DOCKETED	
Docket Number:	23-SPPE-01
Project Title:	STACK SVY03A Data Center Campus
TN #:	254405
Document Title:	TACK SVY03A Supplemental Data Responses Set 1
Description:	N/A
Filer:	Scott Galati
Organization:	DayZenLLC
Submitter Role:	Applicant Representative
Submission Date:	2/12/2024 10:49:08 AM
Docketed Date:	2/12/2024

SUPPLEMENTAL RESPONSES TO CEC STAFF DATA REQUEST SET 1 (11,13,14, 19-23, 31, 32, AND 34-36)

STACK SVY03A Campus (23-SPPE-01)

SUBMITTED TO: CALIFORNIA ENERGY COMMISSION SUBMITTED BY: **STACK Infrastructure**

February 2024



INTRODUCTION

Attached are STACK Infrastructure's (STACK) Supplemental Responses to California Energy Commission (CEC) Staff Data Request Set No. 1 (11,13,14, 19-23, 31, 32, and 34-36) for the SVY03A Data Center Campus (SVY03A Campus) Application for Small Power Plant Exemption (SPPE) (23-SPPE-01). Staff issued Data Request Set No. 1 on November 29, 2023. STACK docketed responses to a majority of the data requests on December 15, 2023.

The Data Responses are grouped by individual discipline or topic area. Within each discipline area, the responses are presented in the same order as Staff presented them and are keyed to the Data Request numbers. Additional tables, figures, or documents submitted in response to a data request (e.g., supporting data, stand-alone documents such as plans, folding graphics, etc.) are found in Attachments at the end of the document and labeled with the Data Request Number for ease of reference.

For context, the text of the Background and Data Request precede each Data Response.

AIR QUALITY AND GREENHOUSE EMISSIONS

BACKGROUND: Additional Air Quality Analyses Schedule

On page 79 of the subject application, the applicant states that "refrigerant use was not provided at the time of this analysis and will be submitted under separate cover."

Additionally, on page 103 of the subject application, the applicant also states that "when provided by the BAAQMD, a cumulative air quality and public health risk assessment will be prepared and submitted under separate cover."

Staff would like a schedule from the applicant detailing when information on refrigerant emission information and the cumulative air quality and public health risk assessment should be expected by CEC staff.

11. Please provide a schedule detailing when the cumulative air quality and public health risk assessment would be provided to CEC staff.

SUPPLEMENTAL RESPONSE TO DATA REQUEST 11

In accordance with BAAQMD CEQA Guidelines, a project impact would be considered significant if the project would:

- Conflict with or obstruct implementation of the applicable air quality plan;
- Violate any air quality standard or contribute substantially to an existing or projected air quality violation;
- Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable federal or state ambient air quality standard (including releasing emissions which exceed quantitative thresholds for ozone precursors);
- Expose sensitive receptors to substantial pollutant concentrations; or
- Create objectionable odors affecting a substantial number of people

In April 2023, the BAAQMD updated the significance thresholds for agencies to use with environmental review of projects. These thresholds were designed to establish the level at which BAAQMD believed air pollutant emissions would cause significant impacts under CEQA.

A project would have a cumulative considerable impact if the aggregate total of all past, present, and foreseeable future sources within a 1,000-foot radius from the fence line of a source plus

the contribution from the project, exceeds the following recommended significance thresholds at a sensitive receptor in Table 1 below.

101					
Health Risks and Hazards for Sensitive Receptors (Cumulative from All Sources within 1,000- Foot Zone of Influence) and Cumulative Thresholds for New Sources					
Excess Cancer Risk 100 per 1 million					
Chronic Hazard Index	10.0				
Annual Average PM25	0.8 µg/m³				
PM2.5 = fine particulate matter or particulates with an aerodynamic diameter of $2.5\mu m$ or less.					
Source: BAAQMD, 2018.					

The project is located within a census tract identified by the California Communities Environmental Health Screening Tool (CalEnviroScreen), Version 4.0, as having an overall CalEnviroScreen score at or above the 70th percentile. Specifically, the project is located in Census Tract 6001437101 which has a CE4.0 rating of 74 percentile, which places the project in an overburdened community. These are designated communities that are overburdened by air pollution and other health disparities.

The Air District limits the excess lifetime cancer risk to 10 in one million as the maximum risk, meaning that a higher risk is deemed unacceptable on a project basis. Recent amendments to the BAAQMD Regulation 2-5 have limited the cancer risk to 6 in one million for designated overburdened communities. At this time, the BAAQMD has not proposed to change the CEQA cancer risk threshold to align with amendments made in Regulation 2-5.

Part 1 – Cumulative Assessment:

Cumulative stationary and mobile source impacts were assessed for the proposed project. As recommended by the BAAQMD (BAAQMD, 2023), in order to evaluate cumulative risks, permitted stationary sources of TACs near the project site were identified using BAAQMD's *Stationary Source Risk and Hazard Analysis Tool*. This mapping tool uses Google Earth to identify the location of stationary sources and their estimated screening level cancer risk and hazard impacts. This tool identified four sources within 1,000 feet of the project boundaries and are summarized in Table 2.

Source	Maximum Cancer Risk (per million)	Hazard Index	PM _{2.5} concentration (μg/m ³)
#8695 Trimac Transportation Inc	0.006	0	0.02
#10991 Freund Baking Company	0.009	0	4.707 (0.62)*
#23302 Arcus Biosciences	0.747 (0.098)*	0.001	0.001
#111545 Breakwater 76 (gas station)	16.224 (2.14)*	0.07	0.0
Combined Sources ¹	2.253	0.017	0.641
BAAQMD Threshold – Combined Sources	100	10.0	0.8

Table 2 Combined Source Listing

* The BAAQMD Distance Adjustment Multiplier Tool for Generic sources was used to adjust the Cancer Risk, HI and PM2.5 impacts at the MEIR which is greater than 1,000 feet from any background source. ¹The combined source level is an overestimate because the maximum impact from each source is assumed to occur at the same location

Cumulative health risk assessments look at all substantial sources of TACs located within 1,000 feet of a project site (i.e., influence area) that can affect sensitive receptors. These sources include rail lines, highways, busy surface streets, and stationary sources identified by BAAQMD.

A review of the project area using BAAQMD's geographic information systems (GIS) screening tools indicated that a portion of State Route 92 is within the 1,000-foot influence area could have cumulative health risk impacts at the Project MEIR (UTM 578,960m E, 4,164,700m N). Figure 1 shows the State Route 92 road segments affecting the MEIR within the influence area. Health risk impacts from State Route 92 upon the MEIR are reported in Table 1. Details of the cumulative screening and health risk calculations are included in *Attachment 1.*

An analysis of potential health impacts from vehicle traffic on State Route 92 was conducted. The analysis involved predicting emissions for the traffic volume and mix of vehicle types on the roadway near the project site and using an atmospheric dispersion model to predict exposure to TACs and PM_{2.5}. The associated cancer risks and PM_{2.5} are then computed based on the modeled exposures.

Emission Rates

This analysis involved the development of DPM, organic TACs, and PM_{2.5} emissions for traffic on the State Route 92 using the Caltrans version of the EMFAC2021 emissions model, known as CT-EMFAC2021. CT-EMFAC2021 provides emission factors for mobile source criteria pollutants and TACs, including DPM. Emission processes modeled include running exhaust for DPM, PM_{2.5}, total organic compounds (e.g., TOG), diesel exhaust organic gas (DEOG), running evaporative losses for TOG, tire and brake wear, and fugitive road dust for PM_{2.5}. All PM_{2.5} emissions from all vehicles were used, rather than just the PM_{2.5} fraction from diesel powered vehicles, because all vehicle types (i.e., gasoline and diesel powered) produce PM_{2.5}. Additionally, PM_{2.5} emissions from vehicle tire and brake wear and from re-entrained roadway dust were included. DPM emissions are projected to decrease in the future and are reflected in the CT-EMFAC2021 emissions data. Inputs to the model include region (i.e., Alameda Clara County), type of road (i.e., freeway), Caltrans estimated local truck mix on State Route 92 (7.0 percent) ¹, traffic mix assigned by CT-EMFAC2021 for the county, year of analysis (2026), and season (annual).

In order to estimate TAC and PM_{2.5} emissions over the 30-year exposure period used for calculating the increased cancer risks for sensitive receptors at the MEIR, the CT-EMFAC2021 model was used to develop vehicle emission factors for the year 2026. Emissions associated with vehicle travel depend on the year of analysis because emission control technology requirements are phased-in over time. Therefore, the earlier the year analyzed in the model, the higher the emission rates utilized by CT-EMFAC2021. Year 2026 emissions were conservatively assumed as being representative of future conditions over the time period that cancer risks are evaluated.

The traffic information reported by Caltrans for State Route 92 in 2021was increased 1 percent per year to an annual average 105,000 vehicles per day for 2026 and includes about 7.0 percent trucks, of which 3.9 percent are considered diesel heavy duty trucks and 3.1 percent are medium duty trucks.² Average hourly traffic distributions for Alameda County roadways in 2026 were developed using the EMFAC model,³ which were then applied to the average daily traffic (ADT) volumes to obtain estimated hourly traffic volumes and emissions for the roadway. For all hours

STACK SVY03A Supplemental Responses to Data Request Set 1

¹ Caltrans. 2022. 2021 Annual Average Daily Truck Traffic on the California State Highways. Web: <u>https://dot.ca.gov/programs/traffic-operations/census</u>

² Caltrans. 2022. 2021 Annual Average Daily Truck Traffic on the California State Highway System. Web: https://dot.ca.gov/programs/traffic-operations/census.

³ The Burden output from EMFAC2007, a previous version of CARB's EMFAC model, was used for this since the current web-based version of EMFAC2021 does not include Burden type output with hour-by-hour traffic volume information.

of the day, an average speed of 50 mph was assumed for all vehicles on State Route 92, 5 mph below the posted speed limit on the roadway to account for commute congestion and the amount of access in the area.

Dispersion Modeling

Dispersion modeling of TAC and PM_{2.5} emissions was conducted using the EPA AERMOD air quality dispersion model, which is recommended by the BAAQMD for this type of analysis.⁴ TAC and PM_{2.5} emissions from traffic on State Route 92 within 1,000 feet of the project site were evaluated. Vehicle traffic on the roadways was modeled using a series of volume sources along a line (line volume sources); with line segments used for opposing travel directions on the roadway. The same meteorological data and off-site MEIR location from the previous project impact dispersion modeling were used in the roadway modeling. Other inputs to the model included road geometry and elevations, hourly traffic emissions, and receptor location and height. Annual TAC and PM_{2.5} concentrations from traffic on the roadways were calculated using the model. Concentrations were calculated at the project MEIR with receptor heights of 1.5 meters (4.9 feet) to represent the breathing height at the MEIR receptor.

Computed Cancer and Non-Cancer Health Impacts

Maximum increased lifetime cancer risks and annual PM_{2.5} concentrations at the MEIR receptor was computed using modeled TAC and PM_{2.5} concentrations and BAAQMD methods and exposure parameters. The traffic-related cancer risk, PM_{2.5} concentration, and HI impacts on the project MEIR are 0.41 in one million with the maximum PM2.5 concentration at the MEIR would be 0.52 ug/m3. The Hazard Index would be less than 0.01. Details of the emission calculations, dispersion modeling, and cancer risk calculations for the MEIR receptor with the maximum cancer risk from State Route 92 traffic are provided in *Attachment 1*.

Summary of Cumulative Air Quality and Risk Impacts

The increased cancer risk calculations were based on guidance provided by the BAAQMD to analyze potential community health risk impacts from nearby sources of TAC emissions and applying the BAAQMD recommended age sensitivity factors to the TAC concentrations⁵. Age-sensitivity factors reflect the greater sensitivity of infants and small children to cancer causing TACs. The range of infant through adult exposures were assumed to occur at the MEIR.

As discussed above, the project site is affected by several sources of TACs. Table 3 shows the cancer and non-cancer risks associated with each source affecting the project site. The sum of impacts from combined sources (i.e., all sources within 1,000 feet of the project) would be below

⁴ BAAQMD. Recommended Methods for Screening and Modeling Local Risks and Hazards. May 2012 ⁵ BAAQMD, 2016. BAAQMD Air Toxics NSR Program Health Risk Assessment (HRA) Guidelines. December 2016.

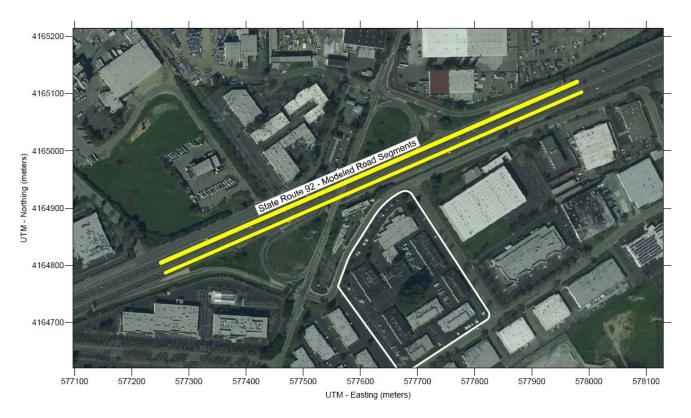
STACK SVY03A Supplemental Responses to Data Request Set 1

the BAAQMD air quality and health risk thresholds. Therefore, the impact from combined community risk would be considered less than significant.

Source	Maximum Cancer Risk (per million)	Hazard Index	PM2.5 concentration (µg/m ³)		
State Route 92, ADT 105,000	0.41	0.01	0.01		
Existing Background Sources.	2.253	0.017	0.641		
SVY03A Project	0.0523	0.000036	0.002		
Combined Sources ¹	2.715	0.027	0.653		
BAAQMD Threshold – Combined Sources	10.0	0.8			
Note: ¹ The combined source level is an overestimate because the maximum impact from each source is assumed to occur at the same location.					

Table 3. Impacts from Combined Sources at the MEIR

Figure 1. Project Site and Nearby TAC and PM_{2.5} Sources



BIOLOGICAL RESOURCES

BACKGROUND: Special Status Plants and Wildlife

Appendix B of the SPPE Application (TN 252251) contains a discussion of sources and databases that were consulted to assess potential project impacts on special status plant and wildlife species. However, the information provided is incomplete and does not conform with the CEC's requirements for an SPPE contained in section (g)(13)(B)(i) of 20 CCR Div. 2 Ch. 5 App. B.

DATA REQUEST

13. Provide detailed maps at a scale of 1:6,000 or color aerial photographs taken at a recommended scale of 1-inch equals 500 feet (1:6,000) with a 30 percent overlap (provided under confidential cover) and 1:350,000 (for public viewing) that show the proposed project site and related facilities, biological resources including, but not limited to, those found during project-related field surveys and in records from the CNDDB, and the associated areas where biological surveys were conducted. Label the biological resources and survey areas as well as the project facilities.

SUPPLEMENTAL RESPONSE TO DATA REQUEST 13

STACK retained WRA to prepare the requested maps. The first map is provided separately under separate cover and the second map is included in Attachment BIO DR-13 to these Supplemental Data Responses.

BACKGROUND: Nitrogen Deposition

Section 4.4.2.1 (Project Impacts) on pages 110-111 of the SPPE Application (TN 252249) notes, "To assess the potential effects of nitrogen deposition from the testing and maintenance of the backup generators, the applicant has commissioned a nitrogen deposition analysis on lands contained in the Eden Landing Ecological Reserve. Excessive nitrogen deposition on low- nitrogen habitats can potentially result in adverse impacts to the habitat. The analysis was not complete at the time of the filing of this SPPE Application and will be docketed under separate cover when available."

DATA REQUEST

14. Submit a completed assessment of nitrogen deposition from the project on low-nitrogen habitats in the vicinity. The assessment must comply with the CEC's requirements for an SPPE Application contained in section (g)(13)(B)(ii) of 20 CCR Div. 2 Ch. 5 App. B, as follows:

(ii) Provide an aerial map of the isopleth graphic depicting modeled nitrogen deposition rates. The geographical extent of the nitrogen deposition map(s) should include the entire plume and a radius of 6 (six) miles from the source, specifically identifying acres of sensitive habitat(s) within each isopleth (emphasis added). Modeling parameters and files shall be provided.

SUPPLEMENTAL RESPONSE TO DATA REQUEST 14

Air emissions from the project include nitrogen oxides (NO_x) , sulfur oxides (SO_x) , and particulates (PM10). Nitrogen oxide gases (NO, NO_2) convert to nitrate particulates in a form that is suitable for uptake by most plants. The effect of this nitrogen could be to promote plant growth that could potentially encourage nonnative plant species at the expense of native species.

To assess nitrogen deposition, AERMOD, which was used in the air quality permitting analysis to evaluate the project's air quality impacts, was also used in the deposition analysis. As described previously, AERMOD is a steady-state, mass-conserving, nonreactive (i.e., no chemistry) plume dispersion model. The ability of AERMOD to overestimate impacts was expanded by including several other assumptions with regards to nitrogen formation and deposition, in order to assess the potential for impacts from the SJC-04 project. These assumptions include:

- 100 percent conversion of oxides of nitrogen (NO_x) and ammonia (NH₃) into atmospherically derived nitrogen (ADN) within the engine stack(s) rather than allowing the conversion of NO_x and NH₃ to occur over distance and time within the atmosphere;
- Depositional rates and parameters were based upon nitric acid (HNO₃) which, of all the depositional species, has the most affinity for impacts to soils and vegetation and the most tendency to "stick" to what it is deposited upon;
- Maximum settling velocities to produce maximum deposition rates;
- Maximum potential emissions for the SJC-04 facility were used rather than actual emissions in the calculation of nitrogen deposition;
- And, once it leaves the engine stack, nitrogen immediately begins to deposit in the surrounding lands.

To produce conservative results (overestimates), modeling assumptions regarding the complex chemistry that occurs to produce nitrogen from NOx, ammonia, and other pollutants were not used in this modeling analysis. As one example, it was assumed that the pollutants leaving the stack(s) would already be in the form of depositional nitrogen (nitrate and ammonium ions). To do this, the emissions of NOx and ammonia were adjusted for the molecular weight of nitrogen and then summed for each individual source. Thus, all impacts would represent 100 percent conversion of combustion emissions into depositional nitrogen. This assumption leads to an exceedingly conservative estimation of nitrogen deposition, because areas with the highest nitrogen emissions do not necessarily experience the greatest deposition effects, which usually occur far from the original nitrogen source.

The AERMOD model calculates atmospheric deposition of nitrogen by calculating the wet and dry fluxes of total nitrogen. This deposition is accomplished by using a resistance model for the dry deposition part, and by assigning particle phase washout coefficients for the wet removal process from rainout. As discussed below, depositional parameters are input into the model in order to calculate the deposition of nitrogen. All depositional parameters were based on HNO3.

In order to model gaseous deposition, the model requires land use characteristics and gas deposition resistance terms based on five seasonal categories. The seasonal categories are input into AERMOD on a month by month basis, corresponding to each summer, fall, winter, and spring seasons, based on Bay Area Air Quality Management District (BAAQMD) defaults for AERMET processing, as follows:

- Late autumn/winter without snow = November, December, and January;
- Transitional spring = February and March;
- Midsummer = April, May, June, and July; and
- Autumn = August, September, and October.

