARC).
- **ZINC OXIDE:** Inhalation of zinc oxide fumes may cause metal fume fever, which is characterized by flu-like symptoms with metallic taste, fever, chills, cough, weakness, chest pain, muscle pain and increased white blood cell count.
- **CALCIUM OXIDE:** Depending on the concentration and duration of exposure, repeated or prolonged inhalation may cause inflammation of the respiratory passages, ulcers of the mucous membranes, and possible perforation of the nasal septum. Repeated or prolonged skin contact may cause dermatitis.
- **MAGNESIUM OXIDE:** Irritation of eyes, nose, and throat. Symptoms may include dryness of nose and mouth, cough, feeling of weakness, tightness of chest, muscular pain, chills, fever, headache, nausea, and vomiting.
- **AMORPHOUS SILICA (SILICON DIOXIDE):** Silicon dusts are a low health risk by inhalation and should be treated as a nuisance dust. Eye contact with pure material can cause particulate irritation. Skin contact with silicon dusts may cause physical abrasion.
- **MANGANESE OXIDE:** Chronic exposure to high concentrations of manganese fumes and dusts may adversely affect the central nervous system with symptoms including languor, sleepiness, weakness, emotional disturbances, spastic gait, mask-like facial expression and paralysis. Animal studies indicate that manganese exposure may increase susceptibility to bacterial and viral infections. Occupational overexposure (Manganese) is a progressive, disabling neurological syndrome that typically begins with relatively mild symptoms and evolves to include altered gait, fine tremor, and sometimes, psychiatric disturbances. May cause damage to lungs with repeated or prolonged exposure. Neurobehavioral alterations in worker populations exposed to MnO including: speed and coordination of motor function are especially impaired.
- **ALUMINUM OXIDE:** Considered to be an inert or nuisance dust.
- **CHORMIUM, CHROMIUM OXIDE AND HEXAVALENT CHROME:** The health hazards associated with exposure to chromium are dependent upon its oxidation state. The metal form (chromium as it exists in this product) is of very low toxicity. The hexavalent form is very toxic. Repeated or prolonged exposure to hexavalent chromium compounds may cause respiratory irritation, nosebleed, ulceration and perforation of the nasal septum. Industrial exposure to certain forms of hexavalent chromium has been related to an increased incidence of cancer. NTP (The National Toxicology Program) Fourth Annual report on Carcinogens cites "certain Chromium compounds" as human carcinogens. ACGIH has reviewed the toxicity data and concluded that chromium metal is not classifiable as a human carcinogen. Hexavalent chromium may cause genetic defects and is suspected of damaging the unborn child. Developmental toxicity in the mouse, suspected of damaging fertility or the unborn child.
- **LEAD OXIDES:** Lead compounds can be toxic when ingested or inhaled. Lead is a cumulative poison. The predominant effects of excessive exposure are anemia, nervous system disorders, and kidney damage. Nervous system disorders may be displayed as irritability, headaches, insomnia, convulsions, muscular tremors, or palsy of the extremities. Excessive exposure can have adverse effects on human reproduction. Lead interferes with normal function of the adult and developing central nervous system in humans. Lead interferes with different enzyme systems. For this reason many organs or organ systems are potential targets for lead. Lead can damage fertility or the unborn child.

Section 12 - Ecological Information

12(a) Ecotoxicity (aquatic & terrestrial): No data available for the product, **EAF Dust** as a whole. However, individual components of the product have been found to be toxic to the environment. Dusts may migrate into soil and groundwater and be ingested by wildlife as follows:

- **Iron Oxide**: LC_{50}: >1000 mg/L; Fish
- **Zinc Oxide:** EU RAR lists as Category 1 Very toxic to aquatic life with long lasting effects.
- **Calcium Oxide:** LC_{50}: 159 mg/L; invertebrates

12(b) Persistence & Degradability: No Data Available

12(c) Bioaccumulative Potential: No Data Available

12(d) Mobility (in soil): No Data Available

Additional Information:

Hazard Category: Category 1

Signal Word: Warning

Hazard Symbol:

Hazard Statement: Very Toxic to aquatic life with long lasting effects.

Section 13 - Disposal Considerations

Disposal: Dispose of in accordance with Local, Provincial/State, Federal and International regulations. Observe safe handling precautions.

Container Cleaning and Disposal: Follow Local, Provincial/State, Federal and international regulations. Observe safe handling precautions

Section 14 - Transport Information

14 (a-g) Transportation Information:

US Department of Transportation (DOT) under 49 CFR 172.101 regulates **EAF Dust** as a hazardous material. All Local, Provincial/State, Federal and international regulations that apply to the transport of this type of material must be adhered to.

Shipping Name: RQ NA3077, Environmentally hazardous substance,, solid, n. o. s., Class 9, PGIII,[K061] **Shipping Symbols:** D, G **Hazard Class:** 9 **UN No:** NA3077 **Packing Group:** III **DOT/ IMO Label:** NA **Special Provisions (172.102):** 8, 146, 335, IB3, T4, TP1, TP29	**Packaging Authorizations** **a) Exceptions:** 155 **b) Non-bulk:** 213 **c) Bulk:** 240	**Quantity Limitations** **a) Passenger Aircraft or Rail:** No Limit **b) Cargo Aircraft Only:** No Limit **Vessel Stowage Location:** A **DOT reportable quantities:** 10

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

Regulations Concerning the International Carriage of Dangerous Goods by Road (ADR) regulates EAF Dust.

Shipping Name: RQ NA3077, Environmentally hazardous substance, solid, n. o. s., Class 9, PGIII,[K061] **Classification Code:** 9 **UN No.:** 3077 **Packing Group:** III **ADR Label:** NA **Special Provisions:** 179, 274, 335, 909 **Limited Quantities:** 5 kg	**Packaging** **a) Packing Instructions:** P002, LP02 **b) Special Packing Provisions:** PP12 **c) Mixed Packing Provisions:** NA	**Portable Tanks & Bulk Containers** **a) Instructions:** T1 BK2 **b) Special Provisions:** TP33

International Air Transport Association (IATA) regulates EAF Dust.

Shipping Name: RQ NA3077, Environmentally hazardous substance, solid, n. o. s., Class 9, PGIII,[K061] **Class/Division:** 9 **Hazard Label (s):** Miscellaneous **UN No.:** 3077 **Packing Group:** III **Excepted Quantities (EQ):** E1	**Passenger & Cargo Aircraft Limited Quantity (EQ)**		**Cargo Aircraft Only:**	**Special Provisions:**
	Pkg Inst: Y911 **Max Net Qty/Pkg:** 30 kg G	**Pkg Inst:** 911 **Max Net Qty/Pkg:** NA	**Pkg Inst:** NA **Max Net Qty/Pkg:** 400 kg	**ERG Code:** 9L

Pkg Inst – Packing Instructions Max Net Qty/Pkg – Maximum Net Quantity per Package ERG – Emergency Response Drill Code

EAF Dust has a **Transport Dangerous Goods (TDG)** classification: Environmentally Hazardous Substance, Solid, n.o.s.

Section 15 - Regulatory Information

Regulatory Information: *The following listing of regulations relating to an ArcelorMittal Dofasco Inc product may not be complete and should not be solely relied upon for all regulatory compliance responsibilities.* The product, **EAF Dust** and/or its constituents are subject to the following regulations:

EPA Regulations: The product, **EAF Dust** is not listed as a whole in the following regulatory listings. However, individual components of the product are listed:

Components	Regulations
Lead (Pb Compounds)	CAA, CWA, SARA 313, SDWA
Zinc (Zn Compounds)	CWA, SARA 313
Manganese	CERCLA, CAA, SARA 313,
Chromium	CERCLA, CWA, SARA 313, RCRA, SDWA

SARA Potential Hazard Categories: Immediate Acute Health Hazard, Delayed Chronic Health Hazard.

Section 313 Supplier Notification: The product, **EAF Dust** contains the following toxic chemicals subject to the reporting requirements of section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 and 40 CFR part 372:

CAS #	Chemical Name	Percent by Weight
7440-66-6	Zinc	40 max
7439-96-5	Manganese (Mn Compounds)	10 max
7439-92-1	Lead (Pb Compounds)	1 max
7440-47-3	Chromium	1 max

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

Pennsylvania Right to Know (RTK): Contains regulated material in the following categories:

- Hazardous Substances: Iron Oxide, Zinc Oxide, Calcium Oxide, Magnesium Oxide, Crystalline silica, Manganese Compounds, Aluminum Oxide, Chromium and Lead
- Special Hazardous Substances: Chromium
- Environmental Hazards: Zinc Oxide, Manganese Compounds, Aluminum Oxide, Chromium and Lead

California Prop. 65: Contains elements known to the State of California to cause cancer or reproductive toxicity. This includes Crystalline Silica, Chromium (Hexavalent compounds), and Lead.

New Jersey: Contains regulated material in the following categories:

- Hazardous Substance: Iron Oxide, Zinc Oxide, Calcium Oxide, Magnesium Oxide, Crystalline silica, Manganese, Aluminum Oxide, Chromium and Lead
- Special Health Hazard Substances: Calcium Oxide, Crystalline silica, Manganese, Chromium and Lead
- Environmental Hazards: Zinc Oxide, Manganese, Aluminum Oxide, Chromium and Lead

Minnesota: Iron Oxide (fume), Magnesium Oxide, Crystalline Silica, Manganese, Aluminum Oxide, Chromium and Lead

Massachusetts: Iron Oxide, Zinc Oxide, Calcium Oxide, Magnesium Oxide, Crystalline Silica, Manganese Compounds, Aluminum Oxide, Chromium and Lead

Section 16 - Other Information

Prepared By: ArcelorMittal Dofasco Inc.

Revision History:

~1997 - Original

05/20/2015 - Update to OSHA HAZCOM 2012

Additional Information:

Hazardous Material Identification System (HMIS) Classification

Health Hazard	2
Fire Hazard	0
Physical Hazard	0

HEALTH= **2** * Temporary or minor injury may occur.

FIRE= **0**, Materials that will not burn.

PHYSICAL HAZARDS = **0**, Materials that are normally stable, even under fire conditions, and will not react with water, polymerize, decompose, condense, or self-react. Non-explosives.

National Fire Protection Association (NFPA)

HEALTH = **2**, Intense or continued exposure could cause temporary incapacitation or possible residual injury unless prompt medical attention is given.

FIRE = **0**, Materials that will not burn.

INSTABILITY = **0**, Normally stable, even under fire exposure conditions, and are not reactive with water.

Section 16 - Other Information (continued)

ABBREVIATIONS/ACRONYMS:

ACGIH	American Conference of Governmental Industrial Hygienists	**NIF**	No Information Found
BEIs	Biological Exposure Indices	**NIOSH**	National Institute for Occupational Safety and Health
CAS	Chemical Abstracts Service	**NTP**	National Toxicology Program
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act	**ORC**	Organization Resources Counselors
CLP	Classification, Labelling and Packaging	**OSHA**	Occupational Safety and Health Administration
CFR	Code of Federal Regulations	**PEL**	Permissible Exposure Limit
CNS	Central Nervous System	**PNOR**	Particulate Not Otherwise Regulated
GI, GIT	Gastro-Intestinal, Gastro-Intestinal Tract	**PNOC**	Particulate Not Otherwise Classified
HMIS	Hazardous Materials Identification System	**PPE**	Personal Protective Equipment
IARC	International Agency for Research on Cancer	**ppm**	parts per million
LC50	Median Lethal Concentration	**RCRA**	Resource Conservation and Recovery Act
LD50	Median Lethal Dose	**REACH**	Regulation on Registration, Evaluation, Authorization and Restriction of Chemicals
LD_{Lo}	Lowest Dose to have killed animals or humans	**RTECS**	Registry of Toxic Effects of Chemical Substances
LEL	Lower Explosive Limit	**SARA**	Superfund Amendment and Reauthorization Act
LOEL	Lowest Observed Effect Level	**SCBA**	Self-contained Breathing Apparatus
LOAEC	Lowest Observable Adverse Effect Concentration	**SDS**	Safety Data Sheet
$\mu g/m^3$	microgram per cubic meter of air	**STEL**	Short-term Exposure Limit
mg/m^3	milligram per cubic meter of air	**TLV**	Threshold Limit Value
mppcf	million particles per cubic foot	**TWA**	Time-weighted Average
MSHA	Mine Safety and Health Administration	**UEL**	Upper Explosive Limit
NFPA	National Fire Protection Association		

Disclaimer: The information contained in this Safety Data Sheet is taken from sources and/or based upon data believed to be reliable as of the date of issue. Neither the above-named supplier nor any of its subsidiaries assumes any liability whatsoever in connection with the information contained herein. NO WARRANTIES ARE MADE, WHETHER EXPRESS OR IMPLIED, INCLUDING WITH RESPECT TO THE COMPLETENESS, ACCURACY OR SUFFICIENCY OF THE FOREGOING, OR ANY IMPLIED WARRANTY OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, OR ANY IMPLIED WARRANTIES OTHERWISE ARISING FROM COURSE OF DEALING OR TRADE. The user is responsible for determining whether the product is fit for a particular purpose and suitable for user's method of use or application.

EAF Dust

Signal Word: DANGER **Symbols:** 

HAZARD STATEMENTS:

Suspected of causing cancer.
May damage fertility or the unborn child.
Causes damage to central nervous system, and lungs through prolonged or repeated exposure.
May cause respiratory irritation.
Causes severe skin burns and serious eye damage.

PRECAUTIONARY STATEMENTS

Do not breathe dusts, mists or sprays.
Wear protective gloves/protective clothing/eye protection/face protection.
Do not eat, drink or smoke when using this product.
Wash thoroughly after handling.
Obtain special instructions before use.
Do not handle until all safety precautions have been read and understood.
Use only outdoors or in well ventilated areas.
Wash thoroughly after handling.
If exposed, concerned or feel unwell: Get medical advice/attention. Call a poison center or doctor/physician.
If inhaled: Remove person to fresh air and keep comfortable for breathing. Immediately call a poison center or doctor/physician.
If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a poison center or doctor/physician.
If on skin (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower. Wash contaminated clothing before reuse.
If swallowed: Rinse mouth. Do NOT induce vomiting.
Dispose of contents in accordance with Federal, Provincial/State and Local regulations.
Store locked up.

SDS ID No.: 9964

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P.O Box 2460
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Emergency Contact: 1-760-476-3962, (3E Company Code: 333211)

Original Issue Date: ~1997 **Revised:** 05/20/2015

06/22/18 Status - CDPH Actions In Response to Fugitive Dust Monitoring Variance Requests[1]

Facility	CDPH Action (Re: Fugitive Dust Monitoring)	Status
Calumet River Terminal	Additional Information Requested 1/26/15	Pending
Carmeuse Lime		Facility Closed
Chicago Port Railroad/Midwest Marine Terminals		Pending
Gulf Sulphur Services	Variance Request Granted 8/15/16 (with required observation and response protocols)	
Horsehead/American Zinc Recycling		Amended Variance Request 2/9/18 Pending
KCBX North		Facility Ceased Operations 6/15
KCBX South	KCBX May 18, 2016 Fugitive Dust Plan includes five monitoring stations at KCBX South.[2]	Outdoor Piles Removed 6/16. U.S. EPA-mandated monitoring concluded 2/17; facility still required "…to operate air monitors in accordance with City of Chicago regulations."[3]
Kinder Morgan/Chicago Arrow Terminals	Variance Request Denied 5/3/17; sold to Watco, which submitted its own Variance Request (see below).	
North American Stevedoring	Variance Request Denied 1/26/18	Request for Reconsideration 2/28/18 Pending
S.H. Bell	Variance Request Denied 2/1/17; S.H. Bell November, 2017 Fugitive Dust Plan includes four monitoring stations[4]	
Watco	Variance Request Denied 12/20/17	

[1] This information is derived from - https://www.cityofchicago.org/city/en/depts/cdph/supp_info/healthy-communities/doe_ordinances_rulesandregulationsandsupportingdocuments.html - last visited on June 22, 2018.

[2] https://www.cityofchicago.org/content/dam/city/depts/cdph/environmental_health_and_food/KCBXFugitiveDustPlan_10730SBurleyAve_May182016.pdf

[3] https://www.epa.gov/petroleum-coke-chicago/kcbx-south-monitor-termination-request-letter; see also: https://www.epa.gov/sites/production/files/2017-03/documents/kcbx-south-monitor-termination-request-letter-20170213-4pp.pdf

American Zinc Recycling (AZR)

2701 E 114th Street, Chicago, Illinois

PM_{10} Network Data

Timestamp	Wind Speed	Wind Direction	Std. Dev. Wind Direction	Gust (3-second)	Temp	Precip	PM10 North	PM10 East	PM10 West	PM10 South
CST	mph	deg	deg	mph	°F	In.	µg/m3	µg/m3	µg/m3	µg/m3
3/1/2019 1:00	2.0	317.7	14.8	5.4	25.6	0	18	10	20	12
3/1/2019 2:00	3.7	11.4	25.5	6.0	26.5	0	15	13	15	11
3/1/2019 3:00	3.6	352.7	30.0	7.8	27.0	0	11	7	11	6
3/1/2019 4:00	4.0	351.2	32.6	8.4	27.0	0	9	8	14	11
3/1/2019 5:00	3.5	12.6	43.3	7.8	27.1	0	14	12	17	13
3/1/2019 6:00	3.4	356.0	32.8	7.2	27.5	0	17	14	15	17
3/1/2019 7:00	3.4	57.0	33.8	7.2	28.2	0	6	10	15	8
3/1/2019 8:00	3.4	70.6	37.6	7.8	28.9	0	12	15	16	11
3/1/2019 9:00	5.3	75.7	16.2	9.0	29.6	0	10	12	33	16
3/1/2019 10:00	5.9	86.2	12.7	9.6	29.7	0	10	28	28	36
3/1/2019 11:00	6.4	82.6	12.8	10.8	30.1	0	8	9	17	31
3/1/2019 12:00	6.0	71.3	21.7	10.8	31.3	0	7	7	38	13
3/1/2019 13:00	4.9	65.2	35.6	10.2	32.6	0	7	8	AN	16
3/1/2019 14:00	5.1	67.4	27.8	10.8	32.9	0	7	6	AN	10
3/1/2019 15:00	5.6	64.7	35.6	13.1	32.5	0	6	11	56	9
3/1/2019 16:00	5.5	66.4	27.6	12.0	32.0	0	7	8	38	11
3/1/2019 17:00	4.6	68.2	30.2	9.6	32.0	0	15	9	29	13
3/1/2019 18:00	3.6	52.4	39.7	9.0	31.8	0	3	12	14	34
3/1/2019 19:00	3.9	342.8	22.9	7.8	30.5	0	9	14	AN	33
3/1/2019 20:00	3.5	348.3	25.7	7.2	30.1	0	9	9	12	23
3/1/2019 21:00	2.9	56.6	32.3	7.2	30.6	0	9	8	19	57
3/1/2019 22:00	4.3	69.4	26.0	7.8	30.6	0	9	11	27	14
3/1/2019 23:00	1.9	310.9	17.2	6.0	30.8	0	11	12	12	24
3/2/2019 0:00	2.7	325.2	32.5	6.6	30.9	0	13	17	18	26
3/2/2019 1:00	2.6	58.3	23.0	6.0	31.1	0	12	10	18	15
3/2/2019 2:00	2.6	34.4	40.5	6.6	31.4	0	13	11	22	17