The results of the analysis are presented in Figure 1.

Results of the wet and dry nitrogen deposition modeling are summed by AERMOD to produce annual deposition rates in units of grams per square meter (g/m²) for the entire 5-year meteorological period modeled, which are converted to kilograms per hectare per year (kg/ha/yr) for presentation in this report. As the critical habitats cover a variety of elevations and distances, the annual average deposition rates calculated for all receptors modeled in the critical habitat areas were used for comparison to threshold levels. The maximum project impact on nitrogen deposition rates would be 4.047 kg/ha/yr immediately adjacent to the facility. In the critical habitat area, the average deposition rates are on the order of 0.001 kg/ha-yr.

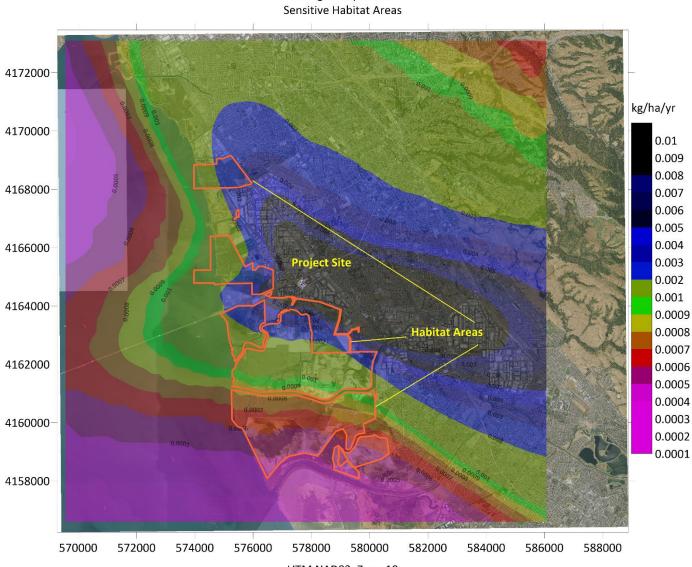
A threshold at which harmful effects from nitrogen deposition on plant communities has not been firmly established. However, a value of 5 kilograms per hectare per year (kg/ha/yr) is often used for comparing nitrogen deposition among plant communities. Research conducted in the South

San Francisco Bay Area indicates that intensified annual grass invasions can occur in areas with nitrogen deposition levels of 11–20 kg/ha/yr, with limited invasions at levels of 4–5 kg/ha/yr (Weiss 2006a and Weiss 2007, as cited in CEC 2007). The maximum and average levels of nitrogen deposition from the project in the sensitive areas are far below levels necessary to cause adverse effects.

Furthermore, the level of nitrogen deposition from the project emissions on plant-available nitrogen would actually be less than the calculated amount because the deposition will be distributed in small amounts during the year and not all of the nitrogen added to the soil during each deposition event is available for plant use because of losses associated with soil processes. Therefore, it is unlikely that there would be significant impacts to biological resources from nitrogen deposition.

The modeling files will be supplied to the CEC staff.

Figure 1



Nitrogen Deposition

UTM NAD83, Zone 10

PROJECT DESCRIPTION-TRANSMISSION

The SPPE application indicates that the SVY03A Backup Generating Facility (SVY03ABGF) would deliver electricity to SVY03A Campus. The SVY03ABGF includes an onsite substation with two electrical supply lines that would connect to a new PG&E switchyard. Staff requires a complete description of the both the SVY03A Campus interconnection to the PG&E transmission grid and the reliability of the PG&E grid in order to understand the potential operation of the back-up generators.

DATA REQUESTS

19. Please provide a complete one-line diagram for the new PG&E switchyard. Show all equipment ratings, including bay arrangement of the breakers, disconnect switches, buses, and related equipment that would be required for interconnection of the on-site project substation. Please label the name of the transmission lines which connect the switchyard to the PG&E system.

SUPPLEMENTAL RESPONSE TO DATA REQUEST 19

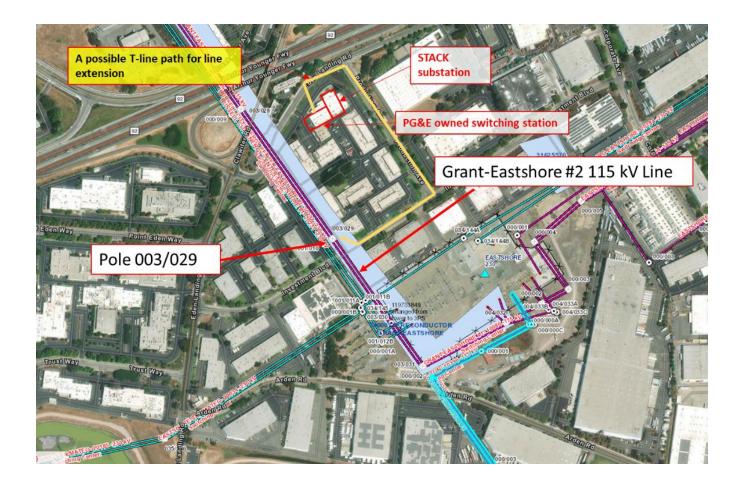
The one-line diagram was provided by PG&E and is included in Attachment PD DR-19.

20. Please provide the conductor name, type, current carrying capacity, and the overhead conductor size for the 115 kV transmission lines which connect the existing PG&E Eastshore-Grant 115 kV line to the new switchyard. Provide a map showing the route and pole locations of the extensions.

SUPPLEMENTAL RESPONSE TO DATA REQUEST 20

Transmission line will use 2-795ACSS conductor. Substation will use 2-2300AAC. The route and pole locations will be determined during preliminary design. However, for purposes of conducting a CEQA analysis, the Staff can use the following figure to further augment the written description contained in the SPPE.

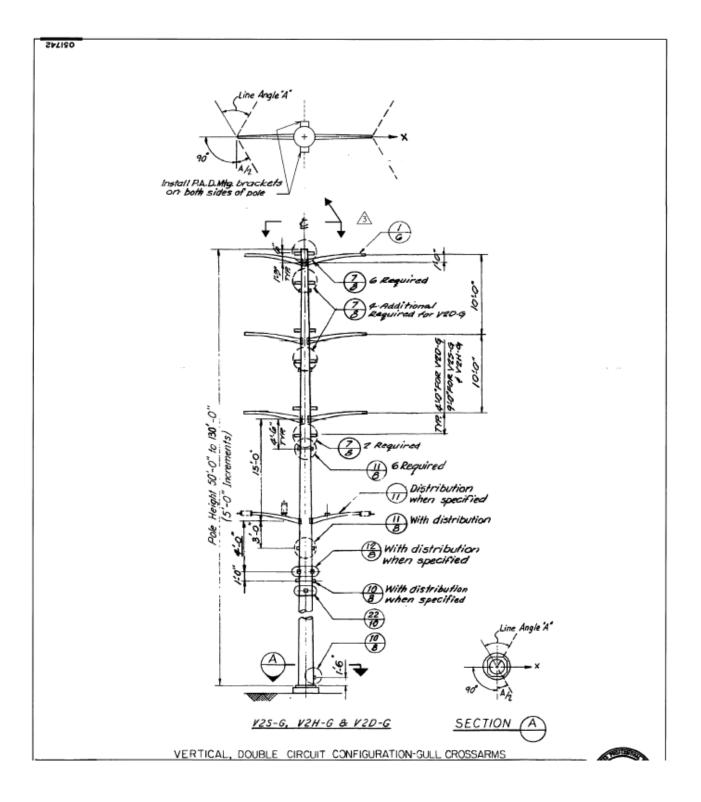
To serve the SVY03A Campus, PG&E will be constructing a "looped" transmission interconnection involving two offsite transmission line extensions. This would involve a line on the south side of the project that comprises a two circuits of 115 kV OH (Overhead) Transmission line (T-Line) from an existing PG&E Eastshore to Grant 115 kV Line which is located on the south side of the project.



21. Please provide pole configurations that would support the 115 kV overhead line which would loop into the new switchyard and to the on-site substation.

RESPONSE TO DATA REQUEST 21

Final design of the transmission line has not been completed. However, for purposes of the CEQA analysis Staff can assume the following typical pole configuration for between 8 and 12 poles.



22. Please provide information that reviews the frequency and duration of historic outages of the Eastshore-Grant 115 kV line and related facilities that would likely trigger the loss of electric service to the proposed onsite substation and could lead to the emergency operations of the diesel-powered generators. This response should identify the reliability of service historically provided by PG&E to similar customers in this part of its service territory.

RESPONSE TO DATA REQUEST 22

PG&E provided the information responsive to this request in Attachment PD DR-22.

23. Please explain whether adding the SVY03A Campus would cause an overload to the PG&E transmission system which would require upgrades to the existing system.

RESPONSE TO DATA REQUEST 23

PG&E has conducted a preliminary study to identify potential impacts from STACK's interconnection request for service. PG&E has identified potential thermal impacts to PG&E Transmission system from STACK's interconnection and it is possible that all can potentially require upgrades and are listed in Table 3.1 included in Attachment PD DR-23. Please note some of the upgrades are needed 5 years from today or beyond, for which PG&E may not have the exact mitigation developed yet and therefore is only requiring monitoring. For the P5 mitigations that are required by 2027, Eastshore 230 kV non-redundant relay mitigation is identified in 2023 Expansion Plan and therefore would be completed by PG&E as part of its approved expansion activities.

TRANSPORTATION

BACKGROUND: Federal Aviation Administration (FAA) Form 7460-1, Notice of Proposed Construction or Alteration for SVY03A Data Center Campus

The Hayward Executive Airport is located approximately 1.75-miles (9,290-feet) north of the project site. Title 14, Part 77.9 of the Code of Federal Regulations requires FAA notification for construction or alterations within 20,000 feet of an airport with a runway more than 3,200 feet in length if the height of the construction or alteration exceeds a slope of 100 to 1 extending outward and upward from the nearest point of the nearest runway of the airport (CFR 2020). Runway 10R/28L at the Hayward Executive Airport is 5,694 feet in length.

The threshold for the FAA notification 100 to 1 surface exceedance height is approximately 92 feet at the project site. If a project's height, including any temporary equipment (such as cranes used during construction) or any ancillary structures (such as transmission poles), exceeds the 100 to 1 surface, the project applicant must submit a copy of FAA Form 7460-1, Notice of Proposed Construction or Alteration, to the FAA.

The small penthouse on the roof top of the data center building would extend to a height 116.5 feet therefore the project applicant must file FAA Form 7460-1 Notice of Proposed Construction or Alteration to comply with federal requirements. Compliance with this federal requirement is established through FAA determinations.

DATA REQUEST

31 Please prepare and submit FAA Form 7460-1, Notice of Proposed Construction or Alteration, to the FAA for the proposed project's buildings, transmission poles, and temporary construction equipment, such as cranes, which would exceed the 100 to 1 surface height of 92 feet. Submit the FAA's determinations to the project docket log once they are received.

SUPPLEMENTAL RESPONSE TO DATA REQUEST 31

FAA Form 7460-1 Notice of Proposed Construction or Alternation has been submitted to the FAA on December 6th, 2023. Emails with confirmation of the filing and the assigned Aeronautical Study Number are included in Attachment TRANS DR-31.

BACKGROUND: Thermal Plume Analysis

According to the SPPE application, the project would have emergency generators and air-cooled chillers and the project site is located 1.72 miles north of the Hayward Executive Airport.

Therefore, staff will require the following information to complete its evaluation of thermal plumes from the 28 emergency generators and server chilling units that would serve the SVY03ADC1 and SVY03ADC2 buildings to ensure air traffic safety and analyze any potentially significant impacts from such plumes.

DATA REQUESTS

32. Please perform a thermal plume modeling analysis of the project's emergency generators for the SVY03A and provide modeling files (or calculation spreadsheets) with all calculations embedded in. Please perform a thermal plume modeling analysis of the heat rejection equipment used to cool the buildings and data servers at the SVY03ADC1 and SVY03ADC2 and provide modeling files (or calculation spreadsheets) with all calculations embedded in.

SUPPLEMENTAL RESPONSE TO DATA REQUEST 32

The thermal plume analysis was completed for the diesel generators and the equipment used to cool the buildings for SVY03ADC1 and SVY03ADC2. The results of the analysis show that the maximum height of the 5.3 m/s plume averaged vertical velocity will always be less than 280 feet above ground level or essentially approximately 180 feet above the building rooftop (rooftop chillers on SVY03ADC1). Attachment TRANS DR-32 includes the calculation sheets. Working calculation sheets will be provided to the CEC staff.

34. Please provide a labeled schematic, showing all mechanical equipment on the roof of the SVY03ADC1 and SVY03ADC2 buildings.

SUPPLEMENTAL RESPONSE TO DATA REQUEST 34

Please see Attachment TRANS DR-34.

- 35. Please provide the following information to support the thermal plume analysis (provide equivalent data if necessary):
 - a. Stack Height (meters) for the data hall air handling units (DAHUs) for the SVY03ADC1 building, the computer room air conditioning (CRAC) units for the SVY03ADC2 building, and the emergency engines for both buildings.
 - b. Exhaust Temp (Kelvin) for the DHAUs, CRAC units, and emergency engines.
 - c. Exit Velocity (meter per second) for the DHAUs units, CRAC units, and the emergency engines.
 - d. Stack Diameter (meters) for the DHAUs, CRAC units, and the emergency engines.
 - e. Number of DHAU, CRAC, and emergency engine unit stacks.
 - f. Arrangement and distance between similar exhaust/heat rejection equipment (e.g., DHAUs, CRAC units, and emergency engine stacks) (meters).

RESPONSE TO DATA REQUEST 35

This data is provided in the working calculation data sheets as noted on the calculation sheets include in Attachment TRANS DR-32 and on the schematic drawing in Attachment TRANS DR-33.

BACKGROUND: Traffic Scoping Memorandum

According to the City of Hayward Transportation Impact Analysis Guidelines, to initiate the Transportation Impact Analysis Process, project consultants must draft a traffic scoping memorandum after completing a planning application. The traffic scoping memorandum provides project description and background information on the project and will be used by Public Works-Transportation staff to determine the various analyses to be included in the transportation impact analysis (Hayward 2020).

DATA REQUEST

36. Please provide a copy of the traffic scoping memorandum that was submitted to the City of Hayward.

SUPPLEMENTAL RESPONSE TO DATA REQUEST 36

An analysis of potential traffic impacts was prepared by Kimley Horn and was included in Appendix H. The analysis has been sent to the City of Hayward for review and comments were received. Attachment TRANS DR-36 includes the revised traffic analysis that addresses the City of Hayward comments

ATTACHMENT BIO DR-13

Biological Resources Maps



December 20, 2023

Attn: Desiree Dei Rossi

David J. Powers & Associates 1736 Franklin, Suite 400 Oakland, CA 94612

Subject: StackSVY03 Data Center CEC Data Request

Dear Ms. Dei Rossi:

This letter and enclosed figures are in response to the California Energy Commission's (CEC) data request 13 for the StackSVY03 Data Center Project (Project) located in Hayward, Alameda County, California. The Project proposes to construct a data center within an urban area of the City of Hayward and requires CEC review. The enclosed figures pertain to sensitive biological resources as requested by the CEC and are included for your review and consideration.

Enclosed Figure 1 details CNDDB documented occurrences of special-status plants and wildlife species within the vicinity of the proposed project area and has been scaled to the requested one inch equals 500 feet (1:6,000). Two special-status plants and four special-status wildlife species have been documented to occur in the vicinity. Given the sensitivity of these species, the data provided in California Department of Fish and Wildlife's California Natural Diversity Database (CNDDB) is confidential not for public distribution. As such, this figure has been labeled as Confidential and should not be distributed beyond the CEC's reviewing team. Figure 2 depicts known aquatic resources within the vicinity of the project site along with boundaries of known reserves and/or parks. A three-mile buffer has been included to visualize aquatic habitats within closer proximity to the project site. Eden Landing Ecological Reserve and the Hayward Regional Shoreline are both in the vicinity and situated west (north and south) of the project site and contain sensitive aquatic resources. Additional aquatic resources, such as streams, sloughs, or channels are also depicted.

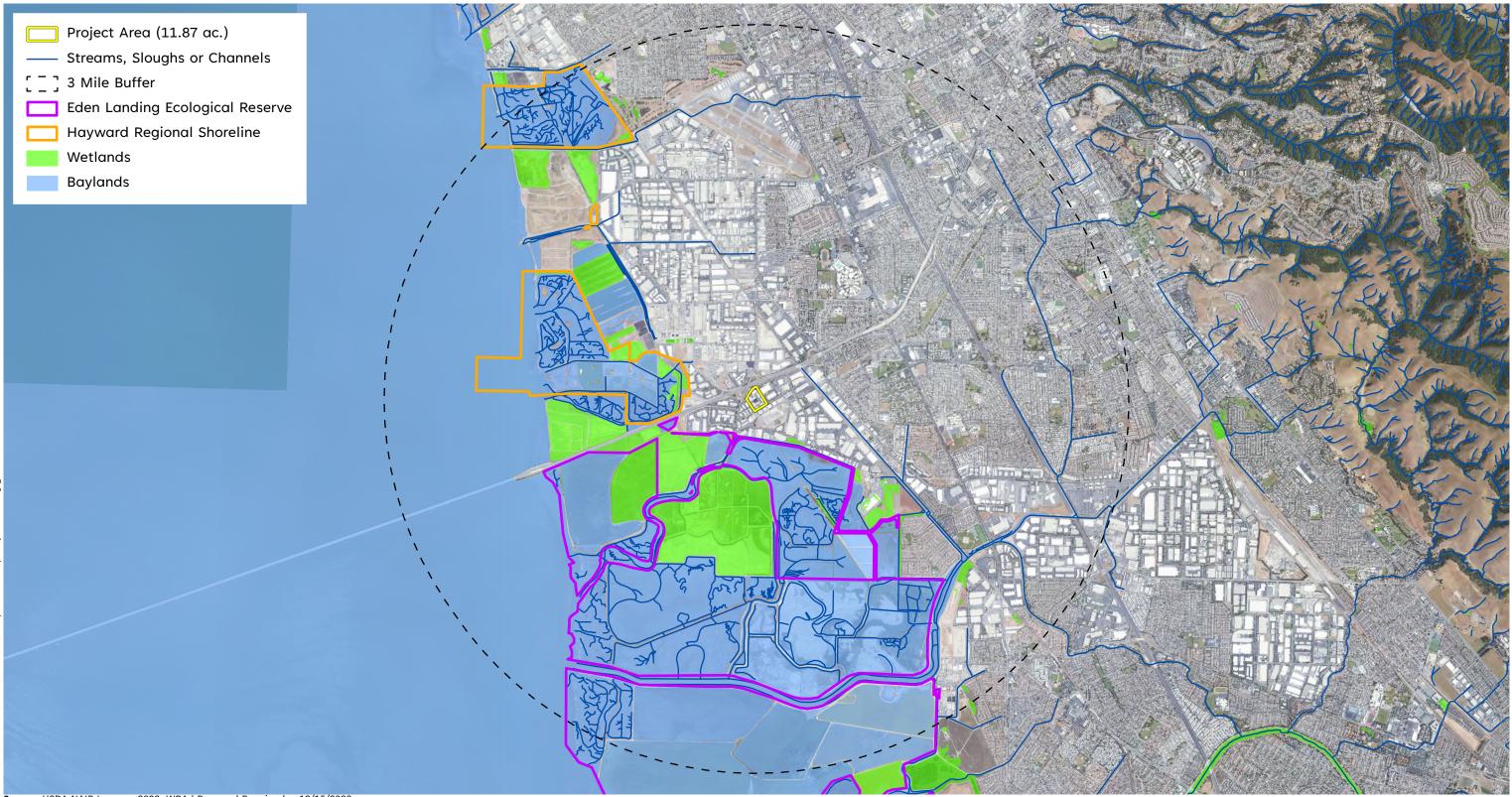
Should you have any questions regarding the contents depicted in the enclosed figures, please contact me at <u>clarke@wra-ca.com</u> or 415-524-7255.