3/2/2019 3:00	4.1	8.0	41.0	7.8	31.1	0	11	12	AN	22
3/2/2019 4:00	3.5	3.9	43.6	7.8	30.7	0	18	12	11	13
3/2/2019 5:00	4.9	355.6	25.9	7.8	30.3	0	14	14	14	46
3/2/2019 6:00	6.1	337.7	13.0	10.2	30.2	0	13	14	19	12
3/2/2019 7:00	6.0	337.1	18.0	10.2	29.9	0	14	15	15	28
3/2/2019 8:00	5.4	323.6	19.4	12.0	29.4	0	18	27	17	8
3/2/2019 9:00	7.0	325.8	19.9	13.7	29.6	0	16	18	34	34
3/2/2019 10:00	7.2	336.3	21.0	13.1	29.6	0	23	18	23	23
3/2/2019 11:00	6.8	344.0	27.1	15.5	29.7	0	23	26	27	57
3/2/2019 12:00	5.2	3.8	52.0	13.1	31.7	0	18	18	27	47
3/2/2019 13:00	6.1	3.7	56.0	14.3	31.7	0	20	17	28	40
3/2/2019 14:00	5.4	46.0	51.3	14.3	32.5	0	16	17	37	36
3/2/2019 15:00	4.4	38.8	54.6	12.5	32.0	0	14	14	24	39
3/2/2019 16:00	4.2	40.6	69.5	13.1	30.7	0	16	15	33	28
3/2/2019 17:00	5.5	354.9	41.9	11.4	29.7	0	8	12	14	27
3/2/2019 18:00	6.2	342.0	21.7	12.0	28.8	0	6	7	11	33
3/2/2019 19:00	7.5	340.9	18.2	13.7	28.4	0	3	4	9	39
3/2/2019 20:00	8.3	341.7	15.1	14.3	28.7	0	3	4	11	33
3/2/2019 21:00	6.5	342.9	18.2	10.8	29.4	0	3	6	8	30
3/2/2019 22:00	6.0	344.8	23.9	10.8	29.6	0	2	3	9	49
3/2/2019 23:00	7.6	341.2	14.6	13.1	29.0	0	3	2	11	36
3/3/2019 0:00	6.4	342.5	14.3	12.0	28.6	0	6	5	16	45
3/3/2019 1:00	6.3	341.5	19.2	12.5	28.4	0	5	9	12	36
3/3/2019 2:00	5.3	341.4	25.9	12.5	27.3	0	12	13	11	44
3/3/2019 3:00	6.2	341.0	23.2	12.0	26.6	0	10	10	12	41
3/3/2019 4:00	4.9	344.2	26.7	10.2	26.5	0	10	7	15	32
3/3/2019 5:00	6.5	342.9	31.5	13.7	25.7	0	8	9	12	60
3/3/2019 6:00	6.7	347.2	33.1	18.5	23.8	0	12	23	42	87
3/3/2019 7:00	10.6	341.4	18.7	18.5	21.6	0	7	11	28	81
3/3/2019 8:00	8.7	339.0	21.8	16.1	20.9	0	7	8	18	37
3/3/2019 9:00	6.9	338.4	29.1	14.3	21.1	0	8	5	16	58
3/3/2019 10:00	7.0	338.3	26.4	14.3	21.2	0	7	8	9	52
3/3/2019 11:00	6.8	333.8	21.2	13.1	21.2	0	20	14	21	35
3/3/2019 12:00	6.9	327.9	18.5	13.1	20.5	0	18	25	16	19

3/3/2019 13:00	6.8	335.0	24.7	12.5	20.8	0	12	14	21	45
3/3/2019 14:00	7.2	331.0	21.2	13.1	21.4	0	12	26	14	18
3/3/2019 15:00	7.0	332.5	23.8	13.7	22.7	0	9	23	14	20
3/3/2019 16:00	6.9	328.4	16.9	16.1	22.8	0	8	21	AN	19
3/3/2019 17:00	8.0	305.7	20.0	15.5	21.9	0	10	59	17	8
3/3/2019 18:00	8.0	300.5	13.3	13.1	19.7	0	6	81	12	6
3/3/2019 19:00	7.9	298.2	12.3	14.3	17.7	0	5	61	10	4
3/3/2019 20:00	9.0	296.7	11.4	14.3	16.1	0	4	64	10	7
3/3/2019 21:00	8.6	285.8	12.7	14.9	13.7	0	9	41	11	7
3/3/2019 22:00	9.2	285.7	13.2	16.1	11.2	0	14	55	AN	8
3/3/2019 23:00	9.1	288.7	12.5	14.9	9.7	0	8	37	7	6
3/4/2019 0:00	8.1	292.2	12.5	14.3	8.3	0	4	46	AN	2
3/4/2019 1:00	9.4	281.5	12.9	16.1	6.3	0	18	40	6	6
3/4/2019 2:00	9.0	283.8	12.9	16.7	3.9	0	8	25	10	7
3/4/2019 3:00	8.9	283.2	13.0	16.1	2.4	0	11	17	12	6
3/4/2019 4:00	9.0	280.4	12.1	14.9	1.3	0	12	17	15	5
3/4/2019 5:00	8.9	278.9	13.5	15.5	-0.3	0	13	30	14	8
3/4/2019 6:00	7.6	273.5	14.6	13.1	-1.1	0	11	15	15	7
3/4/2019 7:00	8.6	276.6	14.3	14.9	-1.6	0	13	25	AN	7
3/4/2019 8:00	9.5	276.1	14.9	16.7	-0.6	0	22	42	6	7
3/4/2019 9:00	9.8	266.3	15.4	18.5	1.1	0	69	49	17	15
3/4/2019 10:00	10.4	268.3	17.5	17.9	3.1	0	91	99	17	34
3/4/2019 11:00	10.4	265.4	21.4	22.7	5.1	0	258	76	23	19
3/4/2019 12:00	11.6	265.5	17.4	21.5	6.7	0	137	70	19	20
3/4/2019 13:00	11.7	265.7	18.0	20.9	8.8	0	96	111	21	13
3/4/2019 14:00	11.5	268.8	13.7	22.1	10.7	0	60	79	AN	18
3/4/2019 15:00	12.0	264.4	17.8	21.5	12.0	0	138	67	18	14
3/4/2019 16:00	11.2	267.6	16.5	21.5	13.5	0	44	30	17	17
3/4/2019 17:00	11.2	261.4	17.8	20.9	13.9	0	65	24	20	18
3/4/2019 18:00	10.9	263.6	16.3	21.5	12.9	0	41	41	18	17
3/4/2019 19:00	11.2	264.0	16.9	23.9	11.6	0	70	35	18	13
3/4/2019 20:00	8.6	263.9	16.4	19.1	10.9	0	19	19	15	15
3/4/2019 21:00	10.1	260.9	16.8	20.3	10.4	0	67	28	17	18
3/4/2019 22:00	11.5	267.6	16.5	22.7	9.8	0	79	63	21	14

3/4/2019 23:00	10.3	266.3	17.6	25.1	9.2	0	38	29	14	13
3/5/2019 0:00	12.0	264.4	16.5	24.5	9.0	0	106	34	17	14
3/5/2019 1:00	11.1	263.4	16.3	25.7	8.9	0	32	23	10	14
3/5/2019 2:00	9.1	256.2	17.9	20.3	8.8	0	81	11	10	16
3/5/2019 3:00	8.6	251.4	19.0	19.7	9.5	0	104	26	19	17
3/5/2019 4:00	9.5	254.7	21.1	19.1	9.9	0	120	45	AN	33
3/5/2019 5:00	8.5	253.5	20.4	18.5	9.8	0	86	26	17	23
3/5/2019 6:00	10.1	258.5	18.8	23.9	9.7	0	92	30	21	19
3/5/2019 7:00	9.5	262.0	15.4	19.7	9.8	0	53	31	20	18
3/5/2019 8:00	9.1	268.2	14.4	18.5	10.5	0	47	52	21	45
3/5/2019 9:00	10.7	271.3	16.2	20.9	12.3	0	45	47	BA	11
3/5/2019 10:00	11.9	277.9	16.3	23.3	13.7	0	57	71	BA	17
3/5/2019 11:00	13.0	284.2	14.9	22.7	14.9	0	67	BA	12	BA
3/5/2019 12:00	12.5	281.5	14.7	23.3	16.6	0	BA	97	9	29
3/5/2019 13:00	12.6	290.0	14.2	20.3	17.7	0	50	104	BA	18
3/5/2019 14:00	13.4	283.6	16.9	23.9	19.2	0	75	97	BA	11
3/5/2019 15:00	14.2	282.1	16.8	25.7	19.9	0	84	91	18	13
3/5/2019 16:00	14.0	279.5	17.2	23.3	19.8	0	100	73	13	13
3/5/2019 17:00	12.5	281.1	12.9	24.5	19.7	0	19	48	10	15
3/5/2019 18:00	13.3	275.8	15.5	25.1	18.9	0	78	53	14	12
3/5/2019 19:00	13.6	282.0	13.1	23.9	17.7	0	22	57	15	14
3/5/2019 20:00	14.2	294.5	13.2	25.7	16.5	0	35	133	17	15
3/5/2019 21:00	13.2	298.3	14.0	24.5	15.3	0	26	144	15	18
3/5/2019 22:00	12.0	295.3	14.1	23.9	14.1	0	9	73	11	11
3/5/2019 23:00	10.1	294.8	13.7	20.9	13.4	0	7	69	11	8
3/6/2019 0:00	8.7	291.8	12.8	17.9	12.9	0	6	33	8	6
3/6/2019 1:00	8.2	295.0	12.7	14.9	12.4	0	8	31	10	5
3/6/2019 2:00	7.2	289.7	12.2	14.9	12.0	0	6	20	11	5
3/6/2019 3:00	6.7	285.8	13.3	14.3	11.5	0	11	12	10	6
3/6/2019 4:00	5.9	285.0	12.8	11.4	11.1	0	11	9	10	9
3/6/2019 5:00	5.7	277.6	12.5	9.6	10.7	0	10	15	10	7
3/6/2019 6:00	4.3	267.6	12.6	9.0	10.1	0	12	10	9	7
3/6/2019 7:00	4.6	258.8	16.2	9.0	10.2	0	11	18	15	21
3/6/2019 8:00	6.6	263.4	17.7	11.4	12.2	0	17	23	18	17

3/6/2019 9:00	6.2	250.0	24.8	13.1	14.6	0	40	22	20	17
3/6/2019 10:00	7.8	247.6	24.0	16.1	17.4	0	94	24	14	16
3/6/2019 11:00	8.2	244.3	30.3	17.3	20.0	0	94	24	19	16
3/6/2019 12:00	9.0	250.0	27.5	22.7	22.8	0	84	24	17	21
3/6/2019 13:00	7.7	236.0	27.9	20.3	25.3	0	131	31	28	24
3/6/2019 14:00	10.0	236.6	26.9	22.7	27.1	0	310	57	39	47
3/6/2019 15:00	10.1	252.2	20.8	20.3	29.4	0	117	25	17	23
3/6/2019 16:00	9.2	257.3	18.8	17.9	30.6	0	AN	29	24	24
3/6/2019 17:00	10.6	253.9	17.5	21.5	31.0	0	92	33	17	27
3/6/2019 18:00	9.5	251.5	21.0	20.9	31.0	0	115	30	20	24
3/6/2019 19:00	7.0	251.4	18.7	16.1	30.7	0	71	29	19	31
3/6/2019 20:00	9.7	260.9	16.6	21.5	30.7	0	47	23	15	16
3/6/2019 21:00	8.1	270.0	14.4	16.1	29.6	0	16	13	13	10
3/6/2019 22:00	8.9	278.3	14.7	19.1	28.6	0	15	17	14	11
3/6/2019 23:00	10.8	289.2	13.0	19.7	27.4	0	23	53	17	15
3/7/2019 0:00	10.1	297.7	12.6	20.9	25.4	0	19	55	17	18
3/7/2019 1:00	8.1	308.0	15.9	17.9	23.4	0	29	70	16	18
3/7/2019 2:00	5.9	316.4	21.0	13.1	22.1	0	16	38	24	20
3/7/2019 3:00	6.6	327.6	18.6	13.7	21.1	0	14	25	24	23
3/7/2019 4:00	4.4	314.8	19.1	11.4	20.1	0	16	40	43	41
3/7/2019 5:00	3.8	303.1	15.2	7.8	19.1	0	23	47	41	28
3/7/2019 6:00	3.6	298.4	10.4	6.6	18.5	0	33	67	32	23
3/7/2019 7:00	3.9	294.4	12.0	7.2	18.5	0	37	62	38	33
3/7/2019 8:00	4.6	314.6	14.6	9.0	20.0	0	55	69	36	49
3/7/2019 9:00	5.2	337.1	35.0	10.2	22.4	0	30	25	48	58
3/7/2019 10:00	4.8	4.2	35.2	10.2	24.3	0	17	16	29	30
3/7/2019 11:00	4.7	62.1	44.2	10.8	25.8	0	9	11	49	19
3/7/2019 12:00	4.2	49.9	34.5	8.4	26.0	0	7	13	31	23
3/7/2019 13:00	4.0	66.1	31.1	8.4	26.7	0	AN	11	56	24
3/7/2019 14:00	4.2	67.1	46.8	9.0	27.6	0	13	13	18	14
3/7/2019 15:00	5.2	72.8	19.9	9.0	27.1	0	11	9	27	13
3/7/2019 16:00	4.6	64.4	35.5	10.2	27.0	0	12	8	27	20
3/7/2019 17:00	5.3	70.9	26.1	10.8	26.8	0	13	6	39	8
3/7/2019 18:00	6.0	80.6	14.1	9.6	26.3	0	12	9	30	7

3/7/2019 19:00	5.2	84.5	10.8	8.4	26.0	0	11	10	13	7
3/7/2019 20:00	5.0	95.8	10.6	8.4	25.8	0	16	11	13	18
3/7/2019 21:00	4.5	104.3	10.6	8.4	25.4	0	24	25	23	21
3/7/2019 22:00	2.7	116.3	12.6	5.4	25.0	0	47	41	41	45
3/7/2019 23:00	2.0	98.4	10.3	3.6	24.5	0	36	39	35	32
3/8/2019 0:00	1.9	125.6	15.5	4.8	24.6	0	52	58	41	44
3/8/2019 1:00	2.6	142.8	17.1	6.0	25.0	0	54	46	34	35
3/8/2019 2:00	3.8	126.4	12.1	6.6	24.9	0	49	28	24	27
3/8/2019 3:00	3.7	135.8	15.1	6.6	25.3	0	39	24	22	18
3/8/2019 4:00	3.6	150.3	17.0	7.8	25.5	0	31	27	26	21
3/8/2019 5:00	3.0	148.2	16.6	6.0	25.3	0	35	25	23	23
3/8/2019 6:00	3.0	108.5	10.0	5.4	25.1	0	32	35	25	30
3/8/2019 7:00	2.8	135.9	18.7	5.4	25.5	0	67	38	32	33
3/8/2019 8:00	3.4	130.1	16.7	6.6	26.6	0	101	78	76	84
3/8/2019 9:00	3.3	129.0	15.0	6.0	28.2	0	118	64	78	86
3/8/2019 10:00	3.2	114.5	14.1	7.2	30.4	0	83	124	82	68
3/8/2019 11:00	3.9	84.2	17.1	7.8	31.3	0	52	59	70	66
3/8/2019 12:00	4.1	83.0	17.0	7.8	32.7	0	58	65	69	58
3/8/2019 13:00	4.6	83.2	22.9	7.8	34.2	0	62	65	71	68
3/8/2019 14:00	4.9	73.0	21.5	9.6	36.5	0	52	56	80	54
3/8/2019 15:00	5.6	69.8	23.9	10.8	36.8	0	27	37	46	31
3/8/2019 16:00	5.5	67.7	23.1	10.2	36.2	0	38	44	74	36
3/8/2019 17:00	5.3	67.0	24.2	9.6	35.3	0	23	23	67	26
3/8/2019 18:00	4.1	66.1	28.1	9.0	33.6	0	26	23	45	21
3/8/2019 19:00	4.9	69.3	19.3	9.0	33.3	0	24	22	47	19
3/8/2019 20:00	5.7	77.9	10.4	11.4	32.5	0	16	13	28	18
3/8/2019 21:00	4.6	79.1	8.9	8.4	31.7	0	18	21	22	18
3/8/2019 22:00	5.6	77.4	12.4	11.4	31.7	0	24	22	26	17
3/8/2019 23:00	4.3	80.7	10.7	9.0	31.0	0	28	21	38	31
3/9/2019 0:00	3.8	82.7	10.2	7.8	30.3	0	22	23	30	23
3/9/2019 1:00	2.4	89.1	13.4	4.2	30.3	0	48	47	52	43
3/9/2019 2:00	3.3	113.5	12.8	6.6	31.2	0	46	41	37	30
3/9/2019 3:00	3.9	111.9	10.2	6.6	31.6	0	42	29	33	30
3/9/2019 4:00	5.3	115.6	10.0	9.6	32.1	0	49	23	25	24

3/9/2019 5:00	7.3	117.0	11.7	13.1	33.1	0	38	25	22	21
3/9/2019 6:00	8.9	122.9	13.0	16.1	32.9	0	48	30	28	25
3/9/2019 7:00	9.3	120.3	12.1	17.3	32.7	0	65	26	23	22
3/9/2019 8:00	11.7	123.9	15.4	20.9	34.4	0	97	45	41	40
3/9/2019 9:00	12.6	122.5	16.2	23.3	35.8	0	142	142	47	46
3/9/2019 10:00	12.2	124.2	16.8	20.9	38.2	0	155	101	47	49
3/9/2019 11:00	13.3	125.5	18.9	26.2	40.4	0	277	172	56	58
3/9/2019 12:00	12.4	126.0	17.2	27.4	41.4	0	287	74	45	38
3/9/2019 13:00	13.7	124.8	17.1	23.9	41.8	0	196	67	53	38
3/9/2019 14:00	15.4	116.2	18.0	29.8	41.9	0.01	289	88	57	45
3/9/2019 15:00	16.0	124.5	16.6	37.0	40.4	0.16	39	22	21	23
3/9/2019 16:00	18.7	124.5	17.8	35.8	40.4	0.01	28	8	10	10
3/9/2019 17:00	14.4	130.2	22.7	30.4	40.3	0.01	32	8	9	7
3/9/2019 18:00	11.8	148.6	23.4	29.8	40.8	0.12	18	5	8	6
3/9/2019 19:00	9.9	157.0	19.3	25.7	41.2	0.12	39	6	4	4
3/9/2019 20:00	4.6	181.5	34.8	12.0	42.0	0.01	45	5	0	1
3/9/2019 21:00	2.9	188.1	21.5	7.8	42.1	0	10	4	2	2
3/9/2019 22:00	4.8	206.7	25.2	16.7	44.1	0	105	5	4	2
3/9/2019 23:00	12.2	249.8	18.6	28.0	45.5	0.01	29	2	4	1
3/10/2019 0:00	16.3	258.6	16.3	38.2	42.4	0	19	3	3	0
3/10/2019 1:00	16.6	255.6	17.5	34.0	39.0	0	41	4	3	4
3/10/2019 2:00	17.8	258.6	17.6	36.4	38.2	0	42	4	1	3
3/10/2019 3:00	17.4	259.3	16.3	31.6	38.0	0	21	4	1	2
3/10/2019 4:00	14.8	260.0	16.6	31.0	37.6	0	53	4	4	2
3/10/2019 5:00	14.2	257.8	17.2	29.2	37.4	0	28	6	4	6
3/10/2019 6:00	14.1	259.2	16.7	29.8	37.2	0	24	5	6	6
3/10/2019 7:00	13.4	255.4	17.8	26.8	36.9	0	22	5	8	4
3/10/2019 8:00	13.2	258.4	17.0	31.0	36.6	0	40	14	12	6
3/10/2019 9:00	13.3	258.4	16.8	25.7	35.7	0	23	13	13	7
3/10/2019 10:00	13.6	261.4	18.3	26.8	35.4	0	26	14	12	11
3/10/2019 11:00	13.8	258.5	17.3	28.0	35.2	0	35	15	13	13
3/10/2019 12:00	13.3	258.0	18.8	29.2	34.8	0	41	16	15	15
3/10/2019 13:00	14.2	259.2	17.6	30.4	35.1	0	36	13	11	11
3/10/2019 14:00	15.0	261.7	15.3	31.0	36.6	0	35	15	7	9