Sincerely,

Bianca Clarke Senior Regulatory Permitting Specialist

Enclosures Figure 1. CNDDB Occurrences Figure 2. Sensitive Habitats within the Vicinity of the Project Area





Sources USDA NAIP Imagery 2022, WRA | Prepared By: njander, 12/15/2023

Figure 2. Sensitive Habitats in the Vicinity of the Project Area





0.5

ATTACHMENT PD DR-19

PG&E Switching Station One-Line Diagram

ATTACHMENT PD DR-22

PG&E Electrical Outage Table

kV	FACILITY NAME	YEAR	Date Out	Time Out	ET Wire Down	Auto Reclose Disabled	Dur (hr:min)	Dur (mins)	Date In	Time In	Cause Category	Cause Detail	Secondary Cause	Comments	REGION	Cust Affected	Fault Type
115	GRANT-EASTSHORE #1	2019	07/09/19	7:41	No	No	3:52	232	07/09/19	11:33	External Contact	Foreign object	NONE	Relayed - 07/09/19, 0741 Grant-East Shore #1-115kV relayed, tested NG. no customers interrupted; weather clear; A-G fault 1.45 mi from Eastshore. near 002/022, +/-1 mi; 1128 Line manually tested OK after no trouble found. 1133 Line returned to service; apparent 3rd party contact, burn mark seen on its crane; CAP ER=117573629	BAY AREA	0	A-G
115	GRANT-EASTSHORE #1	2020	10/04/20	15:09	No	No	0:01	1	10/04/20	15:10	Animal	Bird	СВ	Relayed - 10/04/20, 1509 Grant #2-115/12kV transformer relayed, tested OK due to avian contact on low-side; on the trouble Grant 115kV bus sections "D", "E", "F", #1-115/12kV transformer & Oakland J-Grant 115kV de-energized; Grant-East Shore #1 & #2-115kV lines open-ended at Grant; MOM Grant (CEMO=22,943); weather clear; avian contact led to catastrophic failure of CB-1108; CAP ER=119852449	BAY AREA	7,498	NA
115	GRANT-EASTSHORE #2	2020	10/04/20	15:09	No	No	0:01	1	10/04/20	15:10	Animal	Bird	СВ	Relayed - 10/04/20, 1509 Grant #2-115/12kV transformer relayed, tested OK due to avian contact on low-side; on the trouble Grant 115kV bus sections "D", "E", "F", #1-115/12kV transformer & Oakland J-Grant 115kV de-energized; Grant-East Shore #1 & #2-115kV lines open-ended at Grant; MOM Grant (CEMO=22,943); weather clear; avian contact led to catastrophic failure of CB-1108; CAP ER=119852449	BAY AREA	7,497	NA
115	GRANT-EASTSHORE #2	2022	09/09/22	7:06	No	No	9:27	567	09/09/22	16:33	Other	Other-safety clearance	AUX	Forced - 09/09/22, 0706 to 1633 Grant-Eastshore #2-115kV forced to replace Grant CB-122 NG A phase CCVT; no customers interrupted	BAY AREA	0	NA

ATTACHMENT PD DR-23

Potential Impacts to PG&E System

Table 5-1: Summary of Require	a capacity	opgrades	1	-	-
Monitored Facility	Category	Comments	T1/T2	тз	т4
Grant - East Shore 115kV Line #2		2032 pst-project overload, keep monitoring,			
(Stack SS - East Shore 115kV Line)	P2	mitigation TBD	no	yes	no
East Shore 230/115 kV Transformers 1 and		can be mitigated by system adjustment for			
2	P1, P6	short-term, long-term mitigation TBD	yes	yes	no
		2032 pst-project overload, keep monitoring,			
		long term mitigation TBD			
	P1, P2, P3,	OJ RAS can mitigate until long term			
Moraga - Oakland J 115 kV Line	P6, P7	mitigation can be put in place	yes	yes	yes
Moraga - San Leandro #1, #2 and E3 115 kV		San Leandro RAS, system adjustment for			
Lines	P3	short-term, long-term mitigation TBD	yes	yes	yes
		pre-project issue in 2032, minor			
Oakland D-Oakland L 115 kV Cable	P2	contribution from project, keep monitoring	yes	yes	yes
		keep monitoring, 2032			
		OJ RAS can mitigate until long term			
Pittsburg-East Shore 230 kV Line	P3	mitigation can be put in place	yes	yes	yes
· · · · · · · · · · · · · · · · · · ·		pre-project issue in 2032, minor			
Pittsburg-San Mateo 230 kV Line (section 1)	P7	contribution from project, keep monitoring	yes	yes	yes
			1	1	1-2
		2032 pst-project overload, keep monitoring, long-term mitigation TBD			
	P2, P3, P6,	OJ RAS can mitigation TBD			
San Leandro-Oakland J #1 115 kV Line	P7	mitigation can be put in place	yes	yes	yes
San Leandro-Oakiand 3#1113 kV Line	17		yes	100	yes
Sobrante-Moraga 115 kV Line	P2	pre-project issue in 2032, minor contribution from project, keep monitoring	yes	yes	yes
	F2	contribution from project, keep monitoring	yes	yes	yes
Vaca-Vacaville-Jameson-North Tower 115 kV Line (Hale Jct 1-Vacaville Jct 1)	P3	keep menitering 2022			
kv Line (Hale Jct 1-Vacaville Jct 1)	P3	keep monitoring, 2032 require mitigation in 2027, post-project	no	yes	yes ves
P5-5A:A16:1: EAST SHORE 230 KV BAAH		issues thermal overloads and low voltage			only in
(FAILURE OF NON-REDUNDENT RELAY)	P5	issues	ves	ves	2032
P5-5A:A8:4: MORAGA 230KV BUS #1		pre-project issue in in 2032, no mitigation			
&2(FAILURE OF NON-REDUNDENT RELAY)	P5	required from the project	yes	ves	ves
(100	100	100
P5-5C:A10:2:_RAVENSWOOD 230-115KV BATT(FAILURE OF NON-REDUNDENT BATT)	P5	requires mitigation in 2027, post project issue for low voltage	no	ves	no
	13		10	yes	10
P5-5C:A16:11:_EASTSHORE 115KV	P5	require mitigation in 2027, post-project			
BATT(FAILURE OF NON-REDUNDENT BATT)	15	issues thermal overloads and low voltages	no	yes	no ves
P5-5C:A16:5: EASTSHORE 230KV		require mitigation in 2027, post-project			only in
BATT(FAILURE OF NON-REDUNDENT BATT)	P5	issues thermal overloads and low voltages	yes	yes	2032
P5-5C:A16:7: NEWARK 230KV	-	require mitigation in 2032, post-project		1	
BATT(FAILURE OF NON-REDUNDENT BATT)	P5	issues thermal overloads	yes	ves	ves
P5-5C:A16:9: SAN LEANDRO (OAK U)			1	1-2	,
115KV BATT(FAILURE OF NON-REDUNDENT		pre-project issue in in 2032, no mitigation			
BATT)	P5	required from the project	yes	yes	yes
P5-5C:A8:3: PITTSBURG PP 230-115KV		require mitigation in 2032, post-project			
BATT(FAILURE OF NON-REDUNDENT BATT)	P5	issues thermal overloads	yes	yes	yes
P5-5C:A8:8: MORAGA 230-115KV		pre-project issue in in 2027/2032, no			1
BATT(FAILURE OF NON-REDUNDENT BATT)	P5	mitigation required from the project	yes	ves	yes
and the or non-neo mound on the		magazion regarea nom the project	100	103	,

Table 3-1: Summary of Required Capacity Upgrades

ATTACHMENT TRANS DR-31

FAA 7460 Proof of Filing

From:	Vera, Anthony
To:	Scott Galati; Alex Merritt
Cc:	mkersten@stackinfra.com; Butler, Patrick
Subject:	FW: Status of FAA Filing
Date:	Wednesday, January 3, 2024 11:10:58 AM

Here's the other confirmation as well.

Anthony Vera, PE, QSD Kimley-Horn | 4637 Chabot Dr. #350, Pleasanton, CA 94588 Direct: 925 421 0911 | Mobile: 510 517 2714 Connect with us: Twitter | LinkedIn | Facebook | Instagram | Kimley-Horn.com

From: Butler, Patrick <Patrick.Butler@kimley-horn.com>
Sent: Wednesday, January 3, 2024 11:05 AM
To: Vera, Anthony <Anthony.Vera@kimley-horn.com>
Subject: FW: Status of FAA Filing

Patrick Butler, P.E. (CA) Kimley-Horn | 4637 Chabot Dr, Suite 350, Pleasanton, CA 94588 Direct: 510.350.0229

From: noreply@faa.gov <noreply@faa.gov>
Sent: Thursday, December 7, 2023 10:23 AM
To: mkersten@stackinfra.com; Butler, Patrick <Patrick.Butler@kimley-horn.com>
Subject: Status of FAA Filing

You don't often get email from noreply@faa.gov. Learn why this is important

Your filing is assigned Aeronautical Study Number(s) (ASN): 2023-AWP-20464-OE, 2023-AWP-20470-OE, 2023-AWP-20474-OE, 2023-AWP-20473-OE, 2023-AWP-20473-OE, 2023-AWP-20476-OE, 2023-AWP-20463-OE, 2023-AWP-20467-OE, 2023-AWP-20472-OE, 2023-AWP-20465-OE, 2023-AWP-20466-OE, 2023-AWP-20468-OE, 2023-AWP-20469-OE, 2023-AWP-20471-OE.

To review your electronic record, go to our website <u>oeaaa.faa.gov</u> and select the Search Archives link to locate your case using the assigned Aeronautical Study Number (ASN).

The FAA verified your filing and an aeronautical study has been initiated. Please allow a minimum 45 days for the FAA to complete the study. Please refer to the assigned ASN on all future inquiries regarding this filing.

For Wind Turbine proposals only, please ensure Wind Turbine Data as described on the project summary page in your registered e-filing account has been uploaded to your filing.

To ensure e-mail notifications are delivered to your inbox please add <u>noreply@faa.gov</u> to your address book. Notifications sent from this address are system generated FAA e-mails and replies to this address will NOT be read or forwarded for review. Each system generated e-mail will contain specific FAA contact information in the text of the message. Scott & Alex,

See below for the Aeronautical Study Numbers for the FAA application we submitted for our project. I think this can be included in our responses for the CEC and Planning Comments from the City of Hayward.

Thank you.

Anthony Vera, PE, QSD Kimley-Horn | 4637 Chabot Dr. #350, Pleasanton, CA 94588 Direct: 925 421 0911 | Mobile: 510 517 2714 Connect with us: Twitter | LinkedIn | Facebook | Instagram | Kimley-Horn.com

From: Butler, Patrick <Patrick.Butler@kimley-horn.com>
Sent: Wednesday, January 3, 2024 11:05 AM
To: Vera, Anthony <Anthony.Vera@kimley-horn.com>
Subject: FW: Status of FAA Filing

Patrick Butler, P.E. (CA) Kimley-Horn | 4637 Chabot Dr, Suite 350, Pleasanton, CA 94588 Direct: 510.350.0229

From: noreply@faa.gov <noreply@faa.gov>
Sent: Monday, December 11, 2023 10:48 AM
To: mkersten@stackinfra.com; Butler, Patrick <Patrick.Butler@kimley-horn.com>
Subject: Status of FAA Filing

You don't often get email from noreply@faa.gov. Learn why this is important

Your filing is assigned Aeronautical Study Number(s) (ASN): 2023-AWP-20636-OE, 2023-AWP-20638-OE, 2023-AWP-20639-OE.

To review your electronic record, go to our website <u>oeaaa.faa.gov</u> and select the Search Archives link to locate your case using the assigned Aeronautical Study Number (ASN).

The FAA verified your filing and an aeronautical study has been initiated. Please allow a minimum 45 days for the FAA to complete the study. Please refer to the assigned ASN on all future inquiries regarding this filing.

For Wind Turbine proposals only, please ensure Wind Turbine Data as described on the project summary page in your registered e-filing account has been uploaded to your filing.

To ensure e-mail notifications are delivered to your inbox please add <u>noreply@faa.gov</u> to your address book. Notifications sent from this address are system generated FAA e-mails and replies to this address will NOT be read or forwarded for review. Each system generated e-mail will contain specific FAA contact information in the text of the message.

ATTACHMENT TRANS DR-32

Thermal Plume Calculation Sheets

Stack.Rel.H Output Plume Singlesti Plume Singlesti Plume Stack.Rel.H 0.00 0.060 12.00 Imme Jate		"Aviation Saf	ety and Buo	yant Plumes ,	" Peter Bes	thodology - Summer Max* .t, et. al.		
Mathem Edit Multie Time 3 South Set			ion of Maxim	um Updraft S	peeds for (Calm Conditions at Various He	•	
Antool HotMan Tom 9, 0.221 Notion State Reg 1, 0.304 microsoftem Solution 0.304			from a Gas-	Turbine Pow		•		
Internet Existion Convergion 0.8 (margin delta) Back Vectory 1.37.4 metros 6.30 100 47.2 metros A 1.01 Suback Vectory 1.37.2 metros 6.30 100 47.2 metros A 1.01 Suback Vectory 1.32.0 metros 6.30 100 1.02 1.01 1.02 1.01 Suback Vectory 1.32.0 metros 1.32.0 metros 1.02 2.01 1.01 1.02 1.01								_a =θ _e)
Size: Height, b. 20.0 Dist. Processor Dist. 1.1 Individual Dist. Sub. United State. United State. Velop UP State. Velop V/L		302.21	Kelvins	84.3	°F		feet	
Individual Chiller State Vision(U) 1.3724 meters 60.4 meters Numerical Chiller Vision(U) Sect 271 Individual Chiller Vision(S) 3.13.2 Vision(S) 3.13.2 Vision(S) Sect 271 Sect 271 Individual Chiller Vision(S) 3.13.2 Vision(S) 3.13.2 Vision(S) Sect 271 Sect 271 Individual Chiller Vision(S) 3.13.2 Vision(S) Sect 271 Vision(S) Sect 271 Individual Chiller Vision(S) 3.13.2 Vision(S) Sect 271 Vision(S) Sect 271 Individual Chiller Vision(S) 3.13.2 Vision(S) Sect 271 Vision(S) Vision(S) Sect 271 Individual Chiller Vision(S) 1.43.6 Meters Sect 271 Vision(S) Sect 271 Vision(Vision(S) 1.43.6 Meters Sect 271 Vision(S) Sect 271 Vision(Vision(S) 1.43.6 Meters Sect 271 Vision(S) Sect 271 Vision(Vision(S) 1.43.6 Meters Sect 271 Vision(Vision(S) Vision(Vision(S) Vision(Vision(S) 1.43.6 Meters Sect 271 Vision(Vision(S) Vision(Vision(S) Vision(Vision(S) <td< td=""><td></td><td>22.02</td><td></td><td>400 4/40</td><td>fact in share</td><td></td><td></td><td></td></td<>		22.02		400 4/40	fact in share			
Since Velocity V _m [1.22 m) biolity Chief Velocity V_m [1.22 m) State Notice (1.2000) State Notice (1.2000) State Notice (1.2000) Planes Backery (1.4), (6) Number of Chief Velocity (1.4), (7) Number of Chief Velocity (1.4								
Methods/add Control Statl. 20 Junited Procession Jun								
Back Bank Rungersy Flux 9.4458 (F) (VL)								Sect 2/¶1
Note: Back Book Surging That, T, 3.400 m/s 200 (/T): V, u, D ⁽¹⁾ (u, U,						II Vexit		0000.2/ [[1
Pume Borgenery Finz F NA $4n^{12}$ (2) $\frac{1}{2}\sqrt{\frac{1}\sqrt{1}\sqrt{\frac{1}{2}\sqrt{\frac{1}\sqrt{1}\sqrt{\frac{1}{2}\sqrt{\frac{1}{2}\sqrt{\frac{1}{$						$qV_{avit}D^2(1-\theta_a/\theta_c)/4 = Vol.Flow(q/t)$	π)(1-θ_/θ_)	Sect.2/¶1
$\begin{tabular}{ c c c c c c c c c c c c c c c c c c c$	Plume Buoyancy Flux F				. ,		/(u b/	
Height above Stack x ₀ (0.059) meters 35.6 fact y ₀ = 0.20, meters***********************************	Number of Chillers n	24			2.213	Multiple Stack Multiplication Fac	ctor (n ^{0.25})	,
Image Add Solution								
Height above Ground 2_4 ⁺ 4.8.00 meters 144.0 feet	onditions at End (Top) of Jet Phase:							
Ventors 0.999 ms 21.05 Non- 2.05 Val- 2.05 Conservation of momentum pillane Methodology - Analytical Solutions for Clam Conditions for Clam Conditions for Val- 2.05 Conservations for Manne Methodology Solutions for Clam Conservations for Val- 2.05 Conservations for Val- 2.05 Solutions for Val- 2.05 Solution Valu						z _{jet} = 6.25D, meters*=meters ab	ove stack top	Sect.3/¶1
Prome Top-Het Dimmetri24, pilane Methodology - Analytical Solutions for Calculations for Calculation for Calculations for Calculations for Calculations								
Solve for Height above Stack 2, Height above Stack 2, Stack Period Stack Period Stack 2, Stack Period Stack 2, Stack 3, Stack 2, Stack 3, Stack 2, Stack 3, Stack								
Single Plume-wenged Windlaw Vestor Xubitical Solution in Paler Weit Use a purp for purp face weith weith of the Solution in Table Below Use a purp for purp face weith weith of the Solution in Table Below Use a purp for purp face weith weith of the Solution in Table Below Use a purp face weith weith of the Solution in Table Below Use a purp face weith weith of the Solution in Table Below Use a purp face weith weith of the Solution in Table Below Use a purp face weith weith of the Solution in Table Below Use a purp face weith weith of the Solution in Table Below Use a purp face weith weith of the Solution in Table Below Use a purp face weith weith of the Solution in Table Below Use a purp face weith weith of the Solution in Table Below Use a purp face weith weith of the Solution in Table Below Use a purp face weith weith of the Solution in Table Below Use a purp face weith weith of the Solution in Table Below Use a purp face weith weith of the Solution in Table Below Use a purp face weith weith of the Solution in Table Below Use a purp face weith weith of the Solution in Table Below Use a purp face weith weith weith of the Solution in Table Below Use a purp face weith	Plume Top-Hat Diameter 2a _{jel}	3.475	meters	11.4	feet	2a _{jet} = 2D Conserv	ation of momentum	
Single Plume-swenged Watchall Volcity V Javib V Autlyttal Solution in 7 Javier Volta, V a Javib Product (Va) Solution in 7 Javier Volta, V and Valta, V and Val	nillano Mothodology Analytical Solutions fr	r Calm Condit	ione for Plur	na Uniahta ak	ovo lot Ph	200		
Pure Top-Hai Rate a Writel Workey Writel Source Have Height above Ground 2, rh, 33.252 meters Solutions in Table Below 0.156, z.2, of impair increase with height writel Workey Writel Solutions in Table Below Solutions in Table Below 0.0156, z.2, of impair increase with height writel Workey Writel Solutions in Table Below Solutions in Table Below Writel Workey (PG, Rh, Wei Writel Workey (PG, Rh, Wei Variel Workey) Writel Workey Vritel Workey Vrite				•			<i>.</i>	
With Source Height 2, Hight above Ground 2, Packet 49 0.194 meters Solve for protect 4900/19 0.194 meters Solve for protect 4900/19 0.193 meter Solve for pr				•	lere i rouue	• • •		Sect.2/Eq.6
Height above Ground 2,+h, Poduct (Va), 33.25 meters 100.0 feet where (Va), ¹² e. (1,e,2) ¹² e. (2,e), ¹² e					feet*	())	0	
Vertical Velocity V Solutions in Table Below (Vag, 21, 0.127, 1 (22, 2 ³ , 0.252, 2), 1) ⁽¹⁰⁾ / a Sect.2 (16) ingle Chiler Results: Vag, 02(40, 3) ⁻² Vag, 02(40, 3) ⁻² Sect.2 (16) Solve for Ingle phatows Stack, Z 271.780 metars 881.5 ford* Solve for Ingle phatows Stack, Z Sect.2 (16) Solve for Height of CASC critical vertical velocity 0.731 mts 281.5 ford* Solve for Ingle phatows Stack, Z Solve for Height of CASC critical vertical velocity 0.731 mts 24.5 ford* Solve for Vag, utg mts cable sequation as "bat", ex-ofd, wither -0.06 Find Height above Stack Z 13.557 metars #44.5 ford* Solve for Vag, utg mts cable sequation as "bat", ex-ofd, wither -0.06 Interpolated Height of critical vertical velocity in Jet Phase: #44.5 ford* Solve for Vag, utg mts cable sequation as "bat", ex-ofd, wither -0.06 Interpolated Height of critical vertical velocity in Jet Phase: #44.5 ford* Solve for Vag, utg mts cable sequation as "bat", ex-ofd* -0.06 Interpolated Height above Stack Z #10.4 ford* #10.80 10.08 10.08 10.08 10.08 10.08 10.08 10.08 10.08								
Product (Ve) 11.251 m ² /s V_mD2(8).61 ³⁶ Num Num Bobb for planes-averaged vertical velocity at height Goves the following height abous Stack 2, 27.150 meters 304.8 meters above ground (z'+h) Sec.256,6 Sec.257,0	-						(4 5) (6 5)	
Solve for pubmeaveraged vertical velocity at height Plums Top-Hat Diameter 20 Vertical Velocity v 8.2 27.1 789 refers 2016 for the 2016 for th		11.261	m²/s					. ,
Gives the following Height above Stack <i>x</i> 271.769 meters' Vertical Velocity 825.1 for feat 225.1 for <i>x</i> 247.2 (12(<i>x</i> , <i>x</i>) ⁻¹ (6.25D- <i>x</i> , <i>y</i>)) ^{11/10} (28/12) Sec.2 Fag.6 Sec.2 Fag.6 Solve for Height of CASC critical vertical velocity 5.39 night above Stack <i>x</i> , end theight above Stack	5							
Pum Pum Pum Send 256, is 24.01 free 24.01 free 24.02 16(2,2) Send 256, is						meters above ground (z'+h _s)		
Vertical Velocity 0.731 m/s 2.40 ft/sec V={(va)} ² , 40.250 c.2, ² p(1.502 c.2, 2) p(1.502 (c.2) p(1.502 c.2) p	0 0							
Solve for Height of CASC critical vertical velocity Find Height above Stack z _{et} Height above St							2 (4)2	
Find Height above Stack z _{av} 13.557 reters 44.5 feet Solve for x=[z-z] simultaneously in both eq.(1e, v'a and a]. Interpolated Height of critical velocity in Jet Phase: interpolated Height above Stack z _{av} max max interpolated Height above Stack z _{av} max max interpolated Height above Stack z _{av} max	Vertical Velocity V	0.731	m/s	2.40	ft/sec	V={(Va) _o ³ +0.12F _o [(z-z _v) ² -(6.25D	-z _v) ²]} ^(1/3) /(2a'/2)	Sect.2/Eq.6
Find Height above Stack z _a 13.557 meters 44.5 feet Solve for x=[2x,3] standalescusty in both eq. (a, Va and a]. Interpolated Height of critical velocity in Jet Phase: Find Height above Stack z _a #N/A meters #R/A feet for V=V _{art} using the cubic equation (a, Va and a]. Height above Stack z _a #N/A meters #R/A feet get a dd =[0.127, (2.250-27), ² (Va), ² (Columbar Unight of CACC original contin							
Height above Ground 2,m, +h, 46.58 meters 152.8 for V=V_mained in each acquation at N=X=* N=X=* and acq0.12F, (a) 200, (b) (a) (b) (b) (b) (b) (b) (b) (b) (c) (b) (b) (b) (b) (c) (b) (b) (c) (b) (c) (c) (b) (c) (c) (c) (c) (c) (c) (c) (c) (c) (c				-	-	•		
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $								
Interpolated Height of critical verical velocity in JeP Pase:	Height above Ground Z _{crit} +h	40.300	meters	152.0	leel			
Find Height above Stack 2_{ant} #WA meters #WA meters #WA feet thttp://www.1728.org/2016 able of Plume Top-Hat Diameters (2a) and Plume-Averaged Vertical Velocities starting at end of jet phase: itel of	Interpolated Height of critical vertical v	elocity in .let P	hase:					
Height above Ground z_m +h, #NA meters #NA feet gives the real solution $x = z.2v = [13]$ a or $z(m/above stack) = 10]$. $z(f(above ground) = 10]$ rable of Plume Top-Hat Diameters (2a) and Plume-Averaged Vertical Ve				#N/A	feet	and u-[0.12F ₀ (0.25D-2 _v)		
arbie of Plume Averaged Vertical Velocities starting at end of jet phase: Height (freet) (meters)Plume SingleSKPlume (treets)theight (freet) (meters)Plume SingleSKPlume (treets)SingleSKPlume (treets)SingleSKPlume SingleSKPlume (treets)SingleSKPlume (treets)SingleSKPlume (treets)SingleSKPlume (treets)SingleSKPlume (treets)SingleSKPlume (treets)SingleSKPlume (treets)SingleSKPlume (treets)SingleSKPlume (treets)SingleSKPlume (treets)SingleSKPlume (treets)SingleSKPlume (treets)SingleSKPlume (treets)SingleSKPlume (treets)SingleSKPlume (treets)SingleSKPlume (treets)SingleSKPlume (treets)Jet (treets)Jet (treets)SingleSKPlume (treets)Jet (treets)Jet (treets)Jet (treets)Jet (treets)Jet (treets)Jet (treets) <td></td> <td></td> <td></td> <td></td> <td></td> <td>gives the re</td> <td></td> <td></td>						gives the re		
Size AP all part (lev) Nume Single St. Plum Single St. Plum Comparison Single St. Plum Single St.						-		13.
Height (feet) above ground above								
above ground above stack Radius(m) Vertering Temp(k) Stack Rel/H1 + 108-4 0.00 0.808 12.00 1100 0.50 0.900 12.00 1200 0.554 1.152 11.04 1200 0.564 1.152 11.04 1400 0.646 1.840 7.34 1400 0.646 1.840 7.34 1528 1.556 3.00 5.65 0.65(1/4.0/4.0) (Yugung *2.427) *1.64 1528 1.556 2.138 5.03 305.26 Vugma*3*0* 16100 11.74 2.487 4.58 305.76 CEC Staff Equation: 16100 12.18 3.462 3.03 Vugma*3*0* Vugma*3*0* 16100 2.188 3.462 3.03 Vugma*3*0* Vugma*3*0* 16100 2.198 3.462 3.040 Vugma*3*0* Vugma*3*0* 16101 3.681 1.173 3.01 Som 5* Som 5* 16101 16.631 1.168 30.28	able of Plume Ton-Hat Diameters (2a) and Pl						z(ft/above ground) =	15
Stack.Rel.Ht = 108.40.000.86913.2011000.500.90812.9012003.541.15211.0413006.591.3969.1914009.641.6407.64152.81.3562.1385.30306.56170015.742.4674.58305.78160015.742.4674.58305.78170018.782.9753.87305.26170018.782.9753.87305.2618002.1833.4623.90304.36200027.934.4382.69304.36200027.934.4382.69304.36200027.934.4382.69303.65200030.984.9252.46303.65200030.984.9252.46303.65300.058.419.3141.51303.16300.058.419.3141.51303.65300.019.3719.06810.2302.37400.088.8914.1911.18302.89450.0119.3719.068302.35500.0134.6121.500.96302.44600.0241.2935.3050.68302.25500.021.613.3690.80302.24600.0241.2735.3050.68302.251000.0303.2755.3050.64302.251000.033.690.62302.24 <td></td> <td>ume-Averaged</td> <td>Vertical Velo</td> <td>ocities startin</td> <td>g at end of</td> <td></td> <td>z(ft/above ground) =</td> <td>15</td>		ume-Averaged	Vertical Velo	ocities startin	g at end of		z(ft/above ground) =	15
110.0 0.50 0.908 12.90 Lneat/uterpoint 101 ft interva 120.0 3.54 1.152 11.04 Lneat/uterpoint Sinda Fatto Top of 2.00 140.0 9.64 1.640 7.34 Sinda Fatto Top of 2.00 Sinda Fatto Top of 2.00 140.0 9.64 1.640 7.34 Sinda Fatto Top of 2.00 Sinda Fatto T		-			-		z(ft/above ground) =	15
1200 3.54 1.152 11.04 Lineary interpoted from Stack Rol Ht to Top of Jett Split and Equations: 1400.0 9.64 1.640 7.34 Vusime ((0a), ¹ / ₂ (ax) ² (0.250 x, ¹ / ₂) ¹⁰ /a 152.8 13.56 2.183 5.03 306.56 0, ² / ₂ (1+(1-(0g),)) (V _{am} D ² / ₂ (Az 500 x, ¹ / ₂) ¹⁰ /a 160.0 15.74 2.487 4.58 305.78 CEC Staff Equations: 170.0 18.78 2.975 3.87 305.26 Vusime ^{1/2} (Ag ^{1/2} (4 2.50 x, ^{1/2}) ¹⁰ /a 180.0 2.183 3.462 3.36 304.474 Brigg's Equaton:: Vusime ^{1/2} (Ag ^{1/2} (4 2.50 x, ^{1/2}) ¹⁰ /a 200.0 2.733 4.438 2.69 304.36 Vusime ^{1/2} (Ag ^{1/2} (4 2.50 x, ^{1/2}) ^{1/2} (x) ^{1/2} (x	Height (feet) above ground	(meters) above stack	Plume Radius(m)	SingleStk VertVel(m/s)	Plume		z(ft/above ground) =	15
130.0 6.59 1.396 9.19 140.0 9.44 1.640 7.34 V _{man} ={(Vm ^{3,1} -0, 12){(z,z ¹ /2, (z,z ¹ /2, (z,z ¹ /2, (z,z ¹ /2, z ¹ /2, (z,z ¹ /2, z ¹ /2, z ^{1/2} /2, z ^{1/2}), a = 0.16[z,z_2) 152.8 13.56 2.138 5.30 306.56 9 ₀ =0 ₀ (1+(1-(0, 0,))*(V _{ma} D ² /(4V _{mam} *a ³ λ ²)); 160.0 15.74 2.487 4.58 305.76 V _{man} ={(Vm ^{3,1-0} , 1, V _{ma} D ² /(4V _{mam} *a ³ λ ²)); 170.0 18.78 2.975 3.87 305.26 V _{man} ={(Vm ^{3,1-0} , 1, V _{ma} D ² /(4V _{mam} *a ³ λ ²)); 180.0 21.83 3.462 3.36 304.74 Brigg's Equation: V _{mam} ={(2) × 1 ± ^{0/3} × F _m ^{1/3} × z ^{1/27} , w ^{1/21} × z ^{1/27} , w	Height (feet) above ground <i>Stack.Rel.Ht</i> = 108.4	(meters) above stack 0.00	Plume Radius(m) <mark>0.869</mark>	SingleStk VertVel(m/s) 13.20	Plume	jet phase:		
140.0 9.64 1.640 7.34 Top of Single jet = 144.0 10.86 1.737 6.60 a = 0.16[c2.x] 152.8 13.56 2.138 5.30 306.56 B;=8(1+(1-(0,b_0))^*(V=mD^2)(4V_{pinme}*a^2*k^2)) 160.0 15.74 2.487 4.58 305.78 CEC Staff Equation: 170.0 18.78 2.975 3.87 305.26 V=ma^{m^2}V_w 190.0 24.88 3.960 2.98 304.36 V=ma^{m^2}V_w 200.0 27.93 4.438 2.69 304.36 V=ma^{m^2}V_w 300.0 58.41 9.314 1.51 303.86 V=ma^{m^2}V_w 300.0 58.41 9.314 1.51 303.19 Max<<3.3 m/s	Height (feet) above ground <u>Stack.Rel.Ht = 108.4</u> 110.0	(meters) above stack 0.00 0.50	Plume Radius(m) 0.869 0.908	SingleStk VertVel(m/s) 13.20 12.90	Plume	jet phase: Jet Pha	se Eqs:	10 ft Interva
Top of Single jet = 144.010.861.7376.60a = 0.15(2-2.)152.813.562.1385.30306.56 $\theta_{p}=\theta_{1}(1+(1-(\theta_{p}\theta_{p}))^{r}(V_{ablame})^{a}a^{2}x^{3}))$ 160.015.742.4874.58305.76 $CC Staff Equation:$ 170.018.782.9753.87305.26 $V_{appan^{22}}v_{ap}$ 180.021.833.4623.36304.74 Briggi Equation: 190.024.883.9502.98304.36 Briggi Equation: 200.027.934.4382.69304.07 $V_{appan} = (2n) x 10^{102} x x x^{102}, x x^{10$	Height (feet) above ground <i>Stack.Rel.Ht = 108.4</i> 110.0 120.0	(meters) above stack 0.00 0.50 3.54	Plume Radius(m) 0.869 0.908 1.152	SingleStk VertVel(m/s) 13.20 12.90 11.04	Plume	jet phase: Jet Pha Linearly ir	se Eqs: terpolated from Stack Re	10 ft Interva