3/10/2019 15:00	14.1	265.5	16.0	28.6	37.5	0	89	18	6	7
3/10/2019 16:00	13.1	258.2	17.5	27.4	38.5	0	82	10	10	14
3/10/2019 17:00	12.8	263.7	16.2	23.9	39.1	0	116	12	10	9
3/10/2019 18:00	10.9	266.9	15.9	23.3	37.4	0	42	20	13	7
3/10/2019 19:00	11.0	263.9	16.1	22.7	35.4	0	22	11	8	11
3/10/2019 20:00	9.7	266.3	14.6	20.9	33.6	0	17	9	6	8
3/10/2019 21:00	8.2	259.2	15.0	17.3	32.4	0	19	7	9	7
3/10/2019 22:00	7.8	261.6	15.5	15.5	31.5	0	13	12	7	5
3/10/2019 23:00	6.8	261.0	13.7	14.3	30.8	0	12	7	7	6
3/11/2019 0:00	5.4	254.8	14.8	12.0	30.0	0	14	5	8	5
3/11/2019 1:00	6.9	258.9	14.2	13.7	29.5	0	18	5	7	5
3/11/2019 2:00	6.9	261.4	12.2	13.1	29.0	0	9	6	6	8
3/11/2019 3:00	6.0	263.1	14.2	10.8	28.4	0	9	9	8	9
3/11/2019 4:00	5.8	262.1	14.6	10.2	28.1	0	11	7	7	8
3/11/2019 5:00	5.6	264.6	14.8	10.8	28.1	0	10	15	6	6
3/11/2019 6:00	6.3	272.8	13.9	12.0	28.4	0	28	13	11	7
3/11/2019 7:00	5.7	279.2	14.1	12.0	28.8	0	18	15	17	11
3/11/2019 8:00	6.5	295.4	16.3	12.0	29.9	0	15	46	15	13
3/11/2019 9:00	5.9	296.2	16.4	12.5	30.7	0	15	43	19	16
3/11/2019 10:00	6.6	277.4	17.5	12.5	32.2	0	17	23	13	11
3/11/2019 11:00	6.4	288.3	17.9	12.0	34.2	0	12	24	12	10
3/11/2019 12:00	6.4	289.6	19.9	11.4	36.5	0	14	24	12	11
3/11/2019 13:00	8.4	287.7	18.8	16.1	38.4	0	14	70	10	17
3/11/2019 14:00	8.6	281.3	16.4	14.9	40.4	0	31	20	10	6
3/11/2019 15:00	10.3	288.6	13.4	18.5	42.0	0	28	37	6	5
3/11/2019 16:00	10.5	284.1	13.5	19.1	42.5	0	14	44	12	7
3/11/2019 17:00	9.8	287.0	12.7	17.3	42.2	0	11	40	10	7
3/11/2019 18:00	8.7	287.6	11.0	16.1	40.3	0	6	24	9	8
3/11/2019 19:00	6.2	279.6	10.3	14.3	37.8	0	10	14	8	8
3/11/2019 20:00	5.8	279.4	10.9	11.4	36.0	0	11	17	13	7
3/11/2019 21:00	4.9	276.4	10.8	9.0	34.3	0	17	12	12	13
3/11/2019 22:00	1.3	278.5	6.8	5.4	32.9	0	11	13	11	15
3/11/2019 23:00	1.3	226.3	4.3	3.6	31.9	0	17	17	17	12
3/12/2019 0:00	1.7	231.2	7.6	4.2	31.3	0	18	16	14	11

3/12/2019 1:00	3.1	252.6	8.2	5.4	30.6	0	20	19	21	19
3/12/2019 2:00	1.6	252.2	5.2	4.2	30.0	0	20	15	17	19
3/12/2019 3:00	1.4	232.9	15.7	3.0	29.4	0	23	19	19	17
3/12/2019 4:00	1.2	199.9	12.5	2.4	28.2	0	67	30	24	31
3/12/2019 5:00	1.6	170.4	12.9	3.6	27.8	0	44	54	50	47
3/12/2019 6:00	1.4	177.5	7.2	3.6	27.0	0	56	50	51	55
3/12/2019 7:00	1.9	179.3	9.4	4.2	27.8	0	94	106	83	127
3/12/2019 8:00	2.5	178.6	18.6	5.4	31.4	0	91	86	61	83
3/12/2019 9:00	3.4	157.3	18.0	6.6	34.9	0	77	51	62	61
3/12/2019 10:00	4.8	148.8	19.2	9.0	38.7	0	73	65	50	58
3/12/2019 11:00	5.8	180.4	30.4	12.0	42.5	0	74	65	18	51
3/12/2019 12:00	6.9	201.4	33.0	16.7	45.0	0	58	34	13	19
3/12/2019 13:00	7.1	184.0	24.7	14.9	46.5	0	86	67	27	44
3/12/2019 14:00	7.9	169.2	22.7	14.9	47.4	0	60	26	18	48
3/12/2019 15:00	7.5	172.5	23.8	14.3	48.0	0	41	24	18	49
3/12/2019 16:00	7.7	166.4	20.4	15.5	46.9	0	53	15	15	33
3/12/2019 17:00	7.3	164.0	21.2	16.7	45.7	0	59	16	17	20
3/12/2019 18:00	7.6	155.1	18.4	17.3	44.7	0	31	8	9	11
3/12/2019 19:00	7.6	153.0	16.7	14.3	44.2	0	29	9	13	13
3/12/2019 20:00	9.9	150.5	17.3	19.7	44.1	0	112	6	23	13
3/12/2019 21:00	10.6	152.7	17.5	23.9	44.1	0	151	8	17	19
3/12/2019 22:00	7.8	162.5	20.1	17.9	44.1	0	65	16	12	10
3/12/2019 23:00	8.3	164.2	21.2	20.3	44.3	0	48	8	14	13
3/13/2019 0:00	9.4	168.0	22.7	20.9	44.2	0	128	13	19	14
3/13/2019 1:00	7.1	168.6	22.5	17.3	44.0	0	35	8	8	9
3/13/2019 2:00	8.0	174.4	22.6	20.3	43.9	0	73	10	9	8
3/13/2019 3:00	8.8	185.8	21.2	22.1	41.4	0.05	53	9	13	7
3/13/2019 4:00	8.3	184.6	24.1	18.5	40.2	0.04	37	7	9	6
3/13/2019 5:00	7.5	188.4	20.8	16.7	40.4	0.05	AN	11	8	7
3/13/2019 6:00	7.2	185.9	20.7	16.1	40.3	0.03	32	12	10	8
3/13/2019 7:00	6.1	180.4	23.6	14.3	40.6	0	96	24	9	9
3/13/2019 8:00	5.9	175.8	20.7	13.1	41.7	0	47	23	14	25
3/13/2019 9:00	5.7	181.0	20.8	12.0	43.4	0	AN	28	7	31
3/13/2019 10:00	6.4	178.7	21.3	13.7	45.2	0	69	47	9	58

3/13/2019 11:00	5.7	173.1	21.8	12.5	46.9	0.02	41	29	8	44
3/13/2019 12:00	5.7	161.1	22.8	12.0	46.9	0.06	27	9	14	21
3/13/2019 13:00	6.0	166.0	21.4	12.5	50.3	0	71	19	12	29
3/13/2019 14:00	6.6	153.8	19.8	14.9	54.2	0	36	15	20	17
3/13/2019 15:00	8.9	150.4	15.1	16.7	57.0	0	50	21	27	22
3/13/2019 16:00	9.6	147.6	12.4	17.3	58.6	0	73	20	25	20
3/13/2019 17:00	8.6	149.3	15.8	15.5	59.3	0	67	9	20	14
3/13/2019 18:00	8.9	153.2	19.1	19.7	60.8	0	192	10	15	10
3/13/2019 19:00	8.6	148.8	17.5	15.5	60.5	0	122	12	16	15
3/13/2019 20:00	6.0	134.6	20.5	12.5	59.1	0	84	9	11	10
3/13/2019 21:00	11.5	149.0	13.5	18.5	60.5	0	124	14	14	9
3/13/2019 22:00	9.8	150.3	15.7	19.1	59.2	0.01	41	9	16	10
3/13/2019 23:00	10.6	150.0	14.5	19.7	55.2	0.14	48	12	11	8
3/14/2019 0:00	10.5	149.5	16.7	22.1	52.8	0.03	40	9	9	5
3/14/2019 1:00	13.2	151.1	16.4	25.7	53.4	0	58	6	7	4
3/14/2019 2:00	11.7	150.1	15.7	23.3	54.1	0	45	9	7	9
3/14/2019 3:00	11.5	152.9	16.0	22.1	54.2	0	28	7	10	7
3/14/2019 4:00	10.0	165.9	20.9	23.3	55.1	0	71	10	7	5
3/14/2019 5:00	10.3	157.4	21.0	24.5	56.8	0	47	7	5	6
3/14/2019 6:00	11.6	161.5	21.5	24.5	57.4	0	27	10	7	7
3/14/2019 7:00	10.5	161.3	21.6	23.3	57.1	0	52	17	10	6
3/14/2019 8:00	10.6	163.0	21.9	24.5	56.1	0	37	22	27	26
3/14/2019 9:00	8.7	171.1	22.0	20.9	57.1	0	41	33	21	36
3/14/2019 10:00	11.5	153.2	18.8	26.2	58.0	0.06	48	20	27	21
3/14/2019 11:00	7.4	173.1	28.5	19.1	56.8	0.31	34	21	6	13
3/14/2019 12:00	9.9	168.7	20.7	23.3	60.3	0	21	11	6	11
3/14/2019 13:00	10.7	180.3	28.9	31.0	62.9	0.17	38	32	16	27
3/14/2019 14:00	9.9	225.9	31.5	27.4	60.7	0.05	40	30	23	23
3/14/2019 15:00	15.2	242.0	26.8	39.9	60.0	0	150	46	33	32
3/14/2019 16:00	14.6	241.2	24.3	32.2	55.7	0	106	13	15	19
3/14/2019 17:00	15.7	244.2	23.1	35.8	50.5	0	123	19	10	10
3/14/2019 18:00	14.1	242.2	28.2	33.4	47.9	0	83	9	11	10
3/14/2019 19:00	14.5	247.3	20.8	32.8	46.1	0	82	16	10	6
3/14/2019 20:00	14.2	249.9	21.2	30.4	44.1	0	90	9	9	4

3/14/2019 21:00	12.6	237.8	26.1	32.8	41.9	0	58	6	6	6
3/14/2019 22:00	11.5	236.9	28.7	30.4	40.9	0	44	4	6	7
3/14/2019 23:00	10.9	241.3	23.7	23.9	41.5	0	70	4	5	5
3/15/2019 0:00	10.5	242.2	23.4	26.8	41.3	0	84	2	2	4
3/15/2019 1:00	12.3	248.6	19.7	27.4	40.8	0	AN	2	3	1
3/15/2019 2:00	12.0	246.1	20.3	26.8	39.2	0	67	3	4	-1
3/15/2019 3:00	12.1	251.1	19.8	26.2	38.8	0	36	4	3	2
3/15/2019 4:00	11.9	254.3	18.6	23.9	38.3	0	AV	5	3	3
3/15/2019 5:00	11.8	257.0	17.2	23.9	37.6	0	159	3	3	0
3/15/2019 6:00	10.9	262.2	14.9	24.5	37.1	0	62	0	7	-1
3/15/2019 7:00	9.5	265.5	16.3	17.3	36.9	0	15	5	6	2
3/15/2019 8:00	9.7	272.8	14.2	20.3	36.9	0	9	4	6	2
3/15/2019 9:00	8.9	268.4	15.5	16.7	36.8	0.01	6	3	5	6
3/15/2019 10:00	9.7	263.5	16.2	19.1	36.1	0.02	7	2	8	2
3/15/2019 11:00	9.8	266.5	13.9	19.1	35.8	0.01	8	5	6	1
3/15/2019 12:00	11.0	265.3	15.6	22.1	35.7	0	7	9	6	4
3/15/2019 13:00	11.9	273.0	14.4	23.9	36.2	0	6	6	6	5
3/15/2019 14:00	12.4	275.7	13.9	27.4	36.4	0	5	6	4	3
3/15/2019 15:00	12.6	273.5	15.5	25.1	37.1	0	3	9	3	1
3/15/2019 16:00	13.7	281.3	14.3	26.2	37.7	0	2	17	6	3
3/15/2019 17:00	12.1	275.7	13.9	25.7	38.4	0	5	9	4	4
3/15/2019 18:00	9.8	278.0	13.4	20.9	39.1	0	AN	8	6	1
3/15/2019 19:00	10.2	278.0	13.8	22.7	39.7	0	4	9	6	-2
3/15/2019 20:00	10.4	278.7	13.0	21.5	39.0	0	4	10	4	0
3/15/2019 21:00	11.5	285.3	14.6	21.5	37.7	0	8	81	4	4
3/15/2019 22:00	12.0	288.3	13.1	20.9	36.1	0	6	35	3	6
3/15/2019 23:00	11.0	285.8	11.7	19.7	34.8	0	5	24	5	5
3/16/2019 0:00	9.5	283.9	12.3	16.1	33.7	0	6	40	3	6
3/16/2019 1:00	9.3	286.3	11.2	17.3	32.9	0	4	14	5	2
3/16/2019 2:00	8.7	288.1	11.8	16.7	32.0	0	4	15	5	2
3/16/2019 3:00	7.8	285.4	11.5	13.7	31.3	0	4	9	5	3
3/16/2019 4:00	7.5	290.0	11.9	13.7	30.7	0	5	22	6	3
3/16/2019 5:00	6.5	288.0	11.4	12.0	30.1	0	4	27	6	2
3/16/2019 6:00	6.8	284.1	11.9	12.0	29.7	0	3	13	6	2

3/16/2019 7:00	6.8	282.1	11.6	12.5	30.2	0	8	13	4	3
3/16/2019 8:00	8.4	294.5	14.7	16.7	31.6	0	6	49	3	7
3/16/2019 9:00	8.7	296.5	12.8	15.5	33.0	0	AN	44	9	6
3/16/2019 10:00	8.6	286.8	20.7	14.9	34.8	0	5	11	6	3
3/16/2019 11:00	8.8	294.1	19.5	17.3	36.6	0	AN	24	4	4
3/16/2019 12:00	7.8	281.7	22.1	16.1	38.1	0	4	18	3	3
3/16/2019 13:00	8.6	293.6	17.4	16.1	39.5	0	10	21	2	5
3/16/2019 14:00	6.1	49.5	40.5	16.7	39.3	0	9	15	15	5
3/16/2019 15:00	6.8	69.6	21.3	12.5	37.0	0	6	11	10	5
3/16/2019 16:00	6.5	72.5	17.0	12.0	36.5	0	2	7	12	4
3/16/2019 17:00	5.7	75.8	17.7	11.4	36.9	0	3	5	13	7
3/16/2019 18:00	5.0	82.3	11.6	7.8	36.2	0	7	6	11	5
3/16/2019 19:00	3.8	88.9	12.3	6.6	34.4	0	15	19	23	20
3/16/2019 20:00	1.8	106.1	9.8	4.2	33.6	0	19	17	24	18
3/16/2019 21:00	2.1	127.7	16.0	4.8	33.0	0	16	16	21	13
3/16/2019 22:00	3.0	136.7	13.4	7.8	32.8	0	28	25	24	31
3/16/2019 23:00	3.1	151.8	11.0	7.2	32.7	0	41	20	19	16
3/17/2019 0:00	2.5	140.1	18.0	6.0	32.0	0	32	24	26	20
3/17/2019 1:00	2.6	168.1	9.8	6.6	31.2	0	48	23	21	21
3/17/2019 2:00	3.1	168.2	11.9	6.0	30.6	0	30	16	23	21
3/17/2019 3:00	2.3	159.5	14.5	4.2	30.2	0	64	9	15	10
3/17/2019 4:00	1.6	179.7	18.4	6.0	30.6	0	25	10	14	10
3/17/2019 5:00	2.9	203.5	16.5	6.6	31.5	0	62	16	15	8
3/17/2019 6:00	3.2	232.9	14.6	6.6	32.0	0	55	4	13	11
3/17/2019 7:00	4.3	252.4	17.0	11.4	32.4	0	16	5	8	6
3/17/2019 8:00	4.2	238.7	21.3	9.0	32.7	0	223	6	7	2
3/17/2019 9:00	4.7	247.7	20.1	10.2	34.0	0	20	6	8	0
3/17/2019 10:00	6.4	257.1	17.1	12.0	36.0	0	12	6	6	-1
3/17/2019 11:00	6.7	259.5	16.8	12.5	38.1	0	15	6	6	1
3/17/2019 12:00	6.6	259.5	28.4	13.7	40.5	0	8	11	6	5
3/17/2019 13:00	7.1	262.5	27.4	14.3	41.8	0	17	10	7	5
3/17/2019 14:00	8.6	301.8	32.6	18.5	43.1	0	23	27	7	6
3/17/2019 15:00	6.9	64.4	29.2	14.9	39.7	0	10	10	52	17
3/17/2019 16:00	5.9	61.7	30.4	13.1	39.5	0	7	15	54	13

3/17/2019 17:00	5.7	71.3	19.9	9.6	37.7	0	9	8	57	9
3/17/2019 18:00	5.5	79.0	16.5	9.0	36.2	0	13	10	24	11
3/17/2019 19:00	3.4	83.2	11.0	9.0	34.4	0	12	12	16	9
3/17/2019 20:00	0.9	210.3	3.8	3.6	33.3	0	13	15	13	14
3/17/2019 21:00	1.0	161.2	12.3	3.0	32.9	0	22	12	20	16
3/17/2019 22:00	0.6	209.7	12.8	2.4	32.3	0	32	23	19	17
3/17/2019 23:00	0.4	155.1	7.4	2.4	32.8	0	25	20	22	23
3/18/2019 0:00	0.5	191.0	3.0	2.4	32.9	0	33	26	28	22
3/18/2019 1:00	1.4	230.5	7.5	3.6	32.4	0	AN	26	30	27
3/18/2019 2:00	4.2	281.0	11.7	7.8	32.4	0	40	17	24	21
3/18/2019 3:00	3.5	290.1	10.7	6.0	31.8	0	28	29	16	15
3/18/2019 4:00	4.1	283.5	6.6	6.0	30.8	0	22	25	20	19
3/18/2019 5:00	3.2	269.9	8.4	6.0	30.0	0	73	29	24	21
3/18/2019 6:00	4.1	282.1	8.4	6.6	29.4	0	29	33	28	23
3/18/2019 7:00	4.4	284.9	9.3	7.2	29.7	0	35	36	29	28
3/18/2019 8:00	5.4	296.4	16.2	9.0	31.9	0	37	46	35	33
3/18/2019 9:00	5.5	314.9	20.7	10.2	34.4	0	40	46	39	38
3/18/2019 10:00	4.1	257.6	25.0	8.4	37.1	0	22	25	27	18
3/18/2019 11:00	4.9	242.0	28.2	10.8	39.2	0	30	28	28	24
3/18/2019 12:00	6.1	260.9	23.9	13.1	41.0	0	30	20	29	16
3/18/2019 13:00	6.8	281.7	18.2	13.1	41.7	0	19	24	19	14
3/18/2019 14:00	7.8	274.4	17.1	15.5	42.2	0	27	20	23	21
3/18/2019 15:00	7.7	280.4	20.7	13.7	42.5	0	16	24	23	10
3/18/2019 16:00	7.9	269.7	16.8	16.7	42.9	0	24	20	17	16
3/18/2019 17:00	7.6	272.4	15.7	14.9	42.9	0	14	17	16	10
3/18/2019 18:00	6.8	270.8	13.4	13.7	42.1	0	13	9	18	9
3/18/2019 19:00	5.0	286.4	9.3	9.6	40.2	0	12	19	11	12
3/18/2019 20:00	3.3	273.8	7.9	6.0	38.6	0	13	12	18	13
3/18/2019 21:00	1.6	204.8	7.5	3.6	37.2	0	58	16	24	20
3/18/2019 22:00	1.9	210.3	9.4	4.8	36.2	0	67	30	40	24
3/18/2019 23:00	1.9	204.8	11.3	4.8	35.5	0	39	21	25	19
3/19/2019 0:00	2.2	211.4	13.2	6.0	35.1	0	78	21	16	13
3/19/2019 1:00	1.4	214.1	13.3	4.2	34.4	0	35	18	20	16
3/19/2019 2:00	1.4	242.5	10.3	4.2	33.5	0	27	20	18	11

3/19/2019 3:00	2.4	256.1	11.7	5.4	33.1	0	24	19	21	21
3/19/2019 4:00	3.4	252.8	10.9	7.2	33.1	0	53	18	17	17
3/19/2019 5:00	3.4	253.8	11.1	6.6	32.4	0	39	19	16	16
3/19/2019 6:00	2.2	252.9	12.2	4.8	31.3	0	43	41	29	19
3/19/2019 7:00	2.1	220.8	15.1	5.4	32.7	0	59	75	56	49
3/19/2019 8:00	3.9	242.0	17.9	7.8	36.0	0	47	83	39	53
3/19/2019 9:00	4.2	239.7	21.6	9.6	39.8	0	48	75	28	31
3/19/2019 10:00	6.7	263.9	18.9	13.1	42.8	0	19	49	14	25
3/19/2019 11:00	6.3	252.6	30.2	13.1	44.8	0	50	46	9	22
3/19/2019 12:00	6.7	239.8	30.4	14.9	46.4	0	149	18	10	9
3/19/2019 13:00	6.1	229.1	34.4	17.3	47.3	0	51	36	12	30
3/19/2019 14:00	6.7	209.4	23.1	13.7	48.2	0	67	62	13	42
3/19/2019 15:00	6.5	218.0	30.0	14.9	48.8	0	737	63	13	33
3/19/2019 16:00	5.8	220.0	32.8	13.7	49.5	0	55	17	9	17
3/19/2019 17:00	5.8	222.0	36.2	14.9	49.3	0	61	13	14	10
3/19/2019 18:00	4.4	220.2	32.2	14.3	47.6	0	985	11	17	12
3/19/2019 19:00	3.0	199.4	16.0	7.8	45.7	0	985	20	15	13
3/19/2019 20:00	2.5	162.3	16.6	5.4	44.7	0	218	44	38	64
3/19/2019 21:00	2.8	162.4	20.3	6.0	43.3	0	365	38	27	28
3/19/2019 22:00	3.7	158.5	17.1	9.0	42.5	0	178	16	27	27
3/19/2019 23:00	4.7	168.0	20.2	10.2	42.6	0	91	12	17	16
3/20/2019 0:00	4.2	177.8	22.3	9.6	42.4	0	70	22	13	9
3/20/2019 1:00	4.9	192.0	21.4	10.8	42.4	0	40	13	17	10
3/20/2019 2:00	4.1	199.9	26.8	12.0	42.0	0	42	17	16	10
3/20/2019 3:00	5.5	202.2	21.6	13.1	42.6	0	111	6	14	11
3/20/2019 4:00	4.8	216.6	33.6	12.5	42.5	0	67	16	15	15
3/20/2019 5:00	4.0	210.3	25.2	11.4	41.7	0	36	12	16	16
3/20/2019 6:00	4.0	182.6	21.2	9.0	41.3	0	28	21	18	16
3/20/2019 7:00	5.2	189.0	20.6	13.1	40.1	0.07	181	62	17	19
3/20/2019 8:00	5.4	177.6	25.4	13.7	39.6	0.06	38	25	17	16
3/20/2019 9:00	6.8	187.5	21.9	15.5	39.8	0.06	37	33	16	12
3/20/2019 10:00	6.8	180.6	25.6	15.5	40.3	0	42	26	12	13
3/20/2019 11:00	7.8	181.8	24.2	18.5	40.4	0	36	23	12	9
3/20/2019 12:00	6.8	197.1	23.5	17.9	40.3	0	31	23	15	15