152.8 13.56 2.138 5.30 306.56 θ ₀ =θ ₄ (1+(1-(θ ₀ /θ ₀))*(V _{ext} D ² (4V _{pluen} *a ² *Å ²)) 160.0 15.74 2.487 4.58 305.76 CEC Staff Equation: 170.0 18.78 2.975 3.87 305.26 V _{ext} m ³ ² *Å ²)) 190.0 24.88 3.950 2.98 304.36 W _{ext} m ³ ² *Å ²)) 200.0 27.93 4.438 2.69 303.65 Wext Wext K ² W ²	Height (feet) above ground <i>Stack.Rel.Ht = 108.4</i> 110.0 120.0 130.0	(meters) above stack 0.00 0.50 3.54 6.59	Plume Radius(m) 0.869 0.908 1.152 1.396	SingleStk VertVel(m/s) 13.20 12.90 11.04 9.19	Plume	jet phase: Jet Pha Linearly ir Spillanc	se Eqs: Iterpolated from Stack Re B Equations:	<mark>10 ft Interva</mark> I.Ht to Top of Jet
160.0 15.74 2.487 4.58 305.78 CEC Staff Equation: 170.0 18.78 2.975 3.87 305.26 \\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\	Height (feet) above ground Stack.Rel.Ht = 108.4 110.0 120.0 130.0 130.0 140.0	(meters) above stack 0.00 0.50 3.54 6.59 9.64	Plume Radius(m) 0.869 0.908 1.152 1.396 1.640	SingleStk VertVel(m/s) 13.20 12.90 11.04 9.19 7.34	Plume	jet phase: Jet Pha Linearly ir Spillanc V _{planc} ={(V	se Eqs: hterpolated from Stack Re e Equations: a) _o ³ +0.12F _o ((z-z,) ² -(6.25D	<mark>10 ft Interva</mark> I.Ht to Top of Jet
170.0 18.78 2.975 3.87 305.26 Vmgm ^{0.25} Vg 180.0 21.83 3.462 3.36 304.74 Briggs Equation: 190.0 24.88 3.960 2.98 304.36 Vmgm ^{0.25} Vg 200.0 27.93 4.438 2.69 304.07 Vmere Fmg = 16 mg 210.0 30.98 4.925 2.46 303.65 Vmere Fmg = 16 mg 350.0 73.65 11.753 1.31 302.87 Max<<5.3 m/s	Height (feet) above ground <i>Stack.Rel.Ht</i> = 108.4 110.0 120.0 130.0 140.0 Top of Single jet = 144.0	(meters) above stack 0.00 0.50 3.54 6.59 9.64 10.86	Plume Radius(m) 0.908 1.152 1.396 1.640 1.737	SingleStk VertVel(m/s) 12.90 11.04 9.19 7.34 6.60	Plume Temp(K)	jet phase: Jet Pha Linearly ir Spillanc V _{plum=} =((a = 0.16	se Eqs: terpolated from Stack Re 9 Equations: a), ³ +0.12F _o ((2-2,) ² -(6.25D ((2-2,))	10 ft Interva I.Ht to Top of Jet -z.,) ²]} ^{1/3} / a
180.0 21.83 3.462 3.36 304.74 Brig's Equation: 190.0 24.88 3.950 2.98 304.36 Veggs = (2/3) xt.6 ¹⁰² xxFmg ¹⁰² xu ¹⁰² xz ¹⁴² 200.0 27.93 4.438 2.69 304.07 where Fmg = nFmg 210.0 30.98 4.925 2.46 303.65 where Fmg = nFmg 50 ft Interva 300.0 58.41 9.314 1.51 303.9 50 ft Interva 50 ft Interva 350.0 73.65 11.753 1.31 302.59 Max<5.3 m/s	Height (feet) above ground <i>Stack.Rel.Ht</i> = 108.4 110.0 120.0 130.0 130.0 140.0 Top of Single jet = 144.0 152.8	(meters) above stack 0.00 0.50 3.54 6.59 9.64 10.86 13.56	Plume Radius(m) 0.869 0.908 1.152 1.396 1.640 1.737 2.138	SingleStk VertVel(m/s) 12.90 11.04 9.19 7.34 6.60 5.30	Plume Temp(K) 306.56	jet phase: Jet Pha Linearly ir Spillane V _{plum=} =((α = 0.16 θ _p =θ _s (1-1)	se Eqs: Iterpolated from Stack Re a Equations: $a_{1,3}^{3} \cdot 0.12F_{a}[(z-z_{3})^{2} \cdot (6.25D)(z-z_{3}) + (1-(\theta_{a}/\theta_{a}))^{*}(V_{ext}D^{2}/(4$	10 ft Interva I.Ht to Top of Jet -z.,) ²]} ^{1/3} / a
190.0 24.88 3.950 2.98 304.36 V _{legg1s} = (2/3) x 1.8 ⁽³⁰⁾ x μ ^{1/31} x μ ^{1/31} x μ ^{1/31} x μ ^{1/31} 200.0 27.93 4.438 2.69 304.07 where Fmg = n Fmg 210.0 30.98 4.925 2.46 303.85 50 50 ft Interva 350.0 73.65 11.753 1.31 302.87 Max<5.3 m/s	Height (feet) above ground <i>Stack.Rel.Ht = 108.4</i> 110.0 120.0 130.0 140.0 Top of Single jet = 144.0 152.8 160.0	(meters) above stack 0.00 0.50 3.54 6.59 9.64 10.86 13.56 15.74	Plume Radius(m) 0.869 0.908 1.152 1.396 1.640 1.737 2.138 2.487	SingleStk VertVel(m/s) 12.90 11.04 9.19 7.34 6.60 5.30 4.58	Plume Temp(K) 306.56 305.78	jet phase: Jet Pha Linearly ir Spillanc $V_{plane}=(V$ a = 0.16 $\theta_p=\theta_s(14$	se Eqs: terpolated from Stack Reb Equations: $a_{1,3}^{3+}0.12F_{a}[(x-x_{x})^{2}-(6.25D)](z-x_{x})^{2}((-6.25D))(z-x_{x}))^{2}((4-6))(y-1)(2-6))(4-6))(y-1)(2-6))(x-1)(1-6))(y-1)(y-1)(1-6))(y-1)(y-1)(y-1)(y-1)(y-1)(y-1)(y-1)(y-$	10 ft Interva I.Ht to Top of Jet -z.,) ²]} ^{1/3} / a
200.0 27.93 4.438 2.69 304.07 where Fmp = nFmp 210.0 30.98 4.925 2.46 303.85 250.0 43.17 6.86 1.88 303.66 300.0 58.41 9.314 1.51 303.19 50 ft Interva 350.0 73.65 11.753 1.31 302.87 Max<5.3 m/s	Height (feet) above ground <i>Stack.Rel.Ht = 108.4</i> 110.0 120.0 130.0 140.0 <i>Top of Single jet = 144.0</i> 152.8 160.0 170.0	(meters) above stack 0.00 0.50 3.54 6.59 9.64 10.86 13.56 15.74 18.78	Plume Radius(m) 0.869 0.908 1.152 1.396 1.640 1.737 2.138 2.487 2.975	SingleStk VertVel(m/s) 12.90 11.04 9.19 7.34 6.60 5.30 4.58 3.87	Plume Temp(K) 306.56 305.78 305.26	jet phase: Jet Pha Linearly ir Spillanc V _{plann} ={(V a = 0.16 θ _p =θ _s (1+ CEC St V _{mp} =n ^{0.25} \	se Eqs: therpolated from Stack Re 9 Equations: $a_{\mu}^{3} \cdot 0.12F_{4}(z-z_{\mu})^{2} \cdot (6.25D)$ $i(z-z_{\nu})$ $i(1-(\theta_{\mu}/\theta_{\mu}))^{*}(V_{ext}D^{2}/(4$ aff Equation: J_{sp}	10 ft Interva I.Ht to Top of Jet -z.,) ²]} ^{1/3} / a
210.0 30.98 4.925 2.46 303.85 250.0 43.17 6.876 1.88 303.66 300.0 58.41 9.314 1.51 303.19 350.0 73.65 11.753 1.31 302.67 450.0 104.13 16.630 1.08 302.58 500.0 119.37 19.068 1.02 302.40 600.0 180.83 28.82 0.85 302.40 700.0 180.33 28.822 0.85 302.33 900.0 210.81 33.698 0.80 302.23 1000.0 271.77 43.452 0.73 302.29 1100.0 302.75 36.68 302.23 1000.0 271.77 43.452 0.73 302.29 1100.0 332.73 53.206 0.68 302.25 1300.0 363.21 56.082 0.66 302.25 1300.0 363.21 56.082 0.66 302.25 1400.0 393.69 62.959 0.64 302.25 1500.0 <td< td=""><td>Height (feet) above ground <i>Stack.Rel.Ht = 108.4</i> 110.0 120.0 130.0 140.0 <i>Top of Single jet = 144.0</i> 152.8 160.0 170.0 180.0</td><td>(meters) above stack 0.00 0.50 3.54 6.59 9.64 10.86 13.56 15.74 18.78 21.83</td><td>Plume Radius(m) 0.869 0.908 1.152 1.396 1.640 1.737 2.138 2.487 2.975 3.462</td><td>SingleStk VertVel(m/s) 12.90 11.04 9.19 7.34 6.60 5.30 4.58 3.87 3.36</td><td>Plume Temp(K) 306.56 305.78 305.26 304.74</td><td>jet phase: Jet Pha Linearly ir Spilland $V_{plam}=4[(V = 0.16 \\ \theta_p=\theta_n(1 - CEC st) \\ V_{mp}=n^{0.25} \\ Brigg's$</td><td>Se Eqs: Interpolated from Stack Re B Equations: (a),${}^{3}+0.12F_{4}(z-z)^{2}$ (6.25D ($z-z_{v}$) $(1-(\theta_{v}/\theta_{s}))^{*}(V_{exit}D^{2}/(4$ aff Equation: $I_{v_{p}}$ Equation:</td><td><mark>10 ft Interva</mark> I.Ht to Top of Jet z.)²])^{1/3} / a V_{ptume}*a²*λ²)))</td></td<>	Height (feet) above ground <i>Stack.Rel.Ht = 108.4</i> 110.0 120.0 130.0 140.0 <i>Top of Single jet = 144.0</i> 152.8 160.0 170.0 180.0	(meters) above stack 0.00 0.50 3.54 6.59 9.64 10.86 13.56 15.74 18.78 21.83	Plume Radius(m) 0.869 0.908 1.152 1.396 1.640 1.737 2.138 2.487 2.975 3.462	SingleStk VertVel(m/s) 12.90 11.04 9.19 7.34 6.60 5.30 4.58 3.87 3.36	Plume Temp(K) 306.56 305.78 305.26 304.74	jet phase: Jet Pha Linearly ir Spilland $V_{plam}=4[(V = 0.16 \\ \theta_p=\theta_n(1 - CEC st) \\ V_{mp}=n^{0.25} \\ Brigg's$	Se Eqs: Interpolated from Stack Re B Equations: (a), ${}^{3}+0.12F_{4}(z-z)^{2}$ (6.25D ($z-z_{v}$) $(1-(\theta_{v}/\theta_{s}))^{*}(V_{exit}D^{2}/(4$ aff Equation: $I_{v_{p}}$ Equation:	<mark>10 ft Interva</mark> I.Ht to Top of Jet z.) ²]) ^{1/3} / a V _{ptume} *a ² *λ ²)))
250.0 43.17 6.876 1.88 303.66 300.0 58.41 9.314 1.51 303.19 50 ft interva 350.0 73.65 11.753 1.31 302.87 Max<5.3 m/s	Height (feet) above ground Stack.Rel.Ht = 108.4 110.0 120.0 140.0 Top of Single jet = 144.0 152.8 160.0 170.0 180.0 180.0	(meters) above stack 0.00 0.50 3.54 6.59 9.64 10.86 13.56 15.74 18.78 21.83 24.88	Plume Radius(m) 0.869 0.908 1.152 1.396 1.640 1.737 2.138 2.487 2.975 3.462 3.950	SingleStk VertVel(m/s) 12.90 11.04 9.19 7.34 6.60 5.30 4.58 3.87 3.36 2.98	Plume Temp(K) 306.56 305.78 305.26 304.74 304.36	jet phase: Jet Pha Linearly ir Spillano V _{plame} ={(V a = 0.16 θ _p =θ ₀ (1- CEC st V _{mp} =π ^{0.25} Brigg's V _{bingy} = (;	se Eqs: terpolated from Stack Ree a Equations: (a), ³ +0.12F ₄ [(z-z,) ² -(6.25D (z-z.) (1-(6)/9,))*(V _{ext} D ² /(4 aff Equation: <i>J</i> ₄ , Equation: 2(3) × 1.6 ⁽³²⁾ x F _{mp} ^(1/2) x u ^(1/2)	<mark>10 ft Interva</mark> I.Ht to Top of Jet z.) ²]) ^{1/3} / a V _{ptume} *a ² *λ ²)))
300.0 58.41 9.314 1.51 303.19 50 ft Interval 350.0 73.65 11.753 1.31 302.87 Max<5.3 m/s	Height (feet) above ground Stack.Rel.Ht = 108.4 110.0 120.0 130.0 140.0 Top of Single jet = 144.0 152.8 160.0 170.0 180.0 180.0 190.0	(meters) above stack 0.00 0.50 3.54 6.59 9.64 10.86 13.56 15.74 18.78 21.83 24.88 27.93	Plume Radius(m) 0.869 0.908 1.152 1.396 1.640 1.737 2.138 2.487 2.975 3.462 3.950 4.438	SingleStk VertVel(m/s) 12.90 11.04 9.19 7.34 6.60 5.30 4.58 3.87 3.36 2.98 2.69	Plume Temp(K) 306.56 305.78 305.26 304.74 304.36 304.07	jet phase: Jet Pha Linearly ir Spillano V _{plame} ={(V a = 0.16 θ _p =θ ₀ (1- CEC st V _{mp} =π ^{0.25} Brigg's V _{bingy} = (;	se Eqs: terpolated from Stack Ree a Equations: (a), ³ +0.12F ₄ [(z-z,) ² -(6.25D (z-z.) (1-(6)/9,))*(V _{ext} D ² /(4 aff Equation: <i>J</i> ₄ , Equation: 2(3) × 1.6 ⁽³²⁾ x F _{mp} ^(1/2) x u ^(1/2)	10 ft Interva I.Ht to Top of Jet $(-z_{,})^{2}$ ^{1/3} / a $V_{plume} * a^{2} * \lambda^{2}$
350.0 73.65 11.753 1.31 302.87 400.0 88.89 14.191 1.18 302.69 450.0 104.13 16.630 1.08 302.58 500.0 119.37 19.068 1.02 302.50 550.0 134.61 21.506 0.96 302.44 600.0 149.85 23.945 0.92 302.40 700.0 180.33 28.822 0.85 302.37 800.0 210.81 33.698 0.80 302.33 900.0 241.29 38.575 0.76 302.30 1100.0 302.25 48.329 0.70 302.26 1100.0 302.27 353.206 0.68 302.26 1300.0 363.21 58.082 0.66 302.25 1400.0 393.69 62.959 0.64 302.25 1500.0 424.17 67.836 0.62 302.24 2500.0 76.57 92.20 0.56 302.24 2500.0 76.57 92.20 0.56 302.24 <	Height (feet) above ground Stack.Rel.Ht = 108.4 110.0 120.0 130.0 140.0 Top of Single jet = 144.0 152.8 160.0 170.0 180.0 200.0 210.0	(meters) above stack 0.00 0.50 3.54 4.6.59 9.64 10.86 13.56 15.74 18.78 21.83 24.88 27.93 30.98	Plume Radius(m) 0.869 0.908 1.152 1.396 1.640 1.737 2.138 2.487 2.975 3.462 3.950 4.438 4.925	SingleStk VertVel(m/s) 12.90 11.04 9.19 7.34 6.60 5.30 4.58 3.87 3.36 2.98 2.69 2.46	Plume Temp(K) 306.56 305.78 305.26 304.74 304.36 304.07 303.85	jet phase: Jet Pha Linearly ir Spillano V _{plame} ={(V a = 0.16 θ _p =θ ₀ (1- CEC st V _{mp} =π ^{0.25} Brigg's V _{bingy} = (;	se Eqs: terpolated from Stack Ree a Equations: (a), ³ +0.12F ₄ [(z-z,) ² -(6.25D (z-z.) (1-(6)/9,))*(V _{ext} D ² /(4 aff Equation: <i>J</i> ₄ , Equation: 2(3) × 1.6 ⁽³²⁾ x F _{mp} ^(1/2) x u ^(1/2)	10 ft Interva I.Ht to Top of Jet $(-z_{,})^{2}$ ^{1/3} / a $V_{plume} * a^{2} * \lambda^{2}$
400.0 88.89 14.191 1.18 302.69 450.0 104.13 16.630 1.08 302.58 500.0 119.37 19.068 1.02 302.60 550.0 134.61 21.506 0.96 302.44 600.0 149.85 23.945 0.92 302.40 700.0 180.33 28.822 0.85 302.37 800.0 210.81 33.698 0.80 302.23 900.0 241.29 38.575 0.76 302.30 1000.0 271.77 43.452 0.73 302.26 1100.0 302.273 53.206 0.68 302.27 1200.0 332.73 53.206 0.68 302.26 1300.0 363.21 58.082 0.66 302.25 1400.0 393.69 62.959 0.64 302.25 1500.0 424.17 67.836 0.62 302.24 2500.0 76.57 92.220 0.56 302.24 2500.0 76.57 92.220 0.56 302.24	Height (feet) above ground Stack.Rel.Ht = 108.4 110.0 120.0 130.0 140.0 Top of Single jet = 144.0 152.8 160.0 1770.0 180.0 200.0 210.0 250.0	(meters) above stack 0.00 0.50 3.54 6.59 9.64 10.86 13.56 15.74 18.78 21.83 24.88 27.93 30.98 43.17	Plume Radius(m) 0.869 0.908 1.152 1.396 1.640 1.737 2.138 2.487 2.975 3.462 3.950 4.438 4.925 6.876	SingleStk VertVel(m/s) 12.90 11.04 9.19 7.34 6.60 5.30 4.58 3.87 3.36 2.98 2.69 2.46 1.88	Plume Temp(K) 306.56 305.78 305.26 304.74 304.36 304.07 303.85 303.66	jet phase: Jet Pha Linearly ir Spillano V _{plame} ={(V a = 0.16 θ _p =θ ₀ (1- CEC st V _{mp} =π ^{0.25} Brigg's V _{bingy} = (;	se Eqs: terpolated from Stack Ree a Equations: (a), ³ +0.12F ₄ [(z-z,) ² -(6.25D (z-z.) (1-(6)/9,))*(V _{ext} D ² /(4 aff Equation: <i>J</i> ₄ , Equation: 2(3) × 1.6 ⁽³²⁾ x F _{mp} ^(1/2) x u ^(1/2)	10 ft Interva I.Ht to Top of Jet -z,) ² } ¹³ / a V _{plume} *a ² *λ ²)) ^{1/2)} x z ^(-1/2)
450.0 104.13 16.630 1.08 302.58 500.0 119.37 19.068 1.02 302.50 550.0 134.61 21.506 0.96 302.44 600.0 149.85 23.945 0.92 302.30 700.0 180.33 28.822 0.85 302.30 900.0 241.29 38.575 0.76 302.30 1000.0 271.77 43.452 0.73 302.29 1100.0 302.25 48.329 0.70 302.26 1300.0 332.73 53.206 0.68 302.26 1400.0 393.69 62.959 0.64 302.25 1400.0 393.69 62.959 0.64 302.26 1500.0 424.17 67.836 0.62 302.26 1400.0 393.69 62.959 0.64 302.26 1500.0 424.17 67.836 0.62 302.24 2000.0 576.57 92.20 0.56 302.24 2000.0 576.57 92.20 0.56 302.23	Height (feet) above ground Stack.Rel.Ht = 108.4 110.0 120.0 130.0 140.0 Top of Single jet = 144.0 152.8 160.0 170.0 190.0 200.0 210.0 250.0 300.0	(meters) above stack 0.00 0.50 3.54 6.59 9.64 10.86 13.56 15.74 18.78 21.83 24.88 27.93 30.98 43.17 58.41	Plume Radius(m) 0.869 0.908 1.152 1.396 1.640 1.737 2.138 2.487 2.975 3.462 3.950 4.438 4.925 6.876 9.314	SingleStk VertVel(m/s) 12.90 11.04 9.19 7.34 6.60 5.30 4.58 3.87 3.36 2.98 2.69 2.46 1.88 1.51	Plume Temp(K) 306.56 305.78 305.26 304.74 304.36 304.07 303.85 303.66 303.19	jet phase: Jet Pha Linearly ir Spillano V _{plame} ={(V a = 0.16 θ _p =θ ₀ (1- CEC st V _{mp} =π ^{0.25} Brigg's V _{bingy} = (;	se Eqs: therpolated from Stack Re a Equations: $a_{1,3}^{3+0.12F_{a}}(z-z_{s})^{2}-(6.25D)$ $z(z-z_{s})$ $t(-1, \theta_{a}/\theta_{a}))^{*}(V_{ext}D^{2}/(4$ $I(-\theta_{a}/\theta_{a}))^{*}(V_{ext}D^{2}/(4$ $I(-\theta_{a}/\theta_{a}))^{*}(V_{ext}D^{2}/(4$ $I(-\theta_{a}/\theta_{a}))^{*}(V_{ext}D^{2}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}($	10 ft Interva I.Ht to Top of Jet -z,) ² } ¹³ / a V _{plume} *a ² *λ ²)) ^{1/2)} x z ^(-1/2)
500.0 119.37 19.068 1.02 302.50 550.0 134.61 21.506 0.96 302.44 600.0 149.85 23.945 0.92 302.40 700.0 180.33 28.822 0.85 302.37 800.0 241.29 38.575 0.76 302.30 900.0 241.29 38.575 0.76 302.20 1000.0 271.77 43.452 0.73 302.29 1100.0 302.25 48.329 0.70 302.27 1200.0 332.73 53.206 0.68 302.25 1400.0 393.69 62.959 0.64 302.25 1400.0 393.69 62.959 0.64 302.25 1500.0 424.17 67.836 0.62 302.24 2000.0 576.57 92.20 0.56 302.23 300.0 7881.37 140.988 0.49 302.22 3000.0 881.37 140.988 0.49 302.22 3000.0 881.37 140.988 0.49 302.22 <td>Height (feet) above ground Stack.Rel.Ht = 108.4 110.0 120.0 140.0 Top of Single jet = 144.0 152.8 160.0 170.0 180.0 120.0 200.0 210.0 250.0 350.0</td> <td>(meters) above stack 0.00 0.50 3.54 6.59 9.64 10.86 13.56 15.74 18.78 21.83 24.88 27.93 30.98 43.17 58.41 73.65</td> <td>Plume Radius(m) 0.869 0.908 1.152 1.396 1.640 1.737 2.138 2.487 2.975 3.462 3.950 4.438 4.925 6.876 9.314 11.753</td> <td>SingleStk VertVel(m/s) 12.90 11.04 9.19 7.34 6.60 5.30 4.58 3.87 3.36 2.98 2.69 2.46 1.88 1.51 1.31</td> <td>Plume Temp(K) 306.56 305.78 305.26 304.74 304.36 304.07 303.85 303.66 303.19 302.87</td> <td>jet phase: Jet Pha Linearly ir Spillano V_{plame}={(V a = 0.16 θ_p=θ₀(1- CEC st V_{mp}=π^{0.25} Brigg's V_{bingy} = (;</td> <td>se Eqs: therpolated from Stack Re a Equations: $a_{1,3}^{3+0.12F_{a}}(z-z_{s})^{2}-(6.25D)$ $z(z-z_{s})$ $t(-1, \theta_{a}/\theta_{a}))^{*}(V_{ext}D^{2}/(4$ $I(-\theta_{a}/\theta_{a}))^{*}(V_{ext}D^{2}/(4$ $I(-\theta_{a}/\theta_{a}))^{*}(V_{ext}D^{2}/(4$ $I(-\theta_{a}/\theta_{a}))^{*}(V_{ext}D^{2}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}($</td> <td>10 ft Interva I.Ht to Top of Jet -z,)²}¹³ / a V_{plume}*a²*λ²)) ^{1/2)} x z^(-1/2)</td>	Height (feet) above ground Stack.Rel.Ht = 108.4 110.0 120.0 140.0 Top of Single jet = 144.0 152.8 160.0 170.0 180.0 120.0 200.0 210.0 250.0 350.0	(meters) above stack 0.00 0.50 3.54 6.59 9.64 10.86 13.56 15.74 18.78 21.83 24.88 27.93 30.98 43.17 58.41 73.65	Plume Radius(m) 0.869 0.908 1.152 1.396 1.640 1.737 2.138 2.487 2.975 3.462 3.950 4.438 4.925 6.876 9.314 11.753	SingleStk VertVel(m/s) 12.90 11.04 9.19 7.34 6.60 5.30 4.58 3.87 3.36 2.98 2.69 2.46 1.88 1.51 1.31	Plume Temp(K) 306.56 305.78 305.26 304.74 304.36 304.07 303.85 303.66 303.19 302.87	jet phase: Jet Pha Linearly ir Spillano V _{plame} ={(V a = 0.16 θ _p =θ ₀ (1- CEC st V _{mp} =π ^{0.25} Brigg's V _{bingy} = (;	se Eqs: therpolated from Stack Re a Equations: $a_{1,3}^{3+0.12F_{a}}(z-z_{s})^{2}-(6.25D)$ $z(z-z_{s})$ $t(-1, \theta_{a}/\theta_{a}))^{*}(V_{ext}D^{2}/(4$ $I(-\theta_{a}/\theta_{a}))^{*}(V_{ext}D^{2}/(4$ $I(-\theta_{a}/\theta_{a}))^{*}(V_{ext}D^{2}/(4$ $I(-\theta_{a}/\theta_{a}))^{*}(V_{ext}D^{2}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}($	10 ft Interva I.Ht to Top of Jet -z,) ² } ¹³ / a V _{plume} *a ² *λ ²)) ^{1/2)} x z ^(-1/2)