3/20/2019 13:00	5.9	198.8	25.0	14.3	40.6	0	39	18	16	17
3/20/2019 14:00	5.4	200.1	27.6	11.4	41.7	0	36	28	11	11
3/20/2019 15:00	3.8	219.5	33.5	10.2	43.3	0	45	15	17	14
3/20/2019 16:00	3.4	231.1	28.5	10.2	44.0	0	76	15	19	14
3/20/2019 17:00	3.5	243.4	22.0	8.4	44.4	0	48	22	20	25
3/20/2019 18:00	2.9	244.1	16.1	7.2	44.4	0	42	29	19	18
3/20/2019 19:00	1.8	207.3	12.1	4.2	43.8	0	36	26	26	23
3/20/2019 20:00	2.9	193.3	16.5	6.6	43.7	0	39	28	30	26
3/20/2019 21:00	3.3	212.5	24.9	17.3	43.4	0.04	55	32	27	24
3/20/2019 22:00	4.7	252.7	19.5	13.7	43.0	0.04	29	24	16	17
3/20/2019 23:00	2.1	307.6	11.0	6.6	42.0	0	14	19	14	14
3/21/2019 0:00	3.9	283.1	9.8	7.8	40.8	0	10	11	11	12
3/21/2019 1:00	5.8	293.1	11.6	12.5	40.2	0	14	28	12	12
3/21/2019 2:00	6.2	316.4	20.4	12.0	39.0	0	13	40	13	14
3/21/2019 3:00	5.2	312.5	18.7	12.0	37.9	0.01	17	37	15	11
3/21/2019 4:00	4.8	311.2	19.8	9.6	37.5	0	18	39	22	15
3/21/2019 5:00	5.5	325.1	22.6	11.4	37.5	0.01	21	27	27	15
3/21/2019 6:00	7.5	333.0	20.2	15.5	37.4	0.01	25	30	24	32
3/21/2019 7:00	9.9	338.6	18.9	20.3	37.1	0	12	20	19	23
3/21/2019 8:00	10.2	340.6	20.0	20.9	36.4	0	17	28	20	24
3/21/2019 9:00	8.7	340.7	27.8	19.1	36.3	0	BA	24	14	27
3/21/2019 10:00	9.9	340.9	21.7	18.5	36.4	0	BA	85	17	17
3/21/2019 11:00	7.8	341.9	22.1	18.5	37.4	0	BA	19	8	22
3/21/2019 12:00	7.7	341.1	23.5	16.1	38.3	0	BA	21	11	25
3/21/2019 13:00	4.1	25.5	53.7	12.5	38.8	0	18	14	18	17
3/21/2019 14:00	3.4	10.2	45.2	7.2	38.7	0	13	13	16	13
3/21/2019 15:00	1.9	165.6	14.8	6.6	39.4	0	AN	36	29	61
3/21/2019 16:00	3.6	197.6	20.5	7.8	40.9	0	39	28	26	24
3/21/2019 17:00	7.4	265.5	14.7	14.9	43.9	0	25	13	7	7
3/21/2019 18:00	7.9	280.7	13.1	14.3	43.8	0	6	12	12	6
3/21/2019 19:00	3.3	236.3	13.1	8.4	42.0	0	33	9	10	3
3/21/2019 20:00	2.3	210.7	15.4	5.4	40.3	0	32	12	14	5
3/21/2019 21:00	3.5	227.2	20.5	9.6	39.7	0	41	11	15	12
3/21/2019 22:00	4.9	255.3	13.0	9.6	40.0	0	27	11	8	10

3/21/2019 23:00	4.9	262.6	15.9	11.4	40.9	0	5	7	8	6
3/22/2019 0:00	3.8	259.9	12.2	7.2	40.2	0	9	9	6	5
3/22/2019 1:00	4.1	260.4	9.2	7.2	38.9	0	12	7	7	4
3/22/2019 2:00	4.2	270.3	7.6	6.6	38.3	0	8	7	7	5
3/22/2019 3:00	4.9	284.6	9.9	9.6	38.4	0	19	14	9	6
3/22/2019 4:00	5.0	301.9	13.4	9.0	38.3	0	9	27	9	6
3/22/2019 5:00	5.5	328.7	18.7	14.9	38.2	0	11	12	18	18
3/22/2019 6:00	8.9	343.4	22.3	18.5	39.0	0	8	8	13	28
3/22/2019 7:00	8.5	343.2	21.5	17.3	38.8	0	5	8	7	21
3/22/2019 8:00	7.6	344.2	27.2	18.5	39.7	0	5	6	24	31
3/22/2019 9:00	6.9	346.0	38.9	17.3	41.1	0	5	3	7	34
3/22/2019 10:00	8.1	344.9	28.7	20.3	42.3	0	2	7	16	28
3/22/2019 11:00	7.1	353.0	45.3	17.9	42.4	0	5	10	13	46
3/22/2019 12:00	6.1	32.8	68.5	17.9	40.7	0	4	6	7	24
3/22/2019 13:00	5.9	17.4	65.8	17.3	39.8	0	-2	1	8	23
3/22/2019 14:00	6.0	18.6	62.3	16.1	39.1	0	1	2	7	9
3/22/2019 15:00	5.9	8.4	61.5	17.3	38.8	0	0	2	13	7
3/22/2019 16:00	5.7	20.4	56.0	15.5	37.9	0	-1	3	8	12
3/22/2019 17:00	5.1	18.8	55.9	16.7	37.8	0	1	3	7	10
3/22/2019 18:00	4.0	35.7	56.6	14.3	36.7	0	1	2	9	6
3/22/2019 19:00	3.1	48.5	59.0	8.4	34.7	0	3	3	7	8
3/22/2019 20:00	3.3	70.2	37.2	7.8	34.4	0	3	4	3	5
3/22/2019 21:00	3.6	71.1	21.2	8.4	34.3	0	4	5	11	2
3/22/2019 22:00	2.0	52.4	34.6	6.0	33.6	0	3	3	8	-1
3/22/2019 23:00	2.8	70.7	26.5	6.0	33.5	0	-1	2	7	-1
3/23/2019 0:00	2.3	114.8	26.6	6.6	33.2	0	3	2	7	0
3/23/2019 1:00	1.1	247.6	7.7	3.0	31.4	0	9	0	5	2
3/23/2019 2:00	0.7	287.4	5.5	2.4	30.4	0	17	11	20	7
3/23/2019 3:00	1.4	289.3	6.2	3.0	30.2	0	125	59	68	42
3/23/2019 4:00	1.6	291.8	6.4	3.0	29.8	0	31	20	25	17
3/23/2019 5:00	2.0	267.8	8.7	3.6	29.3	0	55	38	27	30
3/23/2019 6:00	1.6	247.3	6.0	3.0	28.7	0	28	24	25	17
3/23/2019 7:00	0.8	234.7	13.8	3.6	31.8	0	28	32	29	31
3/23/2019 8:00	2.0	129.6	16.4	4.8	35.1	0	30	34	33	51

3/23/2019 9:00	1.9	139.8	39.3	4.8	37.4	0	AN	32	32	20
3/23/2019 10:00	3.3	135.7	24.4	6.0	39.6	0	48	48	43	44
3/23/2019 11:00	3.9	196.0	33.5	8.4	42.6	0	34	24	21	25
3/23/2019 12:00	6.5	88.3	13.0	10.8	43.0	0	23	36	32	31
3/23/2019 13:00	6.7	87.8	14.0	12.0	44.5	0	32	50	41	43
3/23/2019 14:00	7.3	81.0	11.0	11.4	45.4	0	46	46	60	44
3/23/2019 15:00	6.7	74.0	16.4	12.0	45.9	0	33	37	72	33
3/23/2019 16:00	6.4	79.5	13.4	10.8	47.1	0	56	63	76	65
3/23/2019 17:00	6.5	82.7	11.2	10.2	48.6	0	76	83	87	75
3/23/2019 18:00	4.7	113.5	14.6	8.4	45.9	0	73	50	55	43
3/23/2019 19:00	4.2	127.9	12.8	6.6	43.5	0	AN	16	22	16
3/23/2019 20:00	3.7	122.0	9.9	6.6	42.4	0	55	24	25	24
3/23/2019 21:00	3.0	138.9	12.7	6.6	42.8	0	AN	47	45	44
3/23/2019 22:00	2.2	136.8	16.4	4.8	42.8	0	46	48	40	35
3/23/2019 23:00	3.4	160.6	15.4	6.6	43.3	0	39	29	35	26
3/24/2019 0:00	3.3	173.7	20.9	7.2	43.9	0	85	11	17	16
3/24/2019 1:00	3.1	172.4	21.2	9.0	43.8	0	66	13	12	9
3/24/2019 2:00	3.5	165.1	22.2	7.2	43.4	0	75	13	9	7
3/24/2019 3:00	3.7	184.7	21.8	7.8	43.3	0	60	9	7	7
3/24/2019 4:00	4.1	199.0	20.9	11.4	44.0	0	35	7	5	8
3/24/2019 5:00	1.7	178.6	11.6	6.0	44.1	0	39	7	7	5
3/24/2019 6:00	2.8	163.5	14.3	7.2	43.6	0	59	12	14	6
3/24/2019 7:00	3.3	184.5	36.2	8.4	43.3	0	93	16	16	10
3/24/2019 8:00	3.5	203.7	23.2	9.6	43.9	0	37	14	16	11
3/24/2019 9:00	2.5	183.3	25.1	6.0	46.3	0	30	14	13	13
3/24/2019 10:00	2.0	145.9	15.9	4.8	47.6	0	22	18	17	12
3/24/2019 11:00	2.2	164.9	16.8	6.0	48.0	0	23	15	19	12
3/24/2019 12:00	2.8	148.4	15.5	6.6	48.3	0	AN	10	7	9
3/24/2019 13:00	4.0	136.1	19.0	7.8	49.0	0	25	15	18	11
3/24/2019 14:00	3.1	172.5	22.8	6.6	50.9	0	24	11	14	15
3/24/2019 15:00	1.7	271.7	31.1	5.4	50.6	0.01	16	15	19	11
3/24/2019 16:00	3.7	68.1	23.0	7.8	46.8	0.04	22	23	25	18
3/24/2019 17:00	3.8	41.9	38.3	9.0	45.4	0.01	18	22	20	31
3/24/2019 18:00	3.2	53.5	50.3	13.1	44.5	0	AN	23	19	20

3/24/2019 19:00	4.7	44.0	60.3	13.7	40.1	0	16	16	18	30
3/24/2019 20:00	4.0	19.6	72.2	14.9	38.3	0	12	9	8	13
3/24/2019 21:00	4.0	10.6	70.5	13.1	37.2	0	3	5	6	14
3/24/2019 22:00	3.9	19.2	60.4	12.0	36.9	0	-1	2	3	9
3/24/2019 23:00	5.3	355.2	40.3	14.9	36.5	0	1	1	2	19
3/25/2019 0:00	6.0	355.7	43.3	17.9	36.3	0	5	2	2	22
3/25/2019 1:00	5.8	350.0	39.8	14.9	36.3	0	5	1	3	14
3/25/2019 2:00	6.7	349.9	38.7	16.7	36.3	0	4	3	6	29
3/25/2019 3:00	7.3	348.1	37.0	19.1	36.4	0	AN	6	5	25
3/25/2019 4:00	5.5	50.9	74.3	17.3	36.9	0	3	6	7	21
3/25/2019 5:00	6.0	65.2	54.8	16.1	36.0	0	AN	5	10	6
3/25/2019 6:00	7.0	62.3	49.7	20.9	35.1	0	4	5	18	18
3/25/2019 7:00	8.8	57.7	36.6	20.9	35.2	0	5	9	16	32
3/25/2019 8:00	9.3	55.8	34.6	21.5	35.6	0	5	5	22	12
3/25/2019 9:00	7.6	54.6	49.6	19.1	36.1	0	3	0	20	6
3/25/2019 10:00	8.3	52.4	45.1	20.3	36.6	0	1	2	28	7
3/25/2019 11:00	6.7	41.5	56.8	17.9	37.6	0	3	5	28	17
3/25/2019 12:00	5.7	23.2	74.0	14.9	38.6	0	BA	10	18	11
3/25/2019 13:00	6.2	357.8	59.4	19.7	39.3	0	BA	BA	19	BA
3/25/2019 14:00	7.0	356.5	64.1	22.1	38.9	0	BA	12	BA	BA
3/25/2019 15:00	8.3	351.7	38.9	21.5	38.0	0	2	11	16	26
3/25/2019 16:00	8.3	351.2	39.5	19.1	37.4	0	9	17	32	81
3/25/2019 17:00	7.7	349.3	41.3	19.1	37.2	0	8	8	19	46
3/25/2019 18:00	7.8	346.1	34.3	21.5	35.8	0	6	4	8	24
3/25/2019 19:00	6.3	345.3	32.9	15.5	34.0	0	5	4	5	19
3/25/2019 20:00	6.1	343.4	33.2	15.5	33.4	0	6	3	3	20
3/25/2019 21:00	7.1	342.5	23.9	15.5	33.4	0	2	1	3	15
3/25/2019 22:00	6.4	343.5	21.2	14.3	33.6	0	0	-1	5	17
3/25/2019 23:00	5.7	342.0	25.8	12.5	33.6	0	3	0	6	33
3/26/2019 0:00	3.8	338.7	31.2	7.8	33.7	0	2	0	3	29
3/26/2019 1:00	3.9	334.0	18.9	7.2	33.4	0	1	0	3	18
3/26/2019 2:00	3.6	337.9	24.4	6.6	33.2	0	0	1	4	27
3/26/2019 3:00	3.8	334.6	25.7	7.2	33.2	0	0	1	5	24
3/26/2019 4:00	1.9	319.0	32.7	5.4	32.8	0	-1	4	25	13

3/26/2019 5:00	2.5	112.2	50.0	7.8	33.5	0	4	8	21	11
3/26/2019 6:00	6.2	70.7	14.7	12.0	34.3	0	8	13	37	9
3/26/2019 7:00	7.1	80.6	14.0	11.4	35.0	0	9	37	34	65
3/26/2019 8:00	8.3	79.2	13.6	14.9	35.9	0	5	40	37	152
3/26/2019 9:00	9.0	84.3	14.1	14.3	35.6	0	9	53	29	61
3/26/2019 10:00	8.0	73.6	15.2	13.7	36.7	0	5	49	31	68
3/26/2019 11:00	6.9	69.9	26.1	12.5	38.4	0	1	28	30	18
3/26/2019 12:00	6.0	67.1	25.6	11.4	40.3	0	5	15	33	10
3/26/2019 13:00	6.4	72.3	26.3	13.1	41.0	0	6	12	23	10
3/26/2019 14:00	6.4	70.3	30.1	12.5	41.3	0	3	58	24	38
3/26/2019 15:00	6.6	70.3	23.8	12.5	41.0	0	AN	102	60	64
3/26/2019 16:00	6.4	68.4	25.6	12.0	40.8	0	10	10	55	12
3/26/2019 17:00	6.1	74.8	18.1	10.2	40.3	0	6	5	20	6
3/26/2019 18:00	5.2	80.0	14.6	9.6	39.3	0	3	-2	15	3
3/26/2019 19:00	4.2	82.9	9.5	6.6	37.4	0	3	2	9	6
3/26/2019 20:00	2.9	111.3	8.8	4.8	36.5	0	6	13	15	9
3/26/2019 21:00	2.9	140.2	11.5	5.4	36.1	0	AN	27	23	21
3/26/2019 22:00	3.2	155.4	16.0	6.0	35.1	0	102	67	43	51
3/26/2019 23:00	4.5	164.1	14.3	9.6	34.5	0	159	43	26	27
3/27/2019 0:00	1.4	193.0	8.2	4.2	33.1	0	42	28	29	43
3/27/2019 1:00	1.7	167.8	12.5	4.8	32.7	0	69	14	39	14
3/27/2019 2:00	2.9	173.6	12.1	6.0	32.5	0	39	13	14	15
3/27/2019 3:00	2.9	172.1	12.7	5.4	32.3	0	92	11	17	15
3/27/2019 4:00	3.0	169.3	17.4	6.0	32.1	0	AN	25	19	18
3/27/2019 5:00	2.8	171.2	20.0	6.0	32.2	0	127	20	24	19
3/27/2019 6:00	2.9	177.5	19.9	7.8	32.2	0	122	78	45	65
3/27/2019 7:00	4.1	167.0	21.7	10.8	33.8	0	173	72	44	267
3/27/2019 8:00	5.8	170.4	20.9	12.5	37.9	0	268	111	34	503
3/27/2019 9:00	6.6	181.5	24.9	13.7	42.6	0	156	103	23	349
3/27/2019 10:00	7.6	202.6	27.1	18.5	46.2	0	139	146	17	198
3/27/2019 11:00	8.5	204.7	23.1	17.9	48.6	0	183	124	24	198
3/27/2019 12:00	7.8	203.2	26.2	16.1	51.1	0	393	39	17	27
3/27/2019 13:00	8.6	197.5	20.6	19.7	53.2	0	171	112	21	211
3/27/2019 14:00	8.7	189.8	22.8	18.5	55.3	0	149	102	22	197

3/27/2019 15:00	9.1	191.0	28.0	19.7	56.7	0	116	69	18	113
3/27/2019 16:00	8.8	190.7	24.8	21.5	57.1	0	155	47	14	35
3/27/2019 17:00	8.5	188.3	26.4	20.3	56.9	0	105	27	12	21
3/27/2019 18:00	8.0	183.4	21.9	19.1	55.3	0	150	20	15	18
3/27/2019 19:00	6.8	169.4	21.7	14.9	54.0	0	119	52	27	34
3/27/2019 20:00	8.0	175.8	23.7	21.5	53.7	0	101	23	19	24
3/27/2019 21:00	9.0	191.9	25.8	19.7	52.7	0	129	26	14	24
3/27/2019 22:00	5.9	224.7	29.2	20.3	51.2	0.03	211	24	26	17
3/27/2019 23:00	5.2	210.3	31.2	17.9	46.3	0.1	148	11	14	16
3/28/2019 0:00	7.8	194.6	24.1	20.3	45.9	0.01	53	8	10	8
3/28/2019 1:00	7.0	201.0	23.0	14.3	46.9	0	66	6	7	9
3/28/2019 2:00	7.3	197.1	19.6	17.9	47.4	0	84	6	11	5
3/28/2019 3:00	7.4	196.2	21.1	16.1	47.4	0	78	8	8	8
3/28/2019 4:00	7.7	201.4	22.0	16.7	48.3	0	36	13	9	7
3/28/2019 5:00	6.8	206.1	29.1	15.5	49.0	0	45	18	19	10
3/28/2019 6:00	6.3	207.9	28.8	14.9	49.1	0	40	17	17	17
3/28/2019 7:00	6.1	215.7	36.8	14.3	49.9	0	90	62	22	71
3/28/2019 8:00	7.0	216.6	35.6	17.3	51.0	0	103	67	23	55
3/28/2019 9:00	6.8	230.4	42.7	17.9	53.3	0	91	46	24	41
3/28/2019 10:00	7.5	233.5	32.5	19.7	56.3	0	124	41	25	37
3/28/2019 11:00	6.6	233.1	30.0	17.3	59.2	0	AN	43	26	41
3/28/2019 12:00	5.5	243.6	32.0	13.1	61.5	0	58	36	32	35
3/28/2019 13:00	5.2	250.8	24.6	11.4	62.2	0	42	42	35	36
3/28/2019 14:00	5.4	270.8	21.6	11.4	62.5	0	32	36	30	30
3/28/2019 15:00	4.2	238.1	32.3	9.0	63.4	0	44	43	39	34
3/28/2019 16:00	4.3	231.2	26.2	10.2	63.1	0	82	59	38	60
3/28/2019 17:00	5.7	41.7	49.9	17.3	50.4	0	AN	37	53	45
3/28/2019 18:00	5.0	53.8	49.1	13.1	44.6	0	23	20	41	27
3/28/2019 19:00	4.1	31.1	44.0	11.4	43.4	0	16	13	21	31
3/28/2019 20:00	4.1	59.4	60.0	9.6	43.2	0	9	10	37	46
3/28/2019 21:00	4.6	74.1	34.9	12.0	42.3	0	10	8	16	15
3/28/2019 22:00	4.7	61.8	32.0	11.4	43.0	0	7	8	26	16
3/28/2019 23:00	4.2	67.6	31.6	9.0	43.0	0	18	8	20	11
3/29/2019 0:00	3.7	90.2	15.3	7.2	42.5	0	6	9	11	14