550.0 134.61 21.506 0.96 302.44 600.0 149.85 23.945 0.92 302.40 700.0 180.33 28.822 0.85 302.37 800.0 210.81 33.698 0.80 302.33 900.0 241.29 38.575 0.76 302.30 1000.0 271.77 43.452 0.73 302.29 1100.0 302.25 48.329 0.70 302.27 1200.0 332.73 53.206 0.68 302.25 1300.0 363.21 56.082 0.66 302.25 1400.0 393.69 62.959 0.64 302.25 1500.0 424.17 67.836 0.62 302.24 2000.0 576.57 92.220 0.56 302.23 3000.0 881.37 140.988 0.49 302.22 3000.0 881.37 140.988 0.49 302.22 3000.0 881.37 140.988 0.49 302.22	Height (feet) above ground Stack.Rel.Ht = 108.4 110.0 120.0 130.0 140.0 Top of Single jet = 144.0 152.8 160.0 170.0 180.0 200.0 210.0 250.0 300.0 350.0 350.0	(meters) above stack 0.00 0.50 3.54 6.59 9.64 10.86 13.56 15.74 18.78 21.83 24.88 27.93 30.98 43.17 58.41 73.65 88.89	Plume Radius(m) 0.869 0.908 1.152 1.396 1.640 1.737 2.138 2.487 2.975 3.462 3.950 4.438 4.925 6.876 9.314 11.753 14.191	SingleStk VertVel(m/s) 12.90 11.04 9.19 7.34 6.60 5.30 4.58 3.87 3.36 2.98 2.69 2.46 1.88 1.51 1.31	Plume Temp(K) 306.56 305.78 305.26 304.74 304.36 304.07 303.85 303.66 303.19 302.87 302.69	jet phase: Jet Pha Linearly ir Spillano V _{plame} ={(V a = 0.16 θ _p =θ ₀ (1- CEC st V _{mp} =π ^{0.25} Brigg's V _{bingy} = (;	se Eqs: therpolated from Stack Re a Equations: $a_{1,3}^{3+0.12F_{a}}(z-z_{s})^{2}-(6.25D)$ $z(z-z_{s})$ $t(-1, \theta_{a}/\theta_{a}))^{*}(V_{ext}D^{2}/(4$ $I(-\theta_{a}/\theta_{a}))^{*}(V_{ext}D^{2}/(4$ $I(-\theta_{a}/\theta_{a}))^{*}(V_{ext}D^{2}/(4$ $I(-\theta_{a}/\theta_{a}))^{*}(V_{ext}D^{2}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}($	10 ft Interva I.Ht to Top of Jet -z,) ² } ¹³ / a V _{plume} *a ² *λ ²)) ^{1/2)} x z ^(-1/2)
600.0 149.85 23.945 0.92 302.40 700.0 180.33 28.822 0.85 302.37 800.0 210.81 33.698 0.80 302.33 900.0 241.29 38.575 0.76 302.30 1000.0 271.77 43.452 0.73 302.29 1100.0 302.25 48.329 0.70 302.27 1200.0 332.73 53.206 0.68 302.26 1300.0 363.21 58.082 0.66 302.25 1400.0 393.69 62.959 0.64 302.25 1400.0 393.69 62.959 0.68 302.26 1400.0 393.69 62.959 0.64 302.25 1500.0 424.17 67.836 0.62 302.24 2000.0 76.57 92.220 0.56 302.23 3000.0 881.37 140.988 0.49 302.22 3000.0 881.37 140.988 0.49 302.22 3500.0 1033.77 165.372 0.46 302.22 <	Height (feet) above ground Stack.Rel.Ht = 108.4 110.0 120.0 130.0 140.0 Top of Single jet = 144.0 152.8 160.0 170.0 180.0 200.0 210.0 250.0 300.0 300.0 300.0 450.0	(meters) above stack 0.00 3.54 6.59 9.64 10.86 13.56 15.74 18.78 21.83 24.88 27.93 30.98 43.17 58.41 73.65 88.89 104.13	Plume Radius(m) 0.869 0.908 1.152 1.396 1.640 1.737 2.138 2.487 2.975 3.462 3.950 4.438 4.925 6.876 9.314 11.753 14.191 16.630	SingleStk VertVel(m/s) 12.90 11.04 9.19 7.34 6.60 5.30 4.58 3.87 3.36 2.98 2.69 2.46 1.88 1.51 1.31 1.31	Plume Temp(K) 306.56 305.78 305.26 304.74 304.36 304.07 303.85 303.66 303.19 302.87 302.69 302.58	jet phase: Jet Pha Linearly ir Spillano V _{plame} ={(V a = 0.16 θ _p =θ ₀ (1- CEC st V _{mp} =π ^{0.25} Brigg's V _{bingy} = (;	se Eqs: therpolated from Stack Re a Equations: $a_{1,3}^{3+0.12F_{a}}(z-z_{s})^{2}-(6.25D)$ $z(z-z_{s})$ $t(-1, \theta_{a}/\theta_{a}))^{*}(V_{ext}D^{2}/(4$ $I(-\theta_{a}/\theta_{a}))^{*}(V_{ext}D^{2}/(4$ $I(-\theta_{a}/\theta_{a}))^{*}(V_{ext}D^{2}/(4$ $I(-\theta_{a}/\theta_{a}))^{*}(V_{ext}D^{2}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}($	10 ft Interva I.Ht to Top of Jet -z,) ² } ¹³ / a V _{plume} *a ² *λ ²)) ^{1/2)} x z ^(-1/2)
800.0 210.81 33.698 0.80 302.33 100 ft Interv 900.0 241.29 38.575 0.76 302.30 1000.0 271.77 43.452 0.73 302.29 1100.0 302.25 48.329 0.70 302.27 1200.0 332.73 53.206 0.68 302.26 1300.0 363.21 58.082 0.66 302.25 1400.0 393.69 62.959 0.64 302.25 1500.0 424.17 67.836 0.62 302.24 2000.0 576.57 92.20 0.56 302.24 2000.0 576.57 92.20 0.56 302.24 2000.0 576.57 92.20 0.56 302.24 2000.0 576.57 92.20 0.56 302.24 2000.0 576.57 92.20 0.56 302.24 3000.0 881.37 140.988 0.49 302.22 3000.0 1033.77 165.372 0.46 302.22	Height (feet) above ground Stack.Rel.Ht = 108.4 110.0 120.0 130.0 130.0 140.0 Top of Single jet = 144.0 152.8 160.0 1770.0 180.0 200.0 210.0 250.0 350.0 400.0 450.0 500.0	(meters) above stack 0.00 3.54 4.6.59 9.64 10.86 13.56 15.74 18.78 21.83 24.88 27.93 30.98 43.17 58.41 73.65 88.89 104.13 119.37	Plume Radius(m) 0.869 0.908 1.152 1.396 1.640 1.737 2.138 2.487 2.975 3.462 3.950 4.438 4.925 6.876 9.314 11.753 14.191 16.630 19.068	SingleStk VertVel(m/s) 12.90 11.04 9.19 7.34 6.60 5.30 4.58 3.87 3.36 2.98 2.69 2.46 1.88 1.51 1.31 1.31 1.31 1.31 1.31	Plume Temp(K) 306.56 305.78 305.26 304.74 304.36 304.07 303.85 303.66 303.19 302.87 302.68 302.58	jet phase: Jet Pha Linearly ir Spillano V _{plame} ={(V a = 0.16 θ _p =θ ₀ (1- CEC st V _{mp} =π ^{0.25} Brigg's V _{bingy} = (;	se Eqs: therpolated from Stack Re a Equations: $a_{1,3}^{3+0.12F_{a}}(z-z_{s})^{2}-(6.25D)$ $z(z-z_{s})$ $t(-1, \theta_{a}/\theta_{a}))^{*}(V_{ext}D^{2}/(4$ $I(-\theta_{a}/\theta_{a}))^{*}(V_{ext}D^{2}/(4$ $I(-\theta_{a}/\theta_{a}))^{*}(V_{ext}D^{2}/(4$ $I(-\theta_{a}/\theta_{a}))^{*}(V_{ext}D^{2}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}($	10 ft Interva I.Ht to Top of Jet -z,) ² } ¹³ / a V _{plume} *a ² *λ ²))) ^{1/2)} x z ^(-1/2)
900.0 241.29 38.575 0.76 302.30 1000.0 271.77 43.452 0.73 302.29 1100.0 302.25 48.329 0.70 302.27 1200.0 332.73 53.206 0.68 302.26 1300.0 363.21 58.082 0.66 302.25 1400.0 393.69 62.959 0.64 302.25 1500.0 424.17 67.836 0.62 302.24 2000.0 576.57 92.220 0.56 302.24 2000.0 576.57 92.220 0.56 302.24 2500.0 728.97 116.604 0.52 302.23 3000.0 881.37 140.988 0.49 302.22 3500.0 1033.77 165.372 0.46 302.22	Height (feet) above ground Stack.Rel.Ht = 108.4 110.0 120.0 130.0 140.0 Top of Single jet = 144.0 152.8 160.0 170.0 180.0 2200.0 210.0 250.0 300.0 350.0 400.0	(meters) above stack 0.00 0.50 3.54 10.86 13.56 15.74 18.78 21.83 24.88 27.93 30.98 43.17 58.41 73.65 88.89 104.13 119.37 134.61	Plume Radius(m) 0.869 0.908 1.152 1.396 1.640 1.737 2.138 2.487 2.975 3.462 3.950 4.438 4.925 6.876 9.314 11.753 14.191 16.630 19.068 21.506	SingleStk VertVel(m/s) 12.90 11.04 9.19 7.34 6.60 5.30 4.58 3.87 3.36 2.98 2.69 2.46 1.88 1.51 1.31 1.18 1.08 1.02 0.96	Plume Temp(K) 306.56 305.78 305.26 304.74 304.36 304.07 303.85 303.66 303.19 302.87 302.69 302.50 302.44	jet phase: Jet Pha Linearly ir Spillano V _{plame} ={(V a = 0.16 θ _p =θ ₀ (1- CEC st V _{mp} =π ^{0.25} Brigg's V _{bingy} = (;	se Eqs: therpolated from Stack Re a Equations: $a_{1,3}^{3+0.12F_{a}}(z-z_{s})^{2}-(6.25D)$ $z(z-z_{s})$ $t(-1, \theta_{a}/\theta_{a}))^{*}(V_{ext}D^{2}/(4$ $I(-\theta_{a}/\theta_{a}))^{*}(V_{ext}D^{2}/(4$ $I(-\theta_{a}/\theta_{a}))^{*}(V_{ext}D^{2}/(4$ $I(-\theta_{a}/\theta_{a}))^{*}(V_{ext}D^{2}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}($	10 ft Interva I.Ht to Top of Jet -z,) ² } ¹³ / a V _{plume} *a ² *λ ²))) ^{1/2)} x z ^(-1/2)
1000.0 271.77 43.452 0.73 302.29 1100.0 302.25 48.329 0.70 302.27 1200.0 332.73 53.206 0.68 302.26 1300.0 363.21 58.082 0.66 302.25 1400.0 393.69 62.959 0.64 302.25 1500.0 424.17 67.836 0.56 302.24 2000.0 576.57 92.20 0.56 302.23 300.0 881.37 140.988 0.49 302.22 3000.0 881.37 140.988 0.49 302.22 3500.0 1033.77 165.372 0.46 302.22	Height (feet) above ground Stack.Rel.Ht = 108.4 110.0 120.0 130.0 Top of Single jet = 144.0 152.8 160.0 170.0 180.0 200.0 210.0 250.0 300.0 350.0 400.0 550.0	(meters) above stack 0.00 0.50 3.54 6.59 9.64 13.56 13.56 15.74 18.78 21.83 24.88 27.93 30.98 43.17 58.41 73.65 88.89 104.13 119.37 134.61	Plume Radius(m) 0.869 0.908 1.152 1.396 1.640 1.737 2.138 2.487 2.975 3.462 3.950 4.438 4.925 6.876 9.314 11.753 14.191 16.630 19.068 21.506 23.945	SingleStk VertVel(m/s) 12.90 11.04 9.19 7.34 6.60 5.30 4.58 3.87 3.36 2.98 2.66 1.88 1.51 1.31 1.31 1.18 1.02 0.96 0.92	Plume Temp(K) 306.56 305.78 305.26 304.74 304.36 303.85 303.86 303.19 302.87 302.69 302.58 302.58 302.50 302.244 302.40	jet phase: Jet Pha Linearly ir Spillano V _{plame} ={(V a = 0.16 θ _p =θ ₀ (1- CEC st V _{mp} =π ^{0.25} Brigg's V _{bingy} = (;	se Eqs: therpolated from Stack Re a Equations: $a_{1,3}^{3+0.12F_{a}}(z-z_{s})^{2}-(6.25D)$ $z(z-z_{s})$ $t(-1, \theta_{a}/\theta_{a}))^{*}(V_{ext}D^{2}/(4$ $I(-\theta_{a}/\theta_{a}))^{*}(V_{ext}D^{2}/(4$ $I(-\theta_{a}/\theta_{a}))^{*}(V_{ext}D^{2}/(4$ $I(-\theta_{a}/\theta_{a}))^{*}(V_{ext}D^{2}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}($	10 ft Interva I.Ht to Top of Jet -z,) ² } ¹³ / a V _{plume} *a ² *λ ²))) ^{1/2)} x z ^(-1/2)
1100.0 302.25 48.329 0.70 302.27 1200.0 332.73 53.206 0.68 302.26 1300.0 363.21 58.082 0.66 302.25 1400.0 393.69 62.959 0.64 302.25 1500.0 424.17 67.836 0.62 302.24 2000.0 576.57 92.20 0.56 302.24 2500.0 728.97 116.604 0.52 302.23 3000.0 881.37 140.988 0.49 302.22 3500.0 1033.77 165.372 0.46 302.22	Height (feet) above ground Stack.Rel.Ht = 108.4 110.0 120.0 140.0 Top of Single jet = 144.0 152.8 160.0 1700.0 2000.0 2110.0 250.0 3000.0 350.0 400.0 450.0 5550.0 6000.0	(meters) above stack 0.00 0.50 9.64 10.86 13.56 15.74 18.78 21.83 24.88 27.93 30.98 43.17 58.41 73.65 88.89 104.13 119.37 134.61 149.85 180.33	Plume Radius(m) 0.869 0.908 1.152 1.396 1.640 1.737 2.138 2.487 2.975 3.462 3.950 4.438 4.925 6.876 9.314 11.753 14.191 16.630 19.068 21.506 23.945 28.822	SingleStk VertVel(m/s) 13.20 12.90 11.04 9.19 7.34 6.60 5.30 4.58 3.87 3.36 2.98 2.69 2.46 1.88 1.51 1.31 1.18 1.08 1.02 0.96 0.92 0.92 0.85 0.80	Plume Temp(K) 306.56 305.78 305.26 304.74 304.36 304.07 303.85 303.66 303.19 302.87 302.69 302.58 302.50 302.44 302.50 302.40	jet phase: Jet Pha Linearly ir Spillano V _{plame} ={(V a = 0.16 θ _p =θ ₀ (1- CEC st V _{mp} =π ^{0.25} Brigg's V _{bingy} = (;	se Eqs: therpolated from Stack Re a Equations: $a_{1,3}^{3+0.12F_{a}}(z-z_{s})^{2}-(6.25D)$ $z(z-z_{s})$ $t(-1, \theta_{a}/\theta_{a}))^{*}(V_{ext}D^{2}/(4$ $I(-\theta_{a}/\theta_{a}))^{*}(V_{ext}D^{2}/(4$ $I(-\theta_{a}/\theta_{a}))^{*}(V_{ext}D^{2}/(4$ $I(-\theta_{a}/\theta_{a}))^{*}(V_{ext}D^{2}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}($	10 ft Interva I.H to Top of Jet $+z_{v})^{2}$ ^{1/3} / a $V_{plume} *a^{2} *\lambda^{2})))$ 1 ⁽²⁾ x z ^(-1/2) 50 ft Interva
1200.0 332.73 53.206 0.68 302.26 1300.0 363.21 58.082 0.66 302.25 1400.0 393.69 62.959 0.64 302.25 1500.0 424.17 67.836 0.62 302.24 2000.0 576.57 92.220 0.56 302.23 3000.0 881.37 140.988 0.49 302.22 3500.0 1033.77 165.372 0.46 302.22	Height (feet) above ground Stack.Rel.Ht = 108.4 110.0 120.0 130.0 140.0 Top of Single jet = 144.0 152.8 160.0 170.0 200.0 210.0 250.0 3300.0 3350.0 3400.0 400.0 450.0 550.0 6000.0 550.0 800.0	(meters) above stack 0.00 0.50 3.54 6.59 9.64 10.86 13.56 15.74 18.78 21.83 24.88 27.93 30.98 43.17 58.41 73.65 88.89 104.13 119.37 134.61 149.85 5180.33 210.81	Plume Radius(m) 0.869 0.908 1.152 1.396 1.640 1.737 2.138 2.487 2.975 3.462 3.950 4.438 4.925 6.876 9.314 11.753 14.191 16.630 19.068 21.506 23.945 28.822 33.698	SingleStk VertVel(m/s) 13.20 12.90 11.04 9.19 7.34 6.60 5.30 4.58 3.87 3.36 2.98 2.69 2.46 1.88 1.51 1.31 1.18 1.08 1.02 0.96 0.92 0.92 0.85 0.80	Plume Temp(K) 306.56 305.78 305.26 304.74 304.36 304.07 303.85 303.66 303.19 302.69 302.58 302.50 302.44 302.40 302.27 302.33	jet phase: Jet Pha Linearly ir Spillano V _{plame} ={(V a = 0.16 θ _p =θ ₀ (1- CEC st V _{mp} =π ^{0.25} Brigg's V _{bingy} = (;	se Eqs: therpolated from Stack Re a Equations: $a_{1,3}^{3+0.12F_{a}}(z-z_{s})^{2}-(6.25D)$ $z(z-z_{s})$ $t(-1, \theta_{a}/\theta_{a}))^{*}(V_{ext}D^{2}/(4$ $I(-\theta_{a}/\theta_{a}))^{*}(V_{ext}D^{2}/(4$ $I(-\theta_{a}/\theta_{a}))^{*}(V_{ext}D^{2}/(4$ $I(-\theta_{a}/\theta_{a}))^{*}(V_{ext}D^{2}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}($	10 ft Interva I.H to Top of Jet $+z_{v})^{2}$ ^{1/3} / a $V_{plume} *a^{2} *\lambda^{2})))$ 1 ⁽²⁾ x z ^(-1/2) 50 ft Interva
1300.0 363.21 58.082 0.66 302.25 1400.0 393.69 62.959 0.64 302.25 1500.0 424.17 67.836 0.62 302.24 2000.0 576.57 92.220 0.56 302.24 2500.0 728.97 116.604 0.52 302.23 3000.0 881.37 140.988 0.49 302.22 3500.0 1033.77 165.372 0.46 302.22	Height (feet) above ground Stack.Rel.Ht = 108.4 1110.0 120.0 130.0 140.0 Top of Single jet = 144.0 152.8 160.0 170.0 180.0 200.0 210.0 250.0 300.0 3050.0	(meters) above stack 0.00 3.54 6.59 9.64 10.86 13.56 15.74 18.78 21.83 24.88 27.93 30.98 43.17 58.41 73.65 88.89 104.13 119.37 134.61 149.85 180.33 2(0.81) 241.29	Plume Radius(m) 0.869 0.908 1.152 1.396 1.640 1.737 2.138 2.487 2.975 3.462 3.950 4.438 4.925 6.876 9.314 11.753 14.191 16.630 19.068 21.506 23.945 28.822 33.698 38.575	SingleStk VertVel(m/s) 13.20 12.90 11.04 9.19 7.34 6.60 5.30 4.58 3.87 3.87 3.86 2.98 2.69 2.46 1.88 1.51 1.31 1.31 1.31 1.31 1.31 1.31 1.31	Plume Temp(K) 306.56 305.78 305.26 304.74 304.36 304.07 303.85 303.66 303.19 302.87 302.69 302.58 302.50 302.44 302.40 302.37 302.33 302.33	jet phase: Jet Pha Linearly ir Spillano V _{plame} ={(V a = 0.16 θ _p =θ ₀ (1- CEC st V _{mp} =π ^{0.25} Brigg's V _{bingy} = (;	se Eqs: therpolated from Stack Re a Equations: $a_{1,3}^{3+0.12F_{a}}(z-z_{s})^{2}-(6.25D)$ $z(z-z_{s})$ $t(-1, \theta_{a}/\theta_{a}))^{*}(V_{ext}D^{2}/(4$ $I(-\theta_{a}/\theta_{a}))^{*}(V_{ext}D^{2}/(4$ $I(-\theta_{a}/\theta_{a}))^{*}(V_{ext}D^{2}/(4$ $I(-\theta_{a}/\theta_{a}))^{*}(V_{ext}D^{2}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}($	10 ft Interva I.H to Top of Jet $+z_{v})^{2}$ ^{1/3} / a $V_{plume} *a^{2} *\lambda^{2})))$ 1 ⁽²⁾ x z ^(-1/2) 50 ft Interva