3/29/2019 1:00	3.7	26.2	21.5	7.8	43.2	0	6	6	9	10
3/29/2019 2:00	3.7	358.7	47.0	8.4	43.3	0	AN	6	6	16
3/29/2019 3:00	3.6	21.6	59.9	9.6	42.3	0	7	6	11	14
3/29/2019 4:00	4.3	357.2	47.3	9.6	42.0	0	6	5	12	38
3/29/2019 5:00	5.0	341.6	35.7	12.0	42.0	0	3	4	12	32
3/29/2019 6:00	4.2	341.0	37.2	9.0	42.6	0	6	6	15	24
3/29/2019 7:00	3.9	350.0	48.0	10.8	42.7	0	11	14	8	26
3/29/2019 8:00	3.3	35.8	70.1	9.0	44.2	0	9	16	17	19
3/29/2019 9:00	4.0	28.1	49.0	9.0	45.4	0	8	9	16	17
3/29/2019 10:00	5.0	64.7	29.6	10.2	46.4	0	11	18	36	19
3/29/2019 11:00	4.6	39.9	45.5	10.2	46.9	0	24	17	30	30
3/29/2019 12:00	4.7	43.7	41.3	9.0	46.6	0	12	20	23	14
3/29/2019 13:00	6.1	74.8	20.7	10.8	47.3	0	13	15	30	14
3/29/2019 14:00	5.5	75.8	21.0	9.6	46.9	0	28	16	31	16
3/29/2019 15:00	5.4	66.5	26.0	9.6	46.5	0	23	20	32	27
3/29/2019 16:00	4.7	67.6	25.4	9.6	44.1	0	13	16	24	20
3/29/2019 17:00	3.4	36.5	59.5	8.4	43.7	0	9	11	16	19
3/29/2019 18:00	4.6	61.9	43.1	14.3	42.1	0	10	11	20	16
3/29/2019 19:00	7.4	74.0	15.1	13.7	39.7	0	6	8	21	13
3/29/2019 20:00	6.6	60.6	20.0	14.3	39.6	0.05	5	11	30	9
3/29/2019 21:00	4.9	11.1	57.5	11.4	39.1	0.16	9	10	11	23
3/29/2019 22:00	5.6	57.2	27.1	12.0	39.1	0.06	6	6	22	4
3/29/2019 23:00	3.2	39.3	66.5	9.6	38.8	0.07	3	5	8	15
3/30/2019 0:00	4.6	345.8	37.8	10.8	38.2	0.09	AN	4	5	9
3/30/2019 1:00	4.3	7.6	45.5	12.0	38.6	0.04	7	4	3	13
3/30/2019 2:00	4.4	13.1	62.7	13.1	38.8	0.02	4	5	4	12
3/30/2019 3:00	4.1	9.0	49.0	12.0	38.9	0.04	2	3	5	11
3/30/2019 4:00	5.2	345.1	35.9	12.0	38.8	0.1	4	0	5	34
3/30/2019 5:00	5.5	341.5	30.4	14.3	38.9	0.11	3	1	3	37
3/30/2019 6:00	6.2	342.5	32.5	14.9	38.4	0.05	1	1	1	21
3/30/2019 7:00	6.4	351.1	62.9	19.1	38.9	0	0	1	5	27
3/30/2019 8:00	7.7	340.5	27.0	16.7	39.3	0	2	7	10	34
3/30/2019 9:00	9.0	341.5	20.8	18.5	40.6	0	5	5	14	21
3/30/2019 10:00	8.9	341.7	23.3	19.1	41.6	0	3	2	8	34

3/30/2019 11:00	6.5	342.0	30.2	13.7	41.5	0	2	4	6	32
3/30/2019 12:00	6.4	345.7	32.6	16.7	41.3	0	3	5	11	26
3/30/2019 13:00	8.8	345.6	32.3	24.5	40.4	0	6	6	14	38
3/30/2019 14:00	6.1	7.4	62.6	19.1	40.0	0	4	4	13	17
3/30/2019 15:00	6.4	2.4	54.3	20.9	38.5	0	1	5	10	19
3/30/2019 16:00	8.0	350.7	39.3	22.7	36.3	0	4	6	14	21
3/30/2019 17:00	8.8	349.8	37.9	26.8	35.3	0	5	4	9	31
3/30/2019 18:00	5.9	4.3	59.3	15.5	35.1	0	6	4	8	13
3/30/2019 19:00	7.0	345.0	35.7	18.5	34.7	0	5	2	6	19
3/30/2019 20:00	7.0	346.9	37.4	18.5	34.2	0	3	-1	6	24
3/30/2019 21:00	7.4	342.0	29.8	17.9	33.6	0	3	1	15	46
3/30/2019 22:00	7.2	343.8	35.7	17.9	33.1	0	5	4	3	28
3/30/2019 23:00	7.5	343.9	37.1	17.9	32.6	0	5	3	6	22
3/31/2019 0:00	7.2	341.9	37.3	15.5	31.9	0	8	4	9	35
3/31/2019 1:00	8.4	339.9	26.4	19.7	30.7	0	10	5	9	30
3/31/2019 2:00	8.9	331.3	21.6	18.5	29.7	0	6	6	7	1
3/31/2019 3:00	9.2	333.8	23.3	18.5	28.2	0	2	7	6	3
3/31/2019 4:00	8.0	328.9	19.7	16.1	26.6	0	3	8	8	5
3/31/2019 5:00	7.7	323.8	20.6	16.1	25.5	0	3	10	11	12
3/31/2019 6:00	7.7	324.6	23.0	16.7	25.3	0	2	14	7	8
3/31/2019 7:00	7.1	321.9	21.0	17.9	26.3	0	AN	87	15	16
3/31/2019 8:00	9.3	333.0	22.7	20.9	27.6	0	3	40	12	15
3/31/2019 9:00	10.3	335.9	23.1	21.5	28.9	0	1	15	8	17
3/31/2019 10:00	9.3	326.9	26.4	20.9	30.4	0	0	25	7	8
3/31/2019 11:00	7.3	348.7	38.3	17.3	31.8	0	0	17	6	21
3/31/2019 12:00	6.2	17.3	51.1	16.1	33.5	0	0	-1	13	20
3/31/2019 13:00	6.0	52.4	48.2	13.1	34.0	0	0	-1	28	4
3/31/2019 14:00	6.6	56.0	35.2	15.5	34.5	0	1	2	25	8
3/31/2019 15:00	6.9	65.1	31.3	13.1	34.3	0	0	0	22	5
3/31/2019 16:00	7.4	80.9	20.2	13.7	34.0	0	1	1	12	0
3/31/2019 17:00	7.1	76.6	17.2	12.5	33.7	0	2	2	21	0
3/31/2019 18:00	7.5	83.6	12.1	12.0	32.7	0	3	1	20	4
3/31/2019 19:00	5.8	90.3	10.5	9.6	31.8	0	4	2	5	4
3/31/2019 20:00	3.8	129.0	16.3	6.0	31.6	0	13	2	6	3

3/31/2019 21:00	4.4	159.6	15.0	7.8	31.3	0	28	15	10	12
3/31/2019 22:00	5.4	158.8	11.8	10.2	31.1	0	20	9	11	13
3/31/2019 23:00	5.4	154.4	10.5	9.6	30.5	0	19	17	9	9
4/1/2019 0:00	3.8	159.5	16.4	8.4	29.8	0	18	8	8	7

EPA Qualifier Codes

https://aqs.epa.gov/aqsweb/documents/codetables/qualifiers.html

Qualifier Code	Qualifier Description
AN	Machine Malfunction.
AV	Power Outage.
BA	Maintenance. (Flow Check)

American Zinc Recycling (AZR)

2701 E 114th Street, Chicago, Illinois

PM_{10} Network Data

Timestamp	Wind Speed	Wind Direction	Std. Dev. Wind Direction	Gust (3-second)	Temp	Precip	PM10 North	PM10 East	PM10 West	PM10 South
CST	mph	deg	deg	mph	°F	In.	µg/m3	µg/m3	µg/m3	µg/m3
4/1/2019 1:00	2.1	168.4	19.7	6.6	29.1	0	37	7	5	6
4/1/2019 2:00	3.7	161.5	17.3	9.0	28.8	0	16	5	8	8
4/1/2019 3:00	4.9	156.3	12.6	9.0	28.7	0	20	4	7	5
4/1/2019 4:00	4.8	160.3	15.1	9.6	28.1	0	31	5	8	7
4/1/2019 5:00	4.6	165.1	16.5	9.0	27.7	0	58	11	15	10
4/1/2019 6:00	4.4	164.5	13.9	7.2	27.5	0	48	25	51	24
4/1/2019 7:00	4.7	173.7	17.1	10.8	29.3	0	130	63	27	34
4/1/2019 8:00	5.1	201.3	24.0	11.4	33.3	0	49	55	16	27
4/1/2019 9:00	6.4	196.3	22.1	14.9	37.4	0	56	40	13	22
4/1/2019 10:00	7.9	203.3	26.8	16.7	40.0	0	89	34	18	19
4/1/2019 11:00	8.4	206.6	29.7	19.7	42.0	0	146	24	18	14
4/1/2019 12:00	8.6	200.1	28.6	20.9	43.5	0	115	50	13	21
4/1/2019 13:00	10.3	201.3	29.4	23.3	45.1	0	148	40	12	18
4/1/2019 14:00	10.0	210.8	32.8	23.3	46.1	0	184	39	14	18
4/1/2019 15:00	10.1	199.6	25.4	21.5	46.8	0	105	32	11	20
4/1/2019 16:00	10.2	204.3	32.4	21.5	47.1	0	167	11	7	8
4/1/2019 17:00	10.1	197.9	28.7	23.3	47.3	0	101	11	10	8
4/1/2019 18:00	9.2	201.3	24.7	24.5	46.3	0	77	9	8	6
4/1/2019 19:00	7.9	195.3	23.9	16.7	44.7	0	61	5	7	5
4/1/2019 20:00	7.6	193.3	21.8	16.1	43.3	0	74	7	6	4
4/1/2019 21:00	6.9	199.7	23.4	17.9	42.4	0	62	7	7	2
4/1/2019 22:00	7.0	197.4	24.0	17.3	41.9	0	66	5	9	4
4/1/2019 23:00	6.5	205.4	31.1	16.1	41.9	0	81	5	7	6
4/2/2019 0:00	5.3	212.8	36.3	15.5	41.2	0	69	5	7	4
4/2/2019 1:00	6.0	208.9	32.2	14.9	41.0	0	99	7	6	9
4/2/2019 2:00	6.7	211.0	35.4	16.7	41.2	0	62	5	4	7

4/2/2019 3:00	6.3	215.8	35.2	17.9	41.0	0	47	6	7	3
4/2/2019 4:00	6.0	214.0	41.3	15.5	40.5	0	47	9	10	5
4/2/2019 5:00	5.8	218.1	39.5	16.1	40.1	0	33	8	9	11
4/2/2019 6:00	4.9	217.9	32.5	13.7	39.4	0	54	19	20	14
4/2/2019 7:00	5.7	205.2	25.0	13.1	39.9	0	112	46	23	36
4/2/2019 8:00	6.2	214.0	33.8	14.9	42.4	0	70	42	20	56
4/2/2019 9:00	6.5	219.9	36.1	14.9	45.3	0	77	30	25	31
4/2/2019 10:00	7.0	228.7	29.8	16.7	49.4	0	65	34	17	48
4/2/2019 11:00	7.7	220.3	30.8	17.3	52.9	0	129	41	24	30
4/2/2019 12:00	10.1	236.9	34.0	24.5	55.2	0	170	48	38	31
4/2/2019 13:00	11.0	239.3	28.8	25.7	55.7	0	158	68	35	46
4/2/2019 14:00	11.5	240.0	30.5	26.2	54.9	0	212	87	69	86
4/2/2019 15:00	10.8	255.1	19.2	20.9	51.9	0	67	36	37	34
4/2/2019 16:00	12.1	264.3	16.3	21.5	49.3	0	51	32	32	29
4/2/2019 17:00	11.5	260.2	18.2	25.1	48.9	0	AN	38	30	36
4/2/2019 18:00	10.0	263.5	15.9	20.3	48.1	0	24	17	16	16
4/2/2019 19:00	8.0	258.3	17.2	17.3	46.2	0	33	14	11	8
4/2/2019 20:00	6.7	257.6	16.4	13.1	44.7	0	12	19	15	9
4/2/2019 21:00	5.7	257.4	15.3	10.2	43.5	0	12	8	9	11
4/2/2019 22:00	5.0	242.8	19.8	10.8	42.6	0	83	10	14	11
4/2/2019 23:00	4.7	239.9	25.6	11.4	42.0	0	48	18	19	16
4/3/2019 0:00	5.0	233.4	27.0	12.5	41.2	0	206	16	15	11
4/3/2019 1:00	6.2	238.4	25.8	14.3	41.0	0	75	15	19	13
4/3/2019 2:00	5.0	244.7	17.7	11.4	40.3	0	AN	16	17	17
4/3/2019 3:00	7.1	261.9	15.6	14.9	41.7	0	29	10	11	10
4/3/2019 4:00	7.8	277.2	13.0	14.9	41.3	0	12	19	17	9
4/3/2019 5:00	4.4	274.3	11.2	9.6	39.8	0	10	15	15	14
4/3/2019 6:00	2.2	230.4	9.9	4.2	38.5	0	38	42	131	37
4/3/2019 7:00	4.0	261.5	14.7	9.6	40.3	0	26	39	38	38
4/3/2019 8:00	5.5	300.8	20.3	10.2	43.1	0	37	34	25	22
4/3/2019 9:00	4.6	293.6	42.3	10.2	45.3	0	17	26	23	17
4/3/2019 10:00	3.6	310.4	38.4	9.6	47.8	0	19	22	15	16
4/3/2019 11:00	6.8	79.0	17.3	12.5	47.5	0	16	20	54	27
4/3/2019 12:00	6.7	82.0	20.0	11.4	48.6	0	28	47	57	62

4/3/2019 13:00	7.1	194.7	23.3	17.3	54.2	0	116	92	42	40
4/3/2019 14:00	9.7	257.7	20.3	20.3	57.2	0	67	26	23	22
4/3/2019 15:00	9.2	253.8	21.7	19.1	57.4	0	119	20	16	23
4/3/2019 16:00	9.8	264.4	18.1	20.3	57.2	0	48	16	12	11
4/3/2019 17:00	9.3	265.0	17.4	16.7	57.1	0	45	6	13	11
4/3/2019 18:00	5.5	261.6	15.8	11.4	56.4	0	18	13	18	16
4/3/2019 19:00	7.3	261.8	18.5	23.3	55.3	0	27	19	13	12
4/3/2019 20:00	7.6	248.9	22.2	19.7	53.2	0	AN	14	10	11
4/3/2019 21:00	4.6	249.2	20.1	13.7	50.8	0	28	12	12	10
4/3/2019 22:00	1.2	182.4	8.1	4.2	50.4	0	AN	17	9	9
4/3/2019 23:00	1.0	181.1	5.2	3.6	49.9	0	27	32	24	33
4/4/2019 0:00	0.6	270.7	5.3	2.4	48.9	0.03	20	30	23	23
4/4/2019 1:00	2.8	331.0	12.4	6.6	47.8	0.02	17	20	17	14
4/4/2019 2:00	2.0	298.6	19.9	6.0	47.3	0.01	10	16	17	19
4/4/2019 3:00	2.7	99.1	16.4	6.6	46.5	0.02	14	17	23	18
4/4/2019 4:00	4.0	69.2	18.9	7.8	45.6	0.05	16	14	43	18
4/4/2019 5:00	4.4	78.5	13.6	7.8	44.8	0	14	18	40	23
4/4/2019 6:00	4.7	81.7	11.1	8.4	44.4	0	14	16	25	12
4/4/2019 7:00	7.4	74.9	12.8	13.7	43.4	0	12	15	32	16
4/4/2019 8:00	8.1	83.6	12.1	13.7	42.5	0.01	12	20	27	130
4/4/2019 9:00	8.4	79.3	13.0	14.9	43.5	0	9	12	27	183
4/4/2019 10:00	9.9	82.6	13.6	17.3	44.8	0	8	20	38	152
4/4/2019 11:00	9.9	79.8	13.5	16.1	44.1	0.01	12	15	24	29
4/4/2019 12:00	9.9	72.3	16.6	18.5	42.5	0.03	8	15	26	12
4/4/2019 13:00	9.0	72.8	15.3	15.5	43.2	0	7	9	26	51
4/4/2019 14:00	9.6	73.1	12.8	15.5	43.5	0.03	6	5	21	26
4/4/2019 15:00	8.2	68.8	16.7	14.3	43.2	0.02	9	7	40	8
4/4/2019 16:00	8.2	69.0	17.8	14.9	42.8	0.01	10	6	25	6
4/4/2019 17:00	9.6	77.2	13.9	18.5	43.4	0	22	13	25	9
4/4/2019 18:00	9.6	75.2	14.4	18.5	42.8	0	12	11	29	10
4/4/2019 19:00	9.4	91.4	12.0	17.9	42.6	0	12	14	15	15
4/4/2019 20:00	8.0	109.3	12.2	14.9	42.5	0.02	23	16	16	17
4/4/2019 21:00	8.1	120.0	14.8	15.5	41.7	0.02	22	15	19	16
4/4/2019 22:00	8.4	117.3	16.3	17.9	41.0	0	384	16	16	11

4/4/2019 23:00	9.5	116.6	12.2	17.3	40.4	0	205	9	10	11
4/5/2019 0:00	7.8	118.6	15.0	14.3	40.7	0	AN	9	14	12
4/5/2019 1:00	8.7	116.4	15.2	16.7	40.8	0	13	8	13	9
4/5/2019 2:00	6.7	123.8	17.7	13.7	40.5	0	15	11	17	11
4/5/2019 3:00	4.3	133.8	21.7	9.0	40.3	0	17	11	9	11
4/5/2019 4:00	3.2	132.2	22.4	8.4	40.5	0	29	10	9	10
4/5/2019 5:00	2.1	103.3	12.0	4.2	40.8	0	9	9	12	7
4/5/2019 6:00	2.3	87.6	23.6	4.8	41.1	0	15	11	14	16
4/5/2019 7:00	3.4	358.1	32.8	6.0	40.3	0	19	20	17	37
4/5/2019 8:00	3.5	83.7	9.7	6.0	40.7	0	10	6	20	20
4/5/2019 9:00	3.7	89.2	21.0	6.6	42.2	0	AN	9	19	20
4/5/2019 10:00	3.4	66.3	30.5	6.6	43.7	0	14	19	17	33
4/5/2019 11:00	3.2	49.6	41.7	6.6	44.5	0	21	31	23	17
4/5/2019 12:00	3.5	85.2	24.3	6.6	46.5	0	27	27	36	37
4/5/2019 13:00	4.3	84.4	21.5	7.8	49.1	0	27	30	40	34
4/5/2019 14:00	4.9	63.8	28.9	9.6	49.8	0	32	34	39	28
4/5/2019 15:00	4.6	63.9	28.0	8.4	49.1	0	29	38	49	35
4/5/2019 16:00	6.1	77.5	11.8	9.6	48.1	0	28	31	46	28
4/5/2019 17:00	6.3	77.3	9.4	9.6	45.0	0	36	37	47	38
4/5/2019 18:00	3.2	90.6	17.8	6.6	46.0	0	80	87	91	85
4/5/2019 19:00	2.1	12.7	23.2	4.8	46.9	0	70	70	75	81
4/5/2019 20:00	2.3	47.6	36.1	6.6	46.1	0	75	84	86	79
4/5/2019 21:00	3.9	78.1	13.7	7.2	44.2	0	29	24	42	29
4/5/2019 22:00	2.6	101.0	13.3	4.8	44.7	0	41	35	34	33
4/5/2019 23:00	1.2	90.4	11.8	3.6	44.6	0	40	43	44	42
4/6/2019 0:00	2.0	108.8	22.9	5.4	44.1	0	56	43	44	38
4/6/2019 1:00	1.9	190.2	8.3	5.4	44.9	0	52	54	52	50
4/6/2019 2:00	0.9	186.1	7.8	3.0	45.1	0	52	53	50	59
4/6/2019 3:00	0.5	207.9	7.3	2.4	45.0	0	48	57	53	52
4/6/2019 4:00	0.6	251.9	3.3	3.6	44.9	0	49	47	47	45
4/6/2019 5:00	1.0	115.5	4.1	3.6	43.5	0	46	54	49	51
4/6/2019 6:00	0.7	82.2	6.6	3.0	43.2	0	45	59	48	53
4/6/2019 7:00	0.8	293.3	7.0	2.4	44.7	0	52	55	53	69
4/6/2019 8:00	1.3	110.7	13.5	4.2	49.9	0	67	70	83	80

4/6/2019 9:00	2.9	109.9	34.8	6.6	54.0	0	56	55	58	66
4/6/2019 10:00	5.1	77.5	11.4	7.8	53.7	0	49	55	68	51
4/6/2019 11:00	4.6	71.8	19.4	8.4	55.2	0	45	46	51	50
4/6/2019 12:00	5.3	61.4	27.0	12.5	54.5	0	40	42	49	43
4/6/2019 13:00	5.6	66.1	22.1	11.4	54.4	0	35	41	52	37
4/6/2019 14:00	7.5	75.0	13.5	12.0	53.5	0	32	36	53	33
4/6/2019 15:00	9.5	75.0	11.5	14.9	54.1	0	24	29	48	23
4/6/2019 16:00	8.1	72.5	13.8	13.1	52.5	0	18	20	45	22
4/6/2019 17:00	8.1	73.9	12.0	14.3	51.6	0	25	25	39	20
4/6/2019 18:00	5.1	78.2	12.1	9.0	52.9	0	40	49	58	57
4/6/2019 19:00	3.1	91.4	8.9	6.6	52.5	0	55	74	98	81
4/6/2019 20:00	1.7	68.3	19.6	4.8	52.3	0	AN	49	40	58
4/6/2019 21:00	4.7	130.4	18.0	10.2	59.1	0	45	30	29	33
4/6/2019 22:00	5.6	149.2	17.6	13.7	60.3	0	46	15	14	10
4/6/2019 23:00	4.1	130.9	19.2	7.8	58.9	0	77	14	14	10
4/7/2019 0:00	5.2	146.7	17.4	10.2	58.0	0	101	21	22	17
4/7/2019 1:00	4.8	156.3	14.8	10.8	56.9	0	42	15	19	21
4/7/2019 2:00	4.0	154.8	14.5	8.4	56.0	0	28	17	13	13
4/7/2019 3:00	4.6	134.6	15.9	9.0	55.6	0	32	17	16	18
4/7/2019 4:00	6.3	128.5	15.8	12.0	54.4	0	50	16	17	13
4/7/2019 5:00	5.9	150.4	15.3	12.0	54.6	0	AN	17	17	14
4/7/2019 6:00	6.0	147.0	14.3	11.4	54.4	0	55	17	18	13
4/7/2019 7:00	6.0	152.9	13.7	10.8	54.7	0	49	21	15	18
4/7/2019 8:00	6.0	150.2	13.7	11.4	56.5	0	51	10	13	12
4/7/2019 9:00	4.1	159.0	17.3	9.0	57.6	0	40	12	14	12
4/7/2019 10:00	4.9	182.6	23.4	12.0	59.4	0	44	13	20	15
4/7/2019 11:00	6.3	188.4	23.6	13.1	63.4	0	68	11	9	10
4/7/2019 12:00	7.0	178.6	23.3	13.1	67.3	0	50	8	11	6
4/7/2019 13:00	6.5	175.9	25.5	13.7	68.4	0	44	9	8	6
4/7/2019 14:00	7.0	203.4	29.6	17.3	69.2	0	56	18	9	13
4/7/2019 15:00	8.5	214.2	24.5	19.7	68.1	0	71	12	7	12
4/7/2019 16:00	8.4	206.6	27.3	19.7	68.7	0	47	15	14	9
4/7/2019 17:00	7.9	204.0	27.8	17.9	69.5	0	37	11	8	9
4/7/2019 18:00	7.7	215.5	32.2	22.7	68.4	0	27	9	10	6

4/7/2019 19:00	8.1	250.2	18.9	18.5	66.3	0	15	8	9	8
4/7/2019 20:00	10.7	273.6	14.5	22.1	65.6	0	8	11	10	7
4/7/2019 21:00	9.8	279.9	14.2	22.1	63.1	0	5	8	6	4
4/7/2019 22:00	6.3	276.2	13.7	13.1	61.5	0	1	5	11	1
4/7/2019 23:00	3.5	244.0	13.8	8.4	60.0	0	10	6	8	1
4/8/2019 0:00	2.0	226.5	18.6	6.6	59.2	0	23	12	9	9
4/8/2019 1:00	1.5	222.1	19.2	4.2	58.3	0	38	9	10	9
4/8/2019 2:00	2.0	238.2	9.5	4.8	57.3	0	AN	31	14	8
4/8/2019 3:00	2.4	237.2	13.9	6.6	56.9	0	19	8	9	9
4/8/2019 4:00	2.1	247.0	12.6	4.2	56.3	0	AN	16	21	20
4/8/2019 5:00	2.9	263.3	6.8	5.4	55.5	0	16	15	19	12
4/8/2019 6:00	3.0	282.0	6.4	4.8	54.6	0	AN	22	16	17
4/8/2019 7:00	2.9	274.7	12.5	6.0	55.7	0	32	40	31	32
4/8/2019 8:00	4.3	309.5	18.4	8.4	58.5	0	24	34	23	22
4/8/2019 9:00	3.8	302.3	18.5	9.0	60.6	0	25	25	24	19
4/8/2019 10:00	4.4	13.0	40.2	9.0	62.6	0	29	31	25	25
4/8/2019 11:00	6.4	81.1	14.3	10.2	60.7	0	29	21	24	22
4/8/2019 12:00	6.9	80.5	13.6	10.8	61.0	0	AV	25	28	31
4/8/2019 13:00	7.8	80.1	13.4	12.5	61.5	0	29	27	45	50
4/8/2019 14:00	7.6	80.8	15.9	12.0	64.3	0	18	60	57	100
4/8/2019 15:00	7.6	77.3	12.6	11.4	65.3	0	69	90	86	139
4/8/2019 16:00	5.4	81.7	14.2	9.6	67.5	0	79	98	107	100
4/8/2019 17:00	4.4	82.0	30.7	9.0	68.3	0	77	101	92	95
4/8/2019 18:00	5.7	234.1	32.2	15.5	72.6	0	90	19	18	21
4/8/2019 19:00	4.6	225.5	30.0	13.7	69.1	0	98	16	17	13
4/8/2019 20:00	4.0	221.9	33.1	10.8	66.6	0	203	15	19	16
4/8/2019 21:00	4.8	223.5	33.0	14.9	65.9	0	158	17	15	11
4/8/2019 22:00	6.4	233.6	28.9	15.5	65.9	0	109	14	14	11
4/8/2019 23:00	7.6	253.0	17.4	16.1	64.3	0	48	16	13	21
4/9/2019 0:00	7.9	295.2	16.3	15.5	64.2	0	17	35	17	13
4/9/2019 1:00	8.6	341.6	29.7	20.9	60.7	0	46	74	109	139
4/9/2019 2:00	6.3	346.4	31.1	16.7	55.7	0	6	8	8	21
4/9/2019 3:00	2.3	56.3	42.3	7.2	51.4	0	5	7	9	8
4/9/2019 4:00	1.8	320.2	29.5	6.0	49.2	0	5	9	82	11

4/9/2019 5:00	1.1	241.4	7.4	2.4	48.3	0	36	72	34	80
4/9/2019 6:00	1.7	290.3	9.3	3.6	49.3	0	65	61	49	75
4/9/2019 7:00	3.6	308.1	17.0	8.4	53.2	0	154	149	61	61
4/9/2019 8:00	4.9	339.9	38.3	10.2	55.9	0	17	38	44	37
4/9/2019 9:00	4.6	58.5	49.2	10.8	57.2	0	8	20	17	17
4/9/2019 10:00	4.7	62.0	37.9	9.6	57.9	0	12	25	26	10
4/9/2019 11:00	5.9	71.0	22.5	10.8	57.4	0	6	14	27	10
4/9/2019 12:00	7.4	75.3	17.6	13.1	57.1	0	0	12	25	29
4/9/2019 13:00	8.6	70.3	14.8	14.9	56.5	0	0	11	42	35
4/9/2019 14:00	7.0	78.6	18.0	11.4	59.1	0	8	30	28	50
4/9/2019 15:00	5.0	73.6	25.3	11.4	62.6	0	13	17	24	36
4/9/2019 16:00	10.4	302.8	19.7	25.7	65.7	0	22	55	21	16
4/9/2019 17:00	10.7	302.7	19.1	22.7	66.2	0	24	116	11	12
4/9/2019 18:00	9.1	300.3	16.7	18.5	64.7	0	9	35	15	11
4/9/2019 19:00	8.4	290.9	13.1	16.1	63.0	0	7	17	8	6
4/9/2019 20:00	7.0	284.5	11.7	13.1	61.6	0	6	7	12	6
4/9/2019 21:00	7.3	315.9	31.3	23.9	55.8	0	68	95	198	135
4/9/2019 22:00	6.9	353.5	48.0	20.3	43.4	0	18	23	46	43
4/9/2019 23:00	6.1	354.8	52.7	19.1	42.3	0	3	7	7	14
4/10/2019 0:00	5.0	11.2	64.7	16.7	41.6	0	1	6	4	10
4/10/2019 1:00	5.4	359.0	52.9	16.7	40.2	0	2	4	6	7
4/10/2019 2:00	5.2	359.6	51.0	16.1	38.5	0	2	2	3	5
4/10/2019 3:00	4.7	359.2	57.7	15.5	37.5	0	3	1	1	4
4/10/2019 4:00	4.0	6.7	67.8	13.7	36.8	0	1	0	4	3
4/10/2019 5:00	4.6	21.3	73.1	17.3	36.3	0	6	0	15	10
4/10/2019 6:00	4.8	38.5	70.5	12.5	36.3	0	5	4	7	14
4/10/2019 7:00	4.4	46.8	71.6	12.0	36.7	0	11	6	13	15
4/10/2019 8:00	4.5	54.8	53.0	13.1	37.4	0	9	5	15	13
4/10/2019 9:00	6.4	54.6	32.6	15.5	37.7	0	4	2	12	12
4/10/2019 10:00	5.6	54.4	43.8	14.3	38.4	0	0	1	8	11
4/10/2019 11:00	6.3	54.3	41.2	17.3	38.8	0	0	4	13	8
4/10/2019 12:00	8.0	53.6	34.8	19.1	37.8	0.01	10	9	19	6
4/10/2019 13:00	4.1	53.6	58.5	13.7	37.8	0.05	7	8	6	4
4/10/2019 14:00	7.2	49.4	39.1	21.5	39.0	0	6	6	11	2

4/10/2019 15:00	8.5	53.6	34.2	19.1	39.6	0	4	1	12	2
4/10/2019 16:00	9.1	51.2	32.4	22.1	39.9	0.03	3	0	30	3
4/10/2019 17:00	10.4	55.7	27.4	23.3	41.0	0	5	1	15	3
4/10/2019 18:00	12.2	66.0	21.6	23.9	40.4	0	9	2	15	6
4/10/2019 19:00	11.0	65.6	19.7	21.5	40.5	0	7	5	10	5
4/10/2019 20:00	12.3	65.9	22.4	25.7	40.4	0	3	8	8	3
4/10/2019 21:00	13.4	68.2	19.1	23.9	40.3	0	0	12	24	6
4/10/2019 22:00	12.3	65.9	21.4	23.9	40.0	0	1	9	9	4
4/10/2019 23:00	11.4	62.6	25.0	25.1	39.8	0	4	5	11	2
4/11/2019 0:00	13.1	67.5	19.4	27.4	39.6	0	5	4	16	4
4/11/2019 1:00	12.6	74.1	14.7	21.5	40.5	0	6	5	12	9
4/11/2019 2:00	13.4	77.9	13.8	25.1	40.7	0	8	5	19	7
4/11/2019 3:00	16.7	85.7	10.6	27.4	40.1	0	18	9	7	12
4/11/2019 4:00	13.8	83.3	13.2	25.7	40.1	0	10	18	22	17
4/11/2019 5:00	11.6	75.4	16.0	21.5	39.9	0	7	5	23	8
4/11/2019 6:00	12.6	73.5	15.8	23.9	39.7	0	7	5	21	20
4/11/2019 7:00	13.8	81.2	14.1	23.9	40.0	0	12	16	27	157
4/11/2019 8:00	14.6	84.1	11.7	24.5	41.2	0	12	26	35	118
4/11/2019 9:00	13.9	81.4	14.6	25.1	43.5	0	25	31	37	132
4/11/2019 10:00	10.2	73.0	16.1	17.9	46.1	0	18	23	46	51
4/11/2019 11:00	8.4	69.5	19.6	17.3	47.8	0	14	16	34	15
4/11/2019 12:00	8.4	68.9	17.1	16.1	49.2	0	15	17	39	16
4/11/2019 13:00	11.0	72.4	15.4	18.5	51.1	0	17	17	42	43
4/11/2019 14:00	9.3	70.4	14.6	17.3	55.5	0	29	36	47	76
4/11/2019 15:00	11.8	109.1	14.2	20.9	63.2	0	114	194	83	88
4/11/2019 16:00	7.0	88.1	23.4	17.9	62.8	0	63	63	59	49
4/11/2019 17:00	8.5	135.8	22.9	16.7	65.6	0	69	49	39	39
4/11/2019 18:00	7.2	129.9	25.1	16.1	64.5	0	35	35	24	24
4/11/2019 19:00	7.4	126.4	20.6	15.5	63.3	0	28	32	26	18
4/11/2019 20:00	10.6	124.0	18.8	19.7	61.5	0	69	47	22	24
4/11/2019 21:00	11.8	150.0	19.5	26.2	61.4	0	99	51	41	52
4/11/2019 22:00	5.1	242.4	24.0	14.9	61.2	0	26	32	17	25
4/11/2019 23:00	3.7	340.2	17.1	14.3	56.6	0.1	25	27	20	24
4/12/2019 0:00	3.9	240.2	13.2	14.9	56.9	0.07	28	25	23	17

4/12/2019 1:00	2.6	264.6	16.7	7.8	55.1	0.07	26	21	18	14
4/12/2019 2:00	4.1	221.1	23.9	11.4	53.5	0.05	103	15	12	13
4/12/2019 3:00	5.6	190.3	24.7	15.5	51.6	0.02	78	9	9	7
4/12/2019 4:00	6.4	246.8	25.1	16.7	49.0	0.02	23	7	13	10
4/12/2019 5:00	6.3	235.2	27.2	17.9	46.9	0	32	13	18	13
4/12/2019 6:00	7.9	239.5	26.6	20.3	45.3	0	28	13	14	9
4/12/2019 7:00	7.7	228.2	37.3	19.7	44.2	0	106	24	12	14
4/12/2019 8:00	9.3	230.0	28.8	26.8	44.0	0	67	14	11	11
4/12/2019 9:00	13.3	244.3	23.1	32.2	45.5	0	37	16	11	16
4/12/2019 10:00	11.4	235.5	31.6	26.8	47.2	0	40	29	18	20
4/12/2019 11:00	11.8	220.6	30.5	28.0	48.3	0	87	38	19	15
4/12/2019 12:00	12.4	226.9	36.4	32.2	49.3	0	118	76	31	19
4/12/2019 13:00	13.2	231.6	33.3	32.8	50.5	0	138	65	29	33
4/12/2019 14:00	13.7	235.6	35.2	34.6	51.9	0	119	40	27	27
4/12/2019 15:00	15.0	241.3	25.4	38.8	52.1	0	126	54	29	40
4/12/2019 16:00	12.2	236.8	30.2	31.6	52.2	0	80	29	23	22
4/12/2019 17:00	13.3	246.7	26.8	29.8	52.0	0	131	26	24	18
4/12/2019 18:00	11.9	248.5	22.8	27.4	51.2	0	34	14	17	13
4/12/2019 19:00	10.5	252.5	19.7	23.9	49.4	0	13	8	13	9
4/12/2019 20:00	7.2	251.1	18.7	17.9	48.0	0	19	13	14	12
4/12/2019 21:00	9.4	267.2	15.7	18.5	46.7	0	5	12	12	13
4/12/2019 22:00	7.1	265.0	16.4	15.5	44.4	0	8	8	13	10
4/12/2019 23:00	9.1	273.5	14.8	18.5	42.8	0	10	8	10	7
4/13/2019 0:00	7.4	272.7	14.1	14.3	40.9	0	8	14	16	7
4/13/2019 1:00	7.2	260.6	17.2	14.9	39.9	0	11	11	9	6
4/13/2019 2:00	7.6	258.4	17.6	15.5	39.6	0	22	9	9	7
4/13/2019 3:00	5.4	245.6	20.0	11.4	38.5	0	20	9	15	7
4/13/2019 4:00	5.5	245.7	23.7	13.1	38.4	0	26	11	10	8
4/13/2019 5:00	3.2	230.8	25.1	9.0	37.4	0	27	9	10	8
4/13/2019 6:00	2.9	221.8	28.3	9.6	36.6	0	77	15	17	12
4/13/2019 7:00	6.2	244.1	24.8	19.7	39.1	0	37	9	9	8
4/13/2019 8:00	10.2	262.7	16.2	19.7	41.1	0	33	8	6	3
4/13/2019 9:00	9.8	254.2	21.5	19.7	42.5	0	39	4	3	5
4/13/2019 10:00	10.5	257.4	19.6	22.1	43.5	0	23	3	11	6

4/13/2019 11:00	10.4	258.6	21.7	20.9	45.2	0	27	6	6	4
4/13/2019 12:00	11.7	269.2	18.9	22.1	47.4	0	25	10	9	7
4/13/2019 13:00	10.4	262.8	19.7	23.3	49.2	0	23	8	8	9
4/13/2019 14:00	10.1	270.1	23.2	20.9	50.5	0	14	10	5	5
4/13/2019 15:00	9.4	270.3	18.5	19.1	51.9	0	8	14	3	1
4/13/2019 16:00	7.9	279.6	17.5	14.3	52.4	0	6	11	6	1
4/13/2019 17:00	8.1	300.3	17.4	16.1	52.7	0	6	33	6	1
4/13/2019 18:00	7.1	39.6	32.7	14.9	48.8	0	5	10	25	6
4/13/2019 19:00	6.8	65.7	23.4	15.5	44.5	0	3	7	38	4
4/13/2019 20:00	7.1	64.9	22.5	14.9	43.5	0	5	3	13	4
4/13/2019 21:00	7.1	71.4	19.7	14.3	42.9	0	4	1	24	3
4/13/2019 22:00	6.3	64.8	23.7	12.5	42.6	0	2	2	24	4
4/13/2019 23:00	5.3	52.4	44.4	13.7	42.0	0	3	4	14	8
4/14/2019 0:00	5.4	52.9	48.0	15.5	41.4	0	2	3	17	12
4/14/2019 1:00	4.4	50.0	65.0	14.3	40.2	0	6	6	13	9
4/14/2019 2:00	4.0	57.5	61.6	11.4	40.0	0	4	5	8	7
4/14/2019 3:00	5.8	49.8	57.0	16.7	39.3	0	0	3	19	8
4/14/2019 4:00	10.9	55.3	29.9	29.2	37.8	0.03	5	6	31	7
4/14/2019 5:00	10.5	55.8	28.2	22.1	35.3	0.06	5	5	38	5
4/14/2019 6:00	11.3	53.1	28.8	23.9	35.6	0.07	6	4	16	3
4/14/2019 7:00	12.8	59.0	26.8	31.6	36.2	0	5	2	76	4
4/14/2019 8:00	6.4	54.2	80.6	19.7	35.3	0.07	4	4	17	4
4/14/2019 9:00	5.3	343.5	62.3	17.3	34.0	0.06	2	2	4	11
4/14/2019 10:00	6.0	355.7	63.0	17.3	33.6	0.06	1	0	4	7
4/14/2019 11:00	6.5	352.7	65.0	19.7	33.6	0.08	0	2	3	7
4/14/2019 12:00	5.6	343.5	60.4	20.3	33.1	0.04	0	1	2	8
4/14/2019 13:00	6.1	11.4	80.0	22.7	33.4	0.08	0	-1	0	3
4/14/2019 14:00	7.1	8.9	83.7	28.0	34.4	0.15	-1	0	0	-1
4/14/2019 15:00	6.9	340.3	55.2	20.3	35.0	0.11	1	-2	3	5
4/14/2019 16:00	7.3	345.2	44.3	22.1	34.3	0.09	1	-2	2	6
4/14/2019 17:00	8.6	342.3	35.1	20.9	34.3	0.05	0	0	0	18
4/14/2019 18:00	11.3	340.3	23.2	20.9	34.5	0.04	-1	-1	2	25
4/14/2019 19:00	11.1	338.9	20.4	21.5	34.2	0.03	3	1	6	3
4/14/2019 20:00	7.1	322.8	20.1	17.3	33.3	0.02	3	41	6	3