1400.0 393.69 62.959 0.64 302.25 1500.0 424.17 67.836 0.62 302.24 2000.0 576.57 92.220 0.56 302.24 2500.0 728.97 116.604 0.52 302.23 3000.0 881.37 140.988 0.49 302.22 3500.0 1033.77 165.372 0.46 302.22	Height (feet) above ground Stack.Rel.Ht = 108.4 110.0 120.0 130.0 130.0 140.0 Top of Single jet = 144.0 152.8 160.0 170.0 180.0 200.0 210.0 250.0 300.0 350.0 400.0 550.0 600.0 10	(meters) above stack 0.00 3.54 4.6.59 9.64 10.86 13.56 15.74 18.78 21.83 24.88 27.93 30.98 43.17 58.41 73.65 88.89 104.13 119.37 134.61 149.85 3180.33 210.81 241.29 271.77 302.25	Plume Radius(m) 0.869 0.908 1.152 1.396 1.640 1.737 2.138 2.487 2.975 3.462 3.950 4.438 4.925 6.876 9.314 11.753 14.191 16.630 19.068 21.506 23.945 28.822 33.698 38.575 43.452 48.329	SingleStk VertVel(m/s) 12.90 11.04 9.19 7.34 6.60 5.30 4.58 3.87 3.36 2.98 2.69 2.46 1.88 1.51 1.31 1.18 1.02 0.96 0.92 0.85 0.80 0.73 0.70	Plume Temp(K) 306.56 305.78 305.26 304.74 304.36 304.07 303.85 303.66 303.19 302.87 302.69 302.58 302.50 302.44 302.40 302.27 302.33 302.30 302.29 302.27	jet phase: Jet Pha Linearly ir Spillano V _{plame} ={(V a = 0.16 θ _p =θ ₀ (1- CEC st V _{mp} =π ^{0.25} Brigg's V _{bingy} = (;	se Eqs: therpolated from Stack Re a Equations: $a_{1,3}^{3+0.12F_{a}}(z-z_{s})^{2}-(6.25D)$ $z(z-z_{s})$ $t(-1, \theta_{a}/\theta_{a}))^{*}(V_{ext}D^{2}/(4$ $I(-\theta_{a}/\theta_{a}))^{*}(V_{ext}D^{2}/(4$ $I(-\theta_{a}/\theta_{a}))^{*}(V_{ext}D^{2}/(4$ $I(-\theta_{a}/\theta_{a}))^{*}(V_{ext}D^{2}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}($	10 ft Interva I.H to Top of Jet $+z_{v})^{2}$ ^{1/3} / a $V_{plume} *a^{2} *\lambda^{2})))$ 1 ⁽²⁾ x z ^(-1/2) 50 ft Interva
1500.0 424.17 67.836 0.62 302.24 2000.0 576.57 92.220 0.56 302.24 2500.0 728.97 116.604 0.52 302.23 3000.0 881.37 140.988 0.49 302.22 3500.0 1033.77 165.372 0.46 302.22	Height (feet) above ground Stack.Rel.Ht = 108.4 110.0 120.0 130.0 140.0 Top of Single jet = 144.0 152.8 160.0 170.0 180.0 190.0 200.0 210.0 250.0 350.0 350.0 350.0 400.0 3550.0 3550.0 300.0 100.0	(meters) above stack 0.00 0.50 3.54 6.59 9.64 10.86 13.56 15.74 18.78 21.83 24.88 27.93 30.98 43.17 58.41 73.65 88.89 104.13 119.37 134.61 149.85 180.33 210.81 241.29 271.77 302.25 332.73	Plume Radius(m) 0.869 0.908 1.152 1.396 1.640 1.737 2.138 2.487 2.975 3.462 3.950 4.438 4.925 6.876 9.314 11.753 14.191 16.630 19.068 21.506 23.945 28.822 33.698 38.575 43.3452 48.329 53.206	SingleStk VertVel(m/s) 13.20 12.90 11.04 9.19 7.34 6.60 5.30 4.58 3.87 3.36 2.98 2.46 1.88 1.51 1.31 1.18 1.08 1.02 0.96 0.92 0.96 0.92 0.85 0.80 0.73 0.73 0.70 0.68	Plume Temp(K) 306.56 305.78 305.26 304.74 304.36 304.07 303.85 303.66 303.19 302.87 302.69 302.58 302.58 302.50 302.244 302.40 302.27 302.33 302.20	jet phase: Jet Pha Linearly ir Spillano V _{plame} ={(V a = 0.16 θ _p =θ ₀ (1- CEC st V _{mp} =π ^{0.25} Brigg's V _{bingy} = (;	se Eqs: therpolated from Stack Re a Equations: $a_{1,3}^{3+0.12F_{a}}(z-z_{s})^{2}-(6.25D)$ $z(z-z_{s})$ $t(-1, \theta_{a}/\theta_{a}))^{*}(V_{ext}D^{2}/(4$ $I(-\theta_{a}/\theta_{a}))^{*}(V_{ext}D^{2}/(4$ $I(-\theta_{a}/\theta_{a}))^{*}(V_{ext}D^{2}/(4$ $I(-\theta_{a}/\theta_{a}))^{*}(V_{ext}D^{2}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}($	10 ft Interva I.H to Top of Jet x_{2} , y_{2} , x_{3} , x_{4} , x_{2} , y_{2} , y_{2} , y_{2} , x_{4} , x_{2} , y_{2} , $y_{$
2000.0 576.57 92.220 0.56 302.24 500 ft Interv 2500.0 728.97 116.604 0.52 302.23 3000.0 881.37 140.988 0.49 302.22 3500.0 1033.77 165.372 0.46 302.22	Height (feet) above ground Stack.Rel.Ht = 108.4 110.0 120.0 130.0 140.0 Top of Single jet = 144.0 152.8 160.0 170.0 200.0 210.0 200.0 210.0 250.0 30	(meters) above stack 0.00 3.54 6.59 9.64 10.86 13.56 15.74 18.78 21.83 24.83 27.93 30.98 43.17 58.41 73.65 88.89 104.13 119.37 134.61 149.85 180.33 210.81 241.29 271.77 302.25 332.73 363.21	Plume Radius(m) 0.869 0.908 1.152 1.396 1.640 1.737 2.138 2.487 2.975 3.462 3.950 4.438 4.925 6.876 9.314 11.753 14.191 16.630 19.068 21.506 23.945 28.822 33.698 38.575 43.452 48.329 53.206 58.082	SingleStk VertVel(m/s) 13.20 12.90 11.04 9.19 7.34 6.60 5.30 4.58 3.87 3.36 2.98 2.69 2.46 1.88 1.51 1.31 1.18 1.02 0.96 0.92 0.85 0.80 0.76 0.73 0.70 0.688 0.66	Plume Temp(K) 306.56 305.78 305.26 304.74 304.36 304.07 303.85 303.66 303.19 302.87 302.69 302.58 302.50 302.44 302.20 302.23 302.20 302.22 302.22 302.22	jet phase: Jet Pha Linearly ir Spillano V _{plame} ={(V a = 0.16 θ _p =θ ₀ (1- CEC st V _{mp} =π ^{0.25} Brigg's V _{bingy} = (;	se Eqs: therpolated from Stack Re a Equations: $a_{1,3}^{3+0.12F_{a}}(z-z_{s})^{2}-(6.25D)$ $z(z-z_{s})$ $t(-1, \theta_{a}/\theta_{a}))^{*}(V_{ext}D^{2}/(4$ $I(-\theta_{a}/\theta_{a}))^{*}(V_{ext}D^{2}/(4$ $I(-\theta_{a}/\theta_{a}))^{*}(V_{ext}D^{2}/(4$ $I(-\theta_{a}/\theta_{a}))^{*}(V_{ext}D^{2}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}($	10 ft Interva I.H to Top of Jet x_{2} , y_{2} , x_{3} , x_{4} , x_{2} , y_{2} , y_{2} , y_{2} , x_{4} , x_{2} , y_{2} , $y_{$
2500.0 728.97 116.604 0.52 302.23 3000.0 881.37 140.988 0.49 302.22 3500.0 1033.77 165.372 0.46 302.22	Height (feet) above ground Stack.Rel.Ht = 108.4 110.0 120.0 130.0 140.0 Top of Single jet = 144.0 152.8 160.0 170.0 200.0 210.0 200.0 210.0 250.0 3050.0 3050.0 5550.0 6000.0 5550.0 1000.0 1	(meters) above stack 0.00 0.50 3.54 6.59 9.64 10.86 13.56 15.74 18.78 21.83 24.88 27.93 30.98 43.17 58.41 73.65 88.89 104.13 119.37 134.61 149.85 5180.33 210.81 241.29 271.77 302.25 332.73 363.21 393.69	Plume Radius(m) 0.869 0.908 1.152 1.396 1.640 1.737 2.138 2.487 2.975 3.462 3.950 4.438 4.925 6.876 9.314 11.753 14.191 16.630 19.068 21.506 23.945 28.822 33.698 38.575 43.452 43.452 48.329 53.206 58.082 62.959	SingleStk VertVel(m/s) 13.20 12.90 11.04 9.19 7.34 6.60 5.30 4.58 3.87 3.36 2.98 2.69 2.46 1.88 1.51 1.31 1.18 1.08 1.02 0.96 0.92 0.92 0.92 0.92 0.92 0.92 0.92 0.92	Plume Temp(K) 306.56 305.78 305.26 304.74 304.36 304.07 303.85 303.66 303.19 302.69 302.58 302.69 302.58 302.20 302.44 302.40 302.27 302.23 302.25 302.25	jet phase: Jet Pha Linearly ir Spillano V _{plame} ={(V a = 0.16 θ _p =θ ₀ (1- CEC st V _{mp} =π ^{0.25} Brigg's V _{bingy} = (;	se Eqs: therpolated from Stack Re a Equations: $a_{1,3}^{3+0.12F_{a}}(z-z_{s})^{2}-(6.25D)$ $z(z-z_{s})$ $t(-1, \theta_{a}/\theta_{a}))^{*}(V_{ext}D^{2}/(4$ $I(-\theta_{a}/\theta_{a}))^{*}(V_{ext}D^{2}/(4$ $I(-\theta_{a}/\theta_{a}))^{*}(V_{ext}D^{2}/(4$ $I(-\theta_{a}/\theta_{a}))^{*}(V_{ext}D^{2}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}($	10 ft Interva I.H to Top of Jet $+z_{2}$) ²) ^{3/3} / a $V_{plume} *a^{2} *\lambda^{2}$))) ^{1/2)} x z ^(-1/2) 50 ft Interva
3000.0 881.37 140.988 0.49 302.22 3500.0 1033.77 165.372 0.46 302.22	Height (feet) above ground Stack.Rel.Ht = 108.4 110.0 120.0 130.0 140.0 Top of Single jet = 144.0 152.8 160.0 170.0 180.0 190.0 200.0 210.0 200.0 210.0 250.0 300	(meters) above stack 0.00 3.54 4.59 9.64 10.86 13.56 13.56 13.57 4.87 24.88 27.93 30.98 43.17 58.41 73.65 88.89 104.13 119.37 134.61 149.85 180.33 210.81 241.29 271.77 302.25 332.73 363.21 393.69 424.17	Plume Radius(m) 0.869 0.908 1.152 1.396 1.640 1.737 2.138 2.487 2.975 3.462 3.950 4.438 4.925 6.876 9.314 11.753 14.191 16.630 19.068 21.506 23.945 28.822 33.698 38.575 43.452 48.329 53.206 58.082 62.959 67.836	SingleStk VertVel(m/s) 13.20 12.90 11.04 9.19 7.34 6.60 5.30 4.58 3.87 2.69 2.46 1.88 1.51 1.31 1.31 1.31 1.31 1.31 1.31 1.31	Plume Temp(K) 306.56 305.78 305.26 304.74 304.36 304.07 303.85 303.66 303.19 302.69 302.58 302.69 302.58 302.20 302.44 302.40 302.27 302.23 302.25 302.25	jet phase: Jet Pha Linearly ir Spillano V _{plame} ={(V a = 0.16 θ _p =θ ₀ (1- CEC st V _{mp} =π ^{0.25} Brigg's V _{bingy} = (;	se Eqs: therpolated from Stack Re a Equations: $a_{1,3}^{3+0.12F_{a}}(z-z_{s})^{2}-(6.25D)$ $z(z-z_{s})$ $t(-1, \theta_{a}/\theta_{a}))^{*}(V_{ext}D^{2}/(4$ $I(-\theta_{a}/\theta_{a}))^{*}(V_{ext}D^{2}/(4$ $I(-\theta_{a}/\theta_{a}))^{*}(V_{ext}D^{2}/(4$ $I(-\theta_{a}/\theta_{a}))^{*}(V_{ext}D^{2}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}($	10 ft Interva I.H to Top of Jet $+z_{v})^{2}$ ^{1/3} / a $V_{plume} *a^{2} *\lambda^{2})))$ 1 ⁽²⁾ x z ^(-1/2) 50 ft Interva
3500.0 1033.77 165.372 0.46 302.2 <mark>2</mark>	Height (feet) above ground Stack.Rel.Ht = 108.4 110.0 120.0 130.0 140.0 Top of Single jet = 144.0 152.8 160.0 170.0 180.0 200.0 210.0 250.0 300.0 35	(meters) above stack 0.00 3.54 4.6.59 9.64 10.86 13.56 15.74 18.78 21.83 24.88 27.93 30.98 43.17 58.41 73.65 88.89 104.13 119.37 134.61 149.85 180.33 210.81 241.29 271.77 302.25 332.73 363.21 393.69 424.17	Plume Radius(m) 0.869 0.908 1.152 1.396 1.640 1.737 2.138 2.487 2.975 3.462 3.950 4.438 4.925 6.876 9.314 11.753 14.191 16.630 19.068 21.506 23.945 28.822 33.698 38.575 43.452 48.329 53.206 58.082 62.959 67.836 92.220	SingleStk VertVel(m/s) 13.20 12.90 11.04 9.19 7.34 6.60 5.30 4.58 3.87 3.36 2.98 2.69 2.46 1.88 1.51 1.31 1.31 1.31 1.31 1.31 1.31 1.32 0.96 0.92 0.85 0.80 0.70 0.68 0.64 0.62 0.56	Plume Temp(K) 306.56 305.78 305.26 304.74 304.36 304.07 303.85 303.66 303.19 302.87 302.69 302.58 302.50 302.44 302.40 302.37 302.30 302.29 302.27 302.25 302.24 302.25 302.24 302.24 302.24	jet phase: Jet Pha Linearly ir Spillano V _{plame} ={(V a = 0.16 θ _p =θ ₀ (1- CEC st V _{mp} =π ^{0.25} Brigg's V _{bingy} = (;	se Eqs: therpolated from Stack Re a Equations: $a_{1,3}^{3+0.12F_{a}}(z-z_{s})^{2}-(6.25D)$ $z(z-z_{s})$ $t(-1, \theta_{a}/\theta_{a}))^{*}(V_{ext}D^{2}/(4$ $I(-\theta_{a}/\theta_{a}))^{*}(V_{ext}D^{2}/(4$ $I(-\theta_{a}/\theta_{a}))^{*}(V_{ext}D^{2}/(4$ $I(-\theta_{a}/\theta_{a}))^{*}(V_{ext}D^{2}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}($	10 ft Interva Litt to Top of Jet $z_{2,j}^{1/3} / a$ $V_{plume}^* a^{2*} \lambda^2)))$ 50 ft Interva 100 ft Interva
	Height (feet) above ground Stack.Rel.Ht = 108.4 110.0 120.0 130.0 140.0 Top of Single jet = 144.0 152.8 160.0 170.0 180.0 200.0 210.0 250.0 300.0 35	(meters) above stack 0.00 3.54 4.6.59 9.64 10.86 13.56 15.74 18.78 21.83 24.88 27.93 30.98 43.17 58.41 73.65 88.89 104.13 119.37 134.61 149.85 180.33 210.81 241.29 271.77 302.25 332.73 363.21 393.69 424.17	Plume Radius(m) 0.869 0.908 1.152 1.396 1.640 1.737 2.138 2.487 2.975 3.462 3.950 4.438 4.925 6.876 9.314 11.753 14.191 16.630 19.068 21.506 23.945 28.822 33.698 38.575 43.452 48.329 53.206 58.082 62.959 67.836 92.220	SingleStk VertVel(m/s) 13.20 12.90 11.04 9.19 7.34 6.60 5.30 4.58 3.87 3.36 2.98 2.69 2.46 1.88 1.51 1.31 1.31 1.31 1.31 1.31 1.31 1.32 0.96 0.92 0.85 0.80 0.70 0.68 0.64 0.62 0.56	Plume Temp(K) 306.56 305.78 305.26 304.74 304.36 304.07 303.85 303.66 303.19 302.87 302.69 302.58 302.50 302.44 302.40 302.37 302.30 302.29 302.27 302.25 302.24 302.25 302.24 302.24 302.24	jet phase: Jet Pha Linearly ir Spillano V _{plame} ={(V a = 0.16 θ _p =θ ₀ (1- CEC st V _{mp} =π ^{0.25} Brigg's V _{bingy} = (;	se Eqs: therpolated from Stack Re a Equations: $a_{1,3}^{3+0.12F_{a}}(z-z_{s})^{2}-(6.25D)$ $z(z-z_{s})$ $t(-1, \theta_{a}/\theta_{a}))^{*}(V_{ext}D^{2}/(4$ $I(-\theta_{a}/\theta_{a}))^{*}(V_{ext}D^{2}/(4$ $I(-\theta_{a}/\theta_{a}))^{*}(V_{ext}D^{2}/(4$ $I(-\theta_{a}/\theta_{a}))^{*}(V_{ext}D^{2}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}($	10 ft Interva Litt to Top of Jet $z_{2,j}^{1/3} / a$ $V_{plume}^* a^{2*} \lambda^2)))$ 50 ft Interva 100 ft Interva
4000.0 1186.17 189.756 0.44 302.22	Height (feet) above ground Stack.Rel.Ht = 108.4 110.0 120.0 130.0 140.0 Top of Single jet = 144.0 152.8 1100.0 190.0 200.0 2110.0 250.0 300.0 300.0 400.0 400.0 450.0 5550.0 300.0 100.0	(meters) above stack 0.00 0.50 3.54 6.59 9.64 10.86 13.56 15.74 18.78 21.83 24.88 27.93 30.98 43.17 58.41 73.65 88.89 104.13 119.37 134.61 149.85 180.33 210.81 241.29 271.77 302.25 332.73 363.21 393.69 424.17 576.57 728.97 881.37	Plume Radius(m) 0.869 0.908 1.152 1.396 1.640 1.737 2.138 2.487 2.975 3.462 3.950 4.438 4.925 6.876 9.314 11.753 14.191 16.630 19.068 21.506 23.945 28.822 33.698 38.575 43.452 48.329 53.206 58.082 62.959 67.836 92.220 116.604	SingleStk VertVel(m/s) 12.90 11.04 9.19 7.34 6.60 5.30 4.58 2.69 2.46 1.88 1.51 1.31 1.31 1.18 1.02 0.96 0.92 0.85 0.80 0.76 0.73 0.70 0.68 0.64 0.64 0.62 0.65	Plume Temp(K) 306.56 305.78 305.26 304.74 304.36 303.65 303.66 303.19 302.87 302.69 302.58 302.50 302.24 302.20 302.24 302.23 302.20 302.27 302.26 302.25 302.25 302.25 302.24 302.25	jet phase: Jet Pha Linearly ir Spillano V _{plame} ={(V a = 0.16 θ _p =θ ₀ (1- CEC st V _{mp} =π ^{0.25} Brigg's V _{bingy} = (;	se Eqs: therpolated from Stack Re a Equations: $a_{1,3}^{3+0.12F_{a}}(z-z_{s})^{2}-(6.25D)$ $z(z-z_{s})$ $t(-1, \theta_{a}/\theta_{a}))^{*}(V_{ext}D^{2}/(4$ $I(-\theta_{a}/\theta_{a}))^{*}(V_{ext}D^{2}/(4$ $I(-\theta_{a}/\theta_{a}))^{*}(V_{ext}D^{2}/(4$ $I(-\theta_{a}/\theta_{a}))^{*}(V_{ext}D^{2}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}($	<mark>10 ft Interva</mark> I.Ht to Top of Jet -z,) ²]) ^{1/3} / a V _{plume} *a ² *λ ²)))
	Height (feet) above ground Stack.Rel.Ht = 108.4 110.0 120.0 130.0 140.0 Top of Single jet = 144.0 152.8 160.0 170.0 200.0 210.0 250.0 30	(meters) above stack 0.00 0.50 3.54 6.59 9.64 10.86 13.56 15.74 18.78 21.83 24.88 27.93 30.98 43.17 58.41 73.65 88.89 104.13 119.37 134.61 149.85 180.33 210.81 241.29 271.77 302.25 332.73 363.21 393.69 424.17 576.57 78.97 78.81.37	Plume Radius(m) 0.869 0.908 1.152 1.396 1.640 1.737 2.138 2.487 2.975 3.462 3.950 4.438 4.925 6.876 9.314 11.753 14.191 16.630 19.068 21.506 23.945 28.822 33.698 38.575 43.452 48.329 53.206 58.082 62.959 67.836 92.220 116.604	SingleStk VertVel(m/s) 13.20 12.90 11.04 9.19 7.34 6.60 5.30 4.58 3.87 3.36 2.98 2.46 1.88 1.51 1.31 1.18 1.02 0.96 0.92 0.85 0.80 0.73 0.92 0.85 0.80 0.73 0.73 0.70 0.68 0.66 0.64 0.62 0.52 0.52	Plume Temp(K) 306.56 305.78 305.26 304.74 304.36 304.07 303.85 303.66 303.19 302.87 302.69 302.58 302.40 302.40 302.27 302.26 302.22 302.22 302.22 302.22 302.22 302.22 302.22 302.22	jet phase: Jet Pha Linearly ir Spillano V _{plame} ={(V a = 0.16 θ _p =θ ₀ (1- CEC st V _{mp} =π ^{0.25} Brigg's V _{bingy} = (;	se Eqs: therpolated from Stack Re a Equations: $a_{1,3}^{3+0.12F_{a}}(z-z_{s})^{2}-(6.25D)$ $z(z-z_{s})$ $t(-1, \theta_{a}/\theta_{a}))^{*}(V_{ext}D^{2}/(4$ $I(-\theta_{a}/\theta_{a}))^{*}(V_{ext}D^{2}/(4$ $I(-\theta_{a}/\theta_{a}))^{*}(V_{ext}D^{2}/(4$ $I(-\theta_{a}/\theta_{a}))^{*}(V_{ext}D^{2}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}($	10 ft Interva Litt to Top of Jet $z_{2,j}^{1/3} / a$ $V_{plume}^* a^{2*} \lambda^2)))$ 50 ft Interva 100 ft Interva
	Height (feet) above ground Stack.Rel.Ht = 108.4 110.0 120.0 130.0 140.0 Top of Single jet = 144.0 152.8 160.0 170.0 200.0 210.0 250.0 30	(meters) above stack 0.00 0.50 3.54 10.86 13.56 15.74 18.78 21.83 24.88 27.93 30.98 43.17 58.41 73.65 88.89 104.13 119.37 134.61 149.85 332.73 332.21 332.73 363.21 393.69 424.17 576.57 7728.97 881.37 1033.77 1186.17	Plume Radius(m) 0.869 0.908 1.152 1.396 1.640 1.737 2.138 2.487 2.975 3.462 3.950 4.438 4.925 6.876 9.314 11.753 14.191 16.630 19.068 23.945 28.822 33.698 38.575 43.452 48.329 45.206 58.082 62.959 67.836 92.220 116.604 140.988 165.372	SingleStk VertVel(m/s) 13.20 12.90 11.04 9.19 7.34 6.60 5.30 4.58 3.87 3.36 2.98 2.69 2.46 1.88 1.51 1.51 1.31 1.18 1.02 0.96 0.92 0.85 0.80 0.76 0.73 0.70 0.70 0.73 0.70 0.70 0.68 0.66 0.64 0.62 0.52 0.52 0.52 0.49	Plume Temp(K) 306.56 305.78 305.26 304.74 304.36 304.07 303.85 303.66 303.40 302.87 302.69 302.58 302.69 302.58 302.20 302.24 302.24 302.22 302.22 302.22 302.22 302.22 302.22	jet phase: Jet Pha Linearly ir Spillano V _{plame} ={(V a = 0.16 θ _p =θ ₀ (1- CEC st V _{mp} =π ^{0.25} Brigg's V _{bingy} = (;	se Eqs: therpolated from Stack Re a Equations: $a_{1,3}^{3+0.12F_{a}}(z-z_{s})^{2}-(6.25D)$ $z(z-z_{s})$ $t(-1, \theta_{a}/\theta_{a}))^{*}(V_{ext}D^{2}/(4$ $I(-\theta_{a}/\theta_{a}))^{*}(V_{ext}D^{2}/(4$ $I(-\theta_{a}/\theta_{a}))^{*}(V_{ext}D^{2}/(4$ $I(-\theta_{a}/\theta_{a}))^{*}(V_{ext}D^{2}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}(V_{a}/(4))$ $I(-\theta_{a}/\theta_{a})^{*}($	10 ft Interva Litt to Top of Jet $z_{2,j}^{1/3} / a$ $V_{plume}^* a^{2*} \lambda^2)))$ 50 ft Interva 100 ft Interva