4/14/2019 21:00	6.8	306.0	17.8	13.7	32.6	0.01	3	22	9	3
4/14/2019 22:00	6.6	309.4	17.3	13.1	32.6	0	5	28	6	4
4/14/2019 23:00	6.0	314.7	19.0	12.5	32.9	0.01	5	52	6	4
4/15/2019 0:00	6.8	329.2	22.3	16.7	33.3	0.01	5	39	7	5
4/15/2019 1:00	9.7	340.1	17.8	20.9	35.2	0.03	3	1	4	3
4/15/2019 2:00	6.9	315.1	17.9	15.5	34.6	0.02	6	8	6	0
4/15/2019 3:00	6.2	299.2	12.1	12.0	34.1	0	6	17	6	2
4/15/2019 4:00	6.1	280.7	10.7	11.4	33.3	0	5	4	5	5
4/15/2019 5:00	4.8	281.6	10.9	10.2	32.7	0	4	3	4	3
4/15/2019 6:00	4.0	272.9	11.3	9.6	32.9	0	4	4	5	2
4/15/2019 7:00	5.6	281.5	12.0	10.2	35.1	0.01	6	6	5	2
4/15/2019 8:00	5.5	289.0	15.1	9.0	38.0	0.04	5	7	6	1
4/15/2019 9:00	5.8	267.9	18.9	10.8	41.1	0	5	9	6	10
4/15/2019 10:00	5.5	251.9	20.8	12.5	43.8	0	8	11	5	8
4/15/2019 11:00	7.6	270.2	21.1	13.1	45.6	0	11	13	AV	13
4/15/2019 12:00	8.1	265.4	18.5	14.3	47.7	0	11	14	AV	10
4/15/2019 13:00	7.0	253.4	31.2	13.1	49.0	0	25	8	AV	14
4/15/2019 14:00	6.3	259.5	23.0	12.0	50.4	0	16	7	AV	11
4/15/2019 15:00	6.1	235.5	27.6	12.0	52.1	0	23	6	AV	9
4/15/2019 16:00	6.7	227.3	30.5	16.1	53.2	0	52	8	AV	6
4/15/2019 17:00	6.1	207.3	25.3	14.3	52.7	0	78	6	AV	5
4/15/2019 18:00	4.9	186.9	24.0	10.8	52.5	0	61	6	AV	6
4/15/2019 19:00	5.7	167.9	21.8	14.3	52.4	0	26	5	AV	4
4/15/2019 20:00	5.7	167.5	23.4	12.0	51.8	0	25	4	AV	5
4/15/2019 21:00	6.3	179.4	25.4	15.5	51.0	0	38	4	AV	5
4/15/2019 22:00	5.3	176.4	23.1	13.7	50.3	0	79	2	AV	5
4/15/2019 23:00	5.4	175.9	22.9	14.9	49.6	0	31	2	AV	4
4/16/2019 0:00	5.1	172.5	23.3	12.5	49.0	0	35	4	AV	6
4/16/2019 1:00	6.9	177.1	26.2	19.7	49.3	0	61	3	AV	6
4/16/2019 2:00	8.1	175.4	26.5	22.1	50.0	0	70	9	AV	16
4/16/2019 3:00	7.9	181.8	23.6	17.9	50.1	0	59	9	AV	12
4/16/2019 4:00	7.6	187.1	24.4	19.1	50.7	0	21	10	AV	7
4/16/2019 5:00	8.2	191.8	23.9	19.7	51.6	0	50	12	AV	9
4/16/2019 6:00	7.6	193.6	21.8	17.9	51.2	0	83	26	AV	29

4/16/2019 7:00	7.6	198.2	21.7	20.3	51.5	0	77	57	AV	19
4/16/2019 8:00	7.1	206.5	28.0	17.9	54.6	0	58	23	AV	24
4/16/2019 9:00	7.5	232.6	30.9	19.1	58.4	0	52	23	AV	22
4/16/2019 10:00	7.6	228.7	30.2	17.3	62.1	0	55	28	AV	25
4/16/2019 11:00	7.5	228.3	31.8	16.1	65.2	0	43	26	AV	24
4/16/2019 12:00	6.5	231.5	32.7	13.7	69.0	0	27	27	AV	20
4/16/2019 13:00	6.3	247.9	23.8	14.9	71.6	0	31	19	AV	19
4/16/2019 14:00	6.2	241.3	33.2	13.1	73.2	0	36	20	AV	22
4/16/2019 15:00	6.3	239.0	24.8	14.3	74.1	0	46	18	AV	15
4/16/2019 16:00	5.7	222.9	38.3	13.1	74.8	0	94	16	AV	17
4/16/2019 17:00	5.2	57.6	34.4	13.1	59.3	0	23	30	AV	44
4/16/2019 18:00	4.4	46.7	56.3	11.4	55.5	0	28	30	AV	34
4/16/2019 19:00	3.8	48.0	56.5	11.4	51.0	0	21	22	AV	29
4/16/2019 20:00	4.0	48.5	53.7	10.2	47.6	0	33	14	AV	41
4/16/2019 21:00	3.8	56.7	30.8	7.8	45.8	0	38	12	AV	33
4/16/2019 22:00	3.1	53.8	38.6	7.2	45.6	0	65	9	AV	25
4/16/2019 23:00	2.9	13.7	53.1	9.6	45.2	0	43	16	AV	30
4/17/2019 0:00	2.7	57.9	62.0	7.8	45.4	0	39	12	AV	22
4/17/2019 1:00	3.1	58.0	48.0	8.4	45.4	0	40	14	AV	36
4/17/2019 2:00	2.9	60.3	29.6	7.2	44.9	0	47	14	AV	28
4/17/2019 3:00	2.6	49.8	32.5	6.0	44.8	0	38	16	AV	21
4/17/2019 4:00	1.9	8.1	42.0	6.0	44.9	0	45	20	AV	41
4/17/2019 5:00	2.9	41.4	42.5	8.4	45.4	0	38	15	AV	47
4/17/2019 6:00	4.4	66.7	20.7	9.0	45.1	0	25	20	AV	25
4/17/2019 7:00	4.2	80.3	11.2	7.8	45.9	0	62	35	AV	31
4/17/2019 8:00	2.6	110.6	22.0	4.8	49.3	0	98	121	AV	202
4/17/2019 9:00	2.9	125.6	26.0	7.2	54.2	0	119	97	AV	103
4/17/2019 10:00	5.2	121.9	19.0	13.1	59.5	0	111	77	91	127
4/17/2019 11:00	7.8	155.1	21.5	15.5	64.0	0	96	47	36	46
4/17/2019 12:00	8.9	164.9	21.5	15.5	68.2	0	79	51	33	40
4/17/2019 13:00	8.9	175.4	23.7	19.1	71.6	0	99	59	33	62
4/17/2019 14:00	8.8	162.2	23.9	21.5	73.2	0	69	48	49	54
4/17/2019 15:00	10.2	168.3	21.9	21.5	75.1	0	118	74	70	89
4/17/2019 16:00	9.2	177.1	25.9	20.9	75.1	0	77	42	32	45

4/17/2019 17:00	8.9	176.2	25.1	21.5	74.5	0	58	32	38	36
4/17/2019 18:00	9.1	181.2	23.7	23.3	74.7	0	110	49	23	40
4/17/2019 19:00	8.0	184.2	25.0	21.5	73.7	0	82	26	22	21
4/17/2019 20:00	8.7	195.1	24.4	22.1	73.1	0	67	26	17	21
4/17/2019 21:00	10.4	196.3	24.1	29.2	71.5	0	98	40	22	27
4/17/2019 22:00	10.2	201.5	26.3	26.8	69.8	0	95	35	17	18
4/17/2019 23:00	9.2	206.1	24.6	23.3	67.4	0	59	18	17	16
4/18/2019 0:00	9.1	203.9	27.3	25.7	65.4	0	76	12	10	9
4/18/2019 1:00	7.6	211.4	30.9	23.9	64.4	0	61	10	13	11
4/18/2019 2:00	7.6	211.0	33.5	23.3	63.9	0	43	12	14	9
4/18/2019 3:00	7.9	231.1	32.0	19.1	63.9	0	33	14	12	12
4/18/2019 4:00	5.6	224.0	32.3	17.9	63.7	0.13	29	18	9	15
4/18/2019 5:00	4.5	224.1	34.3	12.5	61.8	0.07	21	7	11	4
4/18/2019 6:00	8.0	269.6	13.6	16.1	59.1	0	16	15	14	10
4/18/2019 7:00	6.0	270.3	17.4	16.1	55.6	0	8	15	13	10
4/18/2019 8:00	5.1	271.0	15.6	9.0	55.2	0	7	8	11	15
4/18/2019 9:00	4.9	281.9	10.6	9.0	54.1	0.04	7	11	12	10
4/18/2019 10:00	7.0	286.5	14.5	13.1	53.2	0.31	8	17	12	10
4/18/2019 11:00	5.7	286.5	15.7	10.8	52.8	0.08	7	13	10	10
4/18/2019 12:00	6.4	280.4	12.5	11.4	52.3	0.09	6	12	10	8
4/18/2019 13:00	5.4	304.1	33.2	13.7	50.6	0.06	8	7	11	6
4/18/2019 14:00	2.8	38.7	57.9	7.2	47.8	0.06	5	6	8	10
4/18/2019 15:00	4.1	343.7	24.5	9.0	46.9	0.02	2	6	8	12
4/18/2019 16:00	4.0	29.7	47.9	9.6	45.9	0.01	1	5	7	6
4/18/2019 17:00	3.7	60.4	47.9	10.2	43.4	0	-6	3	6	6
4/18/2019 18:00	4.4	57.2	30.5	9.6	42.2	0	-4	2	6	3
4/18/2019 19:00	4.2	60.2	31.3	9.6	41.8	0	1	0	20	-1
4/18/2019 20:00	3.2	9.4	42.5	11.4	42.0	0	1	3	4	-1
4/18/2019 21:00	3.9	347.4	42.3	10.8	43.0	0	2	3	4	0
4/18/2019 22:00	5.2	346.4	41.3	13.7	43.1	0	1	3	5	6
4/18/2019 23:00	5.2	347.5	41.8	13.1	42.5	0	1	1	4	20
4/19/2019 0:00	5.8	346.9	37.7	14.3	42.4	0	4	4	1	16
4/19/2019 1:00	8.2	343.8	29.3	22.1	42.6	0	4	4	-1	9
4/19/2019 2:00	7.1	351.7	51.0	22.7	41.9	0	3	3	1	44

4/19/2019 3:00	6.8	348.8	45.3	19.1	41.0	0	1	2	1	18
4/19/2019 4:00	9.6	344.3	38.5	23.9	40.8	0	-1	1	2	8
4/19/2019 5:00	8.8	346.0	38.0	24.5	40.4	0	1	3	4	6
4/19/2019 6:00	10.1	345.3	34.6	23.3	40.2	0	2	5	6	11
4/19/2019 7:00	9.7	346.2	40.1	24.5	40.2	0	3	3	6	14
4/19/2019 8:00	9.8	347.2	38.1	22.1	40.3	0	4	0	23	9
4/19/2019 9:00	8.8	347.4	38.1	27.4	41.0	0	3	1	8	9
4/19/2019 10:00	8.9	347.4	40.5	22.7	41.2	0	0	2	5	13
4/19/2019 11:00	11.3	344.6	29.8	27.4	41.9	0	0	3	5	14
4/19/2019 12:00	11.2	347.6	35.0	27.4	42.8	0	2	8	22	25
4/19/2019 13:00	9.8	349.8	41.3	25.1	43.0	0	6	8	11	10
4/19/2019 14:00	10.6	345.3	35.7	25.7	42.8	0	4	4	11	10
4/19/2019 15:00	9.6	347.8	43.0	24.5	43.5	0	4	3	11	22
4/19/2019 16:00	9.9	349.4	40.2	28.6	44.4	0	4	4	8	50
4/19/2019 17:00	10.1	345.9	38.8	29.2	43.8	0	5	4	6	17
4/19/2019 18:00	8.8	347.2	39.1	26.8	44.6	0	3	2	6	21
4/19/2019 19:00	9.2	345.6	38.2	22.7	43.7	0	4	5	8	14
4/19/2019 20:00	9.7	345.5	35.1	25.1	43.2	0	3	3	6	21
4/19/2019 21:00	8.1	347.4	39.3	20.3	43.7	0	1	1	3	14
4/19/2019 22:00	6.0	14.3	69.9	18.5	43.5	0	0	-1	2	7
4/19/2019 23:00	5.9	353.3	53.1	17.9	42.6	0	-1	0	3	7
4/20/2019 0:00	5.7	354.4	66.1	20.9	42.5	0	-1	0	7	6
4/20/2019 1:00	5.3	356.4	52.5	14.9	42.9	0	-2	1	6	10
4/20/2019 2:00	6.7	348.9	44.2	19.1	42.9	0	-1	2	4	38
4/20/2019 3:00	6.4	346.7	48.0	18.5	42.9	0	1	2	4	28
4/20/2019 4:00	7.7	348.5	38.1	25.7	42.5	0	0	8	2	42
4/20/2019 5:00	7.8	347.2	37.1	23.3	41.9	0	-2	5	1	30
4/20/2019 6:00	7.5	347.6	38.3	21.5	42.1	0	1	1	2	34
4/20/2019 7:00	7.6	348.2	43.6	19.7	43.0	0	4	2	1	65
4/20/2019 8:00	8.6	348.5	41.5	22.7	43.8	0	2	2	4	59
4/20/2019 9:00	9.0	346.6	37.1	22.1	44.9	0	2	6	8	45
4/20/2019 10:00	8.4	349.3	41.6	20.9	46.7	0	3	8	7	44
4/20/2019 11:00	10.2	345.0	33.0	25.1	47.6	0	1	11	8	35
4/20/2019 12:00	10.9	344.1	29.1	22.7	49.3	0	1	6	5	44

4/20/2019 13:00	13.1	342.4	22.5	26.2	53.5	0	4	10	15	47
4/20/2019 14:00	11.8	342.5	28.4	25.1	57.1	0	7	9	13	72
4/20/2019 15:00	6.4	347.2	41.5	16.1	59.0	0	6	3	7	23
4/20/2019 16:00	7.1	346.7	33.6	17.3	59.4	0	2	-2	3	24
4/20/2019 17:00	7.7	345.9	26.5	19.1	57.6	0	-2	-1	4	42
4/20/2019 18:00	5.6	348.9	31.6	14.3	55.6	0	-1	-1	7	32
4/20/2019 19:00	5.4	339.6	22.1	12.0	51.8	0	2	1	7	27
4/20/2019 20:00	4.3	340.0	18.8	7.2	50.2	0	2	2	10	19
4/20/2019 21:00	1.6	262.4	12.4	4.2	48.2	0	4	6	21	6
4/20/2019 22:00	1.4	194.6	35.6	4.8	46.8	0	28	6	8	4
4/20/2019 23:00	1.8	163.7	17.1	5.4	45.8	0	22	6	11	7
4/21/2019 0:00	1.1	182.2	8.2	4.8	45.2	0	7	7	9	6
4/21/2019 1:00	1.5	194.5	13.7	3.6	43.9	0	25	10	18	14
4/21/2019 2:00	1.3	200.8	12.3	3.0	43.7	0	30	12	15	16
4/21/2019 3:00	1.8	226.7	13.4	5.4	45.0	0	606	18	15	17
4/21/2019 4:00	1.5	215.1	10.8	4.2	45.4	0	59	19	22	19
4/21/2019 5:00	1.2	208.4	9.1	5.4	44.9	0	28	14	20	13
4/21/2019 6:00	1.5	202.7	12.5	4.8	46.5	0	28	12	13	11
4/21/2019 7:00	2.6	198.8	22.6	6.0	50.4	0	AV	9	8	10
4/21/2019 8:00	3.9	195.3	24.0	9.0	56.4	0	47	8	6	7
4/21/2019 9:00	4.3	192.9	30.5	9.0	62.5	0	26	9	9	10
4/21/2019 10:00	5.1	194.4	25.9	11.4	66.8	0	69	15	13	16
4/21/2019 11:00	5.3	212.1	30.5	11.4	70.6	0	79	19	19	11
4/21/2019 12:00	5.3	206.3	35.1	12.0	72.7	0	75	27	24	25
4/21/2019 13:00	5.5	197.2	31.3	10.8	74.0	0	86	24	21	17
4/21/2019 14:00	5.1	173.6	29.3	10.2	74.9	0	49	23	17	21
4/21/2019 15:00	7.1	170.2	24.0	16.7	76.0	0	56	13	14	17
4/21/2019 16:00	8.8	158.7	22.0	17.9	76.3	0	68	15	17	16
4/21/2019 17:00	8.4	177.3	22.5	16.1	76.8	0	60	17	11	10
4/21/2019 18:00	7.9	177.1	22.2	19.7	75.5	0	57	12	14	16
4/21/2019 19:00	6.0	175.9	22.8	14.9	72.6	0	44	12	14	13
4/21/2019 20:00	7.4	148.6	14.5	14.3	68.7	0	47	11	12	15
4/21/2019 21:00	6.1	151.9	16.6	12.5	66.2	0	50	12	11	14
4/21/2019 22:00	6.1	158.4	21.1	12.0	64.5	0	100	14	13	11

4/21/2019 23:00	5.5	155.6	17.3	12.5	62.4	0	120	12	9	10
4/22/2019 0:00	5.6	154.8	17.8	10.2	60.9	0	94	11	9	9
4/22/2019 1:00	5.7	153.9	19.0	10.8	59.1	0	52	9	10	6
4/22/2019 2:00	4.0	165.2	23.3	9.0	57.5	0	28	7	12	5
4/22/2019 3:00	3.4	156.9	20.1	8.4	56.3	0	58	7	12	5
4/22/2019 4:00	3.5	174.9	24.7	9.0	55.8	0	87	14	15	18
4/22/2019 5:00	4.3	176.1	22.7	10.2	55.8	0	69	15	22	14
4/22/2019 6:00	5.4	173.6	22.3	12.0	57.6	0	179	46	39	48
4/22/2019 7:00	7.1	171.9	22.5	14.9	60.9	0	195	71	37	40
4/22/2019 8:00	7.2	160.5	21.4	16.1	62.8	0	142	68	53	46
4/22/2019 9:00	8.0	175.3	22.6	19.1	67.3	0	91	59	30	40
4/22/2019 10:00	9.1	181.0	23.8	19.1	71.5	0	143	78	32	51
4/22/2019 11:00	8.9	178.6	25.0	22.1	73.6	0	148	92	38	74
4/22/2019 12:00	9.9	194.8	23.4	23.9	75.8	0	164	66	25	48
4/22/2019 13:00	10.3	181.2	27.4	24.5	77.9	0	221	114	58	88
4/22/2019 14:00	11.9	179.1	29.4	26.8	77.8	0	206	138	57	108
4/22/2019 15:00	9.3	180.4	26.3	23.3	77.9	0	96	69	31	72
4/22/2019 16:00	10.4	181.3	26.7	26.2	78.8	0	145	66	28	47
4/22/2019 17:00	9.9	191.5	24.1	24.5	77.2	0	147	60	18	21
4/22/2019 18:00	6.6	201.6	31.4	19.7	74.6	0	275	45	27	25
4/22/2019 19:00	4.5	192.7	17.6	13.1	68.7	0.23	129	45	33	39
4/22/2019 20:00	7.5	141.4	18.3	15.5	68.6	0.01	84	21	15	13
4/22/2019 21:00	5.2	165.9	23.8	12.0	69.0	0	42	14	19	14
4/22/2019 22:00	6.6	173.6	24.8	17.3	68.2	0.01	75	17	20	18
4/22/2019 23:00	9.5	192.3	22.4	26.8	68.9	0.01	92	14	17	11
4/23/2019 0:00	8.7	207.8	33.5	23.9	67.3	0	80	14	12	14
4/23/2019 1:00	6.6	226.6	36.4	16.7	65.8	0	90	10	14	14
4/23/2019 2:00	8.8	256.7	17.8	24.5	63.9	0	27	10	8	13
4/23/2019 3:00	10.7	264.8	18.0	22.7	61.5	0	19	18	14	12
4/23/2019 4:00	8.8	267.8	15.5	17.3	59.4	0	9	15	10	13
4/23/2019 5:00	8.1	333.5	57.0	19.7	54.0	0	6	23	14	12
4/23/2019 6:00	4.6	357.2	59.1	13.1	46.8	0	2	5	9	12
4/23/2019 7:00	3.8	359.6	65.5	12.0	47.1	0	2	8	8	11
4/23/2019 8:00	3.7	12.0	62.7	10.8	45.7	0	5	7	13	16

4/23/2019 9:00	4.1	358.6	53.9	9.6	46.6	0	5	4	10	14
4/23/2019 10:00	4.2	20.6	61.9	12.0	47.2	0	7	10	12	23
4/23/2019 11:00	4.3	39.3	51.0	14.3	49.8	0	8	10	9	29
4/23/2019 12:00	5.8	64.3	36.9	13.1	52.2	0	5	8	38	18
4/23/2019 13:00	7.1	64.3	28.0	15.5	52.2	0	4	6	54	6
4/23/2019 14:00	7.9	65.9	27.0	15.5	50.7	0	6	5	61	4
4/23/2019 15:00	7.8	75.8	17.4	13.1	50.6	0	5	5	36	6
4/23/2019 16:00	6.4	92.1	15.4	11.4	51.1	0	6	6	11	8
4/23/2019 17:00	6.1	84.6	10.3	9.0	52.7	0	39	40	41	38
4/23/2019 18:00	5.0	121.6	15.0	7.8	52.7	0	46	34	50	50
4/23/2019 19:00	4.1	131.6	18.5	8.4	52.5	0	28	14	32	40
4/23/2019 20:00	3.4	149.4	13.1	6.0	52.2	0	45	34	34	34
4/23/2019 21:00	2.1	172.6	13.2	5.4	51.4	0	42	15	20	9
4/23/2019 22:00	1.7	166.7	12.6	4.2	50.7	0	56	12	15	14
4/23/2019 23:00	1.3	175.5	6.3	4.2	50.1	0	14	13	14	10
4/24/2019 0:00	0.8	161.2	6.8	3.0	49.4	0	15	13	11	7
4/24/2019 1:00	1.3	135.5	11.6	3.0	48.5	0	14	11	23	6
4/24/2019 2:00	1.6	357.0	20.9	6.6	47.2	0	17	18	26	9
4/24/2019 3:00	4.7	80.8	8.4	7.8	48.1	0	21	16	28	16
4/24/2019 4:00	4.8	81.2	8.6	9.0	46.0	0	11	12	21	6
4/24/2019 5:00	5.6	80.1	10.3	10.8	44.7	0	6	6	15	3
4/24/2019 6:00	6.2	76.1	9.6	10.8	44.3	0	2	2	19	5
4/24/2019 7:00	5.5	77.8	11.0	9.0	45.9	0	3	10	18	65
4/24/2019 8:00	4.5	77.7	16.3	9.6	47.7	0	BA	29	39	57
4/24/2019 9:00	3.0	92.1	32.1	7.2	51.2	0	BA	53	BA	BA
4/24/2019 10:00	4.3	92.5	20.8	8.4	54.4	0	59	BA	78	BA
4/24/2019 11:00	4.7	81.2	17.5	8.4	53.2	0	61	62	71	61
4/24/2019 12:00	5.2	82.6	18.0	8.4	55.0	0	57	47	61	64
4/24/2019 13:00	5.1	73.9	20.5	9.6	57.9	0	47	47	57	53
4/24/2019 14:00	5.5	65.0	24.3	10.2	58.0	0	86	51	112	48
4/24/2019 15:00	5.2	72.2	22.7	9.6	58.7	0	27	15	59	21
4/24/2019 16:00	5.7	67.0	20.3	11.4	57.8	0	19	18	58	16
4/24/2019 17:00	5.2	77.7	19.7	9.6	55.8	0	12	9	58	14
4/24/2019 18:00	5.6	82.7	10.0	10.8	54.4	0	7	11	17	11

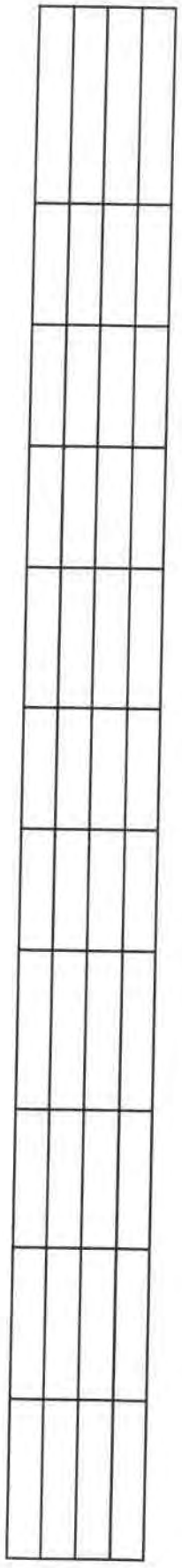
4/24/2019 19:00	3.7	114.2	13.7	7.2	54.6	0	34	31	31	34
4/24/2019 20:00	2.6	111.6	17.9	5.4	54.4	0	37	30	38	33
4/24/2019 21:00	3.5	97.3	12.1	6.6	52.9	0	54	62	61	54
4/24/2019 22:00	1.3	99.2	21.0	4.2	53.8	0	43	52	66	76
4/24/2019 23:00	0.9	309.2	8.9	3.6	53.9	0	63	61	60	48
4/25/2019 0:00	0.9	73.4	24.7	3.0	54.8	0	44	49	57	45
4/25/2019 1:00	2.6	80.1	16.9	5.4	54.7	0	36	39	39	32
4/25/2019 2:00	2.6	103.6	8.3	4.2	53.1	0	26	28	28	25
4/25/2019 3:00	1.8	64.8	27.0	4.2	51.7	0	27	31	33	36
4/25/2019 4:00	1.6	96.1	7.7	4.2	49.7	0	15	20	48	19
4/25/2019 5:00	0.1	329.8	4.2	1.6	49.0	0	26	35	58	39
4/25/2019 6:00	0.3	333.7	6.7	3.0	50.4	0	40	84	87	46
4/25/2019 7:00	1.3	108.4	13.4	4.2	54.9	0	61	90	116	122
4/25/2019 8:00	2.8	114.2	15.5	6.6	56.4	0	51	79	73	50
4/25/2019 9:00	4.1	115.7	19.5	8.4	58.1	0	42	43	54	69
4/25/2019 10:00	4.8	61.2	36.8	11.4	60.6	0	57	67	74	62
4/25/2019 11:00	5.6	59.7	28.1	10.8	59.9	0	54	64	84	65
4/25/2019 12:00	6.2	77.6	23.3	12.0	59.8	0	29	35	67	38
4/25/2019 13:00	5.9	57.4	31.4	11.4	59.6	0	26	27	73	41
4/25/2019 14:00	5.8	61.9	27.0	12.5	58.0	0	18	20	79	29
4/25/2019 15:00	6.8	68.9	19.9	13.1	55.9	0	16	14	60	13
4/25/2019 16:00	5.8	68.1	20.1	11.4	55.1	0	10	14	36	17
4/25/2019 17:00	5.8	87.5	9.7	9.6	54.1	0	10	9	17	11
4/25/2019 18:00	4.6	71.6	20.4	7.8	53.9	0	23	29	50	34
4/25/2019 19:00	3.9	66.7	21.0	7.8	51.9	0	7	12	17	9
4/25/2019 20:00	3.6	54.2	24.1	7.2	51.1	0	7	15	15	12
4/25/2019 21:00	5.7	344.6	22.5	13.1	50.8	0	19	22	32	52
4/25/2019 22:00	8.3	345.4	25.8	22.7	51.8	0	32	45	49	82
4/25/2019 23:00	13.2	343.1	28.6	28.6	51.1	0	25	37	57	72
4/26/2019 0:00	16.0	340.8	21.2	39.4	50.5	0.01	5	14	12	25
4/26/2019 1:00	16.9	340.6	18.9	31.6	50.7	0.03	4	9	10	17
4/26/2019 2:00	10.0	341.8	27.1	23.9	48.8	0.01	6	10	10	11
4/26/2019 3:00	10.8	334.3	19.8	22.1	49.7	0	6	6	8	21
4/26/2019 4:00	7.5	313.7	18.1	17.3	50.2	0	6	30	10	3

4/26/2019 5:00	7.1	296.7	11.5	13.1	49.9	0	6	23	12	8
4/26/2019 6:00	7.0	289.0	12.1	13.7	49.8	0	4	12	11	6
4/26/2019 7:00	10.5	304.7	17.8	22.7	51.5	0	17	63	12	12
4/26/2019 8:00	11.5	325.7	21.6	25.1	54.0	0	12	48	25	24
4/26/2019 9:00	11.8	327.2	23.1	25.1	56.3	0	21	43	32	37
4/26/2019 10:00	12.3	320.7	21.2	23.9	57.8	0	17	51	28	30
4/26/2019 11:00	9.8	327.7	25.2	23.3	59.6	0	18	35	39	43
4/26/2019 12:00	12.4	315.7	22.3	25.7	60.5	0	24	73	24	32
4/26/2019 13:00	12.7	311.7	20.6	25.7	61.5	0	25	88	22	25
4/26/2019 14:00	13.4	298.5	15.0	30.4	62.3	0	30	AN	19	16
4/26/2019 15:00	13.5	309.8	20.5	25.7	63.2	0	33	77	32	31
4/26/2019 16:00	13.1	312.5	20.9	28.0	63.4	0	19	82	25	18
4/26/2019 17:00	11.6	309.3	19.2	20.9	63.2	0	14	78	16	16
4/26/2019 18:00	11.1	309.3	15.5	21.5	62.1	0	15	55	13	12
4/26/2019 19:00	7.9	308.1	17.5	17.9	60.0	0	13	59	21	11
4/26/2019 20:00	5.6	296.0	14.6	12.0	58.1	0	23	38	12	11
4/26/2019 21:00	6.1	286.2	9.7	10.8	56.7	0	9	21	10	9
4/26/2019 22:00	6.2	290.8	10.4	10.8	55.4	0	6	23	8	6
4/26/2019 23:00	5.5	288.7	10.4	10.2	53.8	0	7	21	16	10
4/27/2019 0:00	4.5	299.1	14.8	9.0	52.3	0	14	33	11	10
4/27/2019 1:00	3.4	56.2	41.9	7.8	48.8	0	12	8	23	10
4/27/2019 2:00	3.0	74.7	62.1	9.6	46.1	0	4	3	12	4
4/27/2019 3:00	3.1	69.4	33.7	7.2	44.8	0	2	-1	18	2
4/27/2019 4:00	2.8	72.1	27.0	6.6	43.9	0	3	-1	24	2
4/27/2019 5:00	4.5	68.9	26.2	13.7	43.7	0	-1	2	27	0
4/27/2019 6:00	6.2	64.3	20.9	12.5	41.9	0	-1	6	22	-1
4/27/2019 7:00	7.8	73.5	15.7	12.5	41.3	0	0	4	21	27
4/27/2019 8:00	8.0	74.7	17.1	14.9	41.0	0	25	8	159	42
4/27/2019 9:00	7.7	76.0	14.5	12.5	40.9	0	3	8	84	101
4/27/2019 10:00	5.9	98.6	17.0	12.5	39.5	0.03	67	87	48	62
4/27/2019 11:00	5.0	91.1	12.8	9.6	34.9	0.06	5	63	38	43
4/27/2019 12:00	4.1	114.1	12.8	9.0	33.8	0.09	66	47	50	45
4/27/2019 13:00	8.6	72.3	13.4	17.9	35.4	0.11	8	7	27	17
4/27/2019 14:00	9.9	69.1	16.1	19.7	35.8	0.03	4	2	37	-1

4/27/2019 15:00	9.7	67.5	22.0	19.7	36.3	0.09	0	-2	27	
4/27/2019 16:00	11.2	67.1	19.0	26.2	36.7	0.08	1	-1	13	
4/27/2019 17:00	10.2	58.6	28.6	26.2	35.8	0.12	3	-1	14	
4/27/2019 18:00	5.8	66.2	82.5	20.3	34.8	0.07	1	0	9	
4/27/2019 19:00	6.2	54.2	81.5	20.9	34.1	0.04	0	-1	7	
4/27/2019 20:00	6.0	17.0	82.7	22.1	34.2	0.09	2	-1	7	
4/27/2019 21:00	5.7	356.1	72.1	21.5	34.9	0.07	2	0	6	
4/27/2019 22:00	5.1	328.4	85.3	17.3	35.8	0.06	0	-1	5	
4/27/2019 23:00	5.5	47.9	83.5	19.7	37.1	0.03	1	1	6	
4/28/2019 0:00	5.3	65.0	90.4	17.9	38.4	0.02	3	5	6	
4/28/2019 1:00	4.1	56.0	70.9	14.9	39.1	0	5	5	11	
4/28/2019 2:00	5.5	346.2	36.4	13.7	38.9	0	2	2	9	9
4/28/2019 3:00	5.9	340.7	29.1	14.3	38.5	0	0	3	7	10
4/28/2019 4:00	5.3	343.2	38.7	12.5	38.2	0	3	3	6	23
4/28/2019 5:00	5.6	340.9	36.1	14.9	38.1	0	2	2	6	19
4/28/2019 6:00	5.2	343.0	44.3	14.9	39.3	0	0	1	7	18
4/28/2019 7:00	5.3	52.6	60.3	16.1	41.1	0	0	-1	16	9
4/28/2019 8:00	7.1	57.2	29.7	14.9	41.7	0	-2	0	26	5
4/28/2019 9:00	6.9	63.4	33.4	14.9	42.6	0	0	3	27	2
4/28/2019 10:00	6.4	56.8	37.2	13.1	43.7	0	-1	0	24	3
4/28/2019 11:00	7.5	61.5	29.1	15.5	43.9	0	-1	1	15	4
4/28/2019 12:00	5.9	65.7	33.0	12.0	45.1	0	3	4	14	5
4/28/2019 13:00	5.8	71.4	27.7	11.4	45.6	0	3	2	286	42
4/28/2019 14:00	6.9	61.4	27.1	13.1	46.9	0	4	0	204	15
4/28/2019 15:00	5.5	8.1	44.7	13.7	48.0	0	2	-2	11	35
4/28/2019 16:00	4.8	44.4	48.5	11.4	49.3	0	1	0	11	4
4/28/2019 17:00	5.9	60.2	32.0	13.1	47.0	0	1	1	11	6
4/28/2019 18:00	6.4	59.1	26.5	13.7	44.1	0	0	4	40	3
4/28/2019 19:00	8.0	66.7	21.6	14.9	42.7	0	3	4	42	0
4/28/2019 20:00	8.8	75.2	13.8	16.1	42.9	0	5	4	27	3
4/28/2019 21:00	9.7	78.0	15.7	17.3	44.1	0	4	4	19	5
4/28/2019 22:00	5.8	78.4	15.1	12.5	45.0	0	2	4	14	7
4/28/2019 23:00	2.8	113.6	12.6	6.0	45.3	0	5	7	18	12
4/29/2019 0:00	5.2	144.7	17.1	12.0	47.1	0	20	13	13	10

4/29/2019 1:00	6.5	121.7	13.7	14.9	47.9	0	16	8	6	5
4/29/2019 2:00	9.1	122.7	17.0	19.7	48.7	0	24	4	7	3
4/29/2019 3:00	7.6	122.0	15.3	14.3	47.7	0.02	10	5	7	1
4/29/2019 4:00	9.0	116.6	12.6	16.7	45.9	0.05	14	6	8	2
4/29/2019 5:00	12.6	123.1	16.3	22.7	44.7	0.15	20	12	10	9
4/29/2019 6:00	9.9	143.3	21.2	22.7	43.9	0.14	28	29	15	18
4/29/2019 7:00	10.1	158.4	15.7	20.3	43.8	0.3	59	16	13	17
4/29/2019 8:00	7.7	152.6	22.6	17.3	43.8	0.15	37	30	19	24
4/29/2019 9:00	8.5	130.9	22.0	21.5	44.0	0.14	32	21	48	78
4/29/2019 10:00	9.4	140.0	22.0	21.5	43.7	0.17	31	20	59	87
4/29/2019 11:00	10.1	135.9	23.3	20.9	45.1	0.12	78	18	28	29
4/29/2019 12:00	9.0	132.0	24.3	23.3	45.1	0	9	8	37	38
4/29/2019 13:00	4.8	148.7	24.0	12.0	46.1	0	72	16	28	30
4/29/2019 14:00	4.2	158.3	20.4	9.0	48.4	0	81	14	14	19
4/29/2019 15:00	3.3	219.3	30.0	8.4	51.3	0	21	8	10	6
4/29/2019 16:00	4.6	261.4	19.1	8.4	52.4	0	12	6	12	11
4/29/2019 17:00	5.6	290.6	17.7	10.2	53.3	0	11	14	11	7
4/29/2019 18:00	5.5	288.5	14.8	9.6	52.9	0	8	10	9	5
4/29/2019 19:00	3.6	290.2	13.3	9.0	52.4	0	5	12	14	5
4/29/2019 20:00	3.6	269.8	13.9	7.8	52.0	0	9	16	11	9
4/29/2019 21:00	2.8	261.3	15.9	5.4	51.8	0	10	9	14	12
4/29/2019 22:00	3.0	289.4	14.9	6.0	51.7	0	8	12	17	10
4/29/2019 23:00	3.9	359.1	46.9	10.8	50.8	0	13	15	17	18
4/30/2019 0:00	4.6	74.9	18.1	8.4	46.1	0	12	11	41	61
4/30/2019 1:00	5.2	63.8	27.3	10.8	46.1	0	14	16	35	145
4/30/2019 2:00	4.7	76.8	17.2	9.0	44.9	0	8	13	21	24
4/30/2019 3:00	4.1	66.9	23.7	9.6	44.3	0	6	7	16	12
4/30/2019 4:00	5.2	70.1	30.0	11.4	44.1	0	5	2	17	7
4/30/2019 5:00	4.7	35.2	66.6	13.7	40.6	0.01	3	2	7	17
4/30/2019 6:00	4.5	6.2	30.2	12.0	39.4	0.06	2	1	5	3
4/30/2019 7:00	5.0	60.7	32.2	12.5	40.6	0	2	-1	18	3
4/30/2019 8:00	3.6	27.3	66.6	12.0	41.1	0.01	5	-2	13	2
4/30/2019 9:00	5.7	45.5	49.5	16.1	40.9	0.04	3	-2	17	3
4/30/2019 10:00	4.8	46.7	45.3	13.7	41.6	0.05	1	-1	17	4

4/30/2019 11:00	5.0	48.6	44.8	14.9	42.2	0.08	2	3	13	4
4/30/2019 12:00	5.5	51.0	36.9	12.5	43.6	0	3	4	17	5
4/30/2019 13:00	5.0	34.3	41.5	11.4	44.4	0	4	6	16	10
4/30/2019 14:00	6.6	33.8	41.0	21.5	44.3	0.07	11	7	20	12
4/30/2019 15:00	7.2	44.8	52.4	19.7	45.3	0.69	8	7	19	10
4/30/2019 16:00	12.9	81.3	13.3	23.9	47.2	0.06	9	6	15	11
4/30/2019 17:00	13.5	92.0	12.0	24.5	49.2	0	28	15	16	10
4/30/2019 18:00	10.8	96.5	12.6	19.7	49.6	0.01	14	8	14	10
4/30/2019 19:00	10.4	96.1	11.5	17.9	49.2	0	17	8	15	9
4/30/2019 20:00	6.5	80.2	19.0	12.5	49.0	0	23	12	50	12
4/30/2019 21:00	5.0	57.0	41.2	12.0	47.3	0.04	5	7	36	186
4/30/2019 22:00	4.9	59.1	38.7	12.5	46.2	0.01	4	3	21	44
4/30/2019 23:00	3.3	58.4	61.8	9.0	45.5	0.01	3	2	8	46
5/1/2019 0:00	5.8	63.8	24.6	12.5	45.1	0.16	1	2	24	12



EPA Qualifier Codes

https://aqs.epa.gov/aqsweb/documents/codetables/qualifiers.html

Qualifier Code	Qualifier Description
AN	Machine Malfunction.
AV	Power Outage.
BA	Maintenance. (Flow Check)