 **Jour.0
 1330.37
 214.140
 0.42
 302.22

 *Winter Min = Monthly Mean of Minimum Daily Temperatures for 1971-2000 (Lowest in Dece
 302.21
 302.21

 NOAA Sources:
 Climatography of the United
 302.21
 302.21

MERGED (along length) Plume Average Vertical Velocities for SVY03A Chillers using CEC Staff Methodology - Summer Max*

"Aviation Safety and Buoyant Plumes," Peter Best, et. al.

		-	oyant Plumes," Peter Bes num Updraft Speeds for	st, et. al. Calm Conditions at Various Heigi	hts in the Merged
				e Power Station at Oakey, Queer	nsland, Australia," Dr. K.T. Spilla
Ambient Conditions:	202.21	Kolvina	84.3 °F	Constants: Assume neutral cond 0.3048 meters/fe	
Ambient Potential Temp θ Plume Exit Conditions:	a 302.21	Kelvins	84.3 F	Gravity g 9.81 m/s ²	et
Stack Height h	33.03	meters	108 4/12 feet-inches	λ 1.11	
Individual Stack Diameter			68.4 inches	λ _o ~1.0	
Stack Velocity Vex			43.30 ft/sec	4Vol/(60πD ²)	
Individual Volumetric Flow	v 31.29	cu.m/sec	66,300 ACFM	$\pi V_{exit} D^2/4$	Sect.2/¶1
Stack Potential Temp θ	s 313.32	Kelvins	104.3 °F		
Initial Stack Buoyancy Flux F		m ⁴ /s ³	20.0 ∆T(°F)	$gV_{exit}D^2(1-\theta_a/\theta_s)/4 = Vol.Flow(g/\pi)$	
Plume Buoyancy Flux I		m ⁴ /s ³		$\lambda^2 g Va^2 (1-\theta_a/\theta_p)$ for a, V, θ_p at plum	e height (see below)
Total Number of Stacks					
Average Adjacent Stack Separation		meters	9.2 feet	Calcs based on multiple plume tre	
Number of Stacks along Orientation N	N 12			plume velocities increased by N ^{0.2} fully merged (interp. below ht, sing	
Conditions at End (Top) of Jet Phase:				Tuny merged (interp. below in, sing	gie mergeu stack above nij
Height above Stack z _i	10.859	meters*	35.6 feet*	z _{iet} = 6.25D, meters*=meters abo	ve stack top Sect.3/¶1
Height above Ground z _{iet} +h		meters	144.0 feet	jer	1
Vertical Velocity V	6.599	m/s	21.65 ft/sec	V _{jet} = 0.5V _{exit} = V _{exit} /2	
Plume Top-Hat Diameter 2a _{je}	at 3.475	meters	11.4 feet	2a _{jet} = 2D Conserva	ation of momentum "
Spillane Methodology - Analytical Solutions fo Single Plume-averaged Vertical Velocity V Single Plume Values: Plume Top-Hat Radius a	given by Anal	ytical Soluti	-		with height Sect.2/Eq.6
Virtual Source Height z		meters*	0.6 feet*	$z_v = 6.25D[1-(\theta_e/\theta_s)^{1/2}], \text{ meters}^*=meters$	ters above stack top Sect.2/Eq.6
Height above Ground z _v +h	s 33.225	meters	109.0 feet	where ($(\theta_{a}/\theta_{s})^{1/2} = (\theta_{e}/\theta_{s})^{1/2} = 0.9821$
Single Plume Values: Vertical Velocity V	/ Us	ed in Plume	Merging Only	${(Va)_0}^3 + 0.12F_0 [(z-z_v)^2 - (6.25D-z_v)^2]$	
Product (Va)	。 11.261	m²/s		$V_{exit}(D/2)(\theta_e/\theta_s)^{1/2}$	
Plume Merging - Based on Single Plume Calcu					Sect.3/¶3
Begin Merging Plume Top-Hat Diameter 2atouc		meters	9.2 feet	2a _{touch} =d, (or a _{touch} =d/2)	
Height above Stack z _{touc}		meters*	29.3 feet*	$z_{touch} = z_v + d/(2*0.16)$, meters*=me	elers above stack top
Height above Ground z _{touch} +h Vertical Velocity V _{touc}			137.7 feet 26.3 ft/sec	$V_{\text{touch}} = \{(Va)_o^3 + 0.12F_o [(z-z_v)^2 -$	(6 2ED 7) ² 11 ^(1/3) / -
Total Merging Plume Top-Hat Diameter 2a _{fil}		meters	101.0 feet	$V_{touch} = \{(Va)_0^+ + 0.12F_0 (2-z_v) - 2a_{full} = 2d(N-1)/2, (or a_{full} = d(N-1)/2) \}$	
Height above Stack z_{fu}	-	meters*	316.4 feet*	$z_{full} = z_v + 2d/(2^*0.16)$, meters*=me	
Height above Ground z _{full} +h	-		424.8 feet	$z_{\text{tull}} = z_0 \cdot z_0 \cdot (z_0 \cdot r_0), \text{ meters} = meters$	ters above static top
Vertical Velocity V _{fu}	-		3.7 ft/sec	$V_{\text{full}} = \{(Va)_0^3 + 0.12F_0 [(z_{\text{full}} - z_y)^2 -$	(6.25D-z.) ²]} ^(1/3) / a ₆₋₁
Product (V ³ a) _{fi}		m ⁴ /s ³			
Conditions at End (Top) of Merging Phase - De	-		and I Merged Plume calc	ulations (based on TOTAL number	of stacks):
Merged Plume Values: Plume Diameter 2			Table Below	2a = 2 x (a _m + 0.16(z-z _{full})), or line	
Revised Merged Plume Radius a					
		meters	111.8 feet	where a _m = n ^{0.25} a _{full} where Total M	Nerging Occurs
Revised Merged Plume Velocity V			111.8 feet 8.19 ft/sec	where a _m = n ^{0.25} a _{full} where Total M	Nerging Occurs
Revised Merged Plume Velocity V, Revised Virtual Source Height z _{fu}	2.495				Nerging Occurs Merging Occurs
	n 2.495 II 96.444	m/s meters*	8.19 ft/sec	where $a_m = n^{0.25} a_{full}$ where Total M and $V_m = n^{0.25} V_{full}$ where Total M Height above stack where Total M $V = \{n(V^3a)_{full}/a\}^{1/3}$ for heights above	/lerging Occurs /lerging Occurs /lerging Occurs (shown above) /e total merging elevation
Revised Virtual Source Height z _{fu} Revised Vertical Velocity V	n 2.495 II 96.444	m/s meters*	8.19 ft/sec 316.4 feet*		Aerging Occurs Merging Occurs Aerging Occurs (shown above) re total merging elevation -z _{touch})
Revised Virtual Source Height z _⊪ Revised Vertical Velocity \ Nultiple Plume Calculations	n 2.495 II 96.444 / S	m/s meters* solutions in f	8.19 ft/sec 316.4 feet* Tables Below	where $a_m = n^{0.25} a_{tull}$ where Total M and $V_m = n^{0.25} V_{tull}$ where Total M Height above stack where Total M $V = \{n(V^3a)_{tull}/a\}^{1/3}$ for heights above $V = V_{touch}/(Z_{tull})^{1/2} (z-z_{couch})/(Z_{tull}) = f(z-z_{tull})/(Z_{tull}) = f(z-z$	/lerging Occurs /lerging Occurs /lerging Occurs (shown above) /e total merging elevation
Revised Virtual Source Height z _h Revised Vertical Velocity \ Multiple Plume Calculations Solve for plume-averaged vertical vel	n 2.495 I 96.444 / S ocity at height	m/s meters* Solutions in 1,000.0	8.19 ft/sec 316.4 feet* Tables Below feet 304.8	$ \begin{array}{l} \mbox{where } a_m = n^{0.25} a_{kull} \mbox{ where Total } M \\ \mbox{ and } V_m = n^{0.25} V_{kull} \mbox{ where Total } M \\ \mbox{Height above stack where Total } M \\ \mbox{V=} \{n(V^3a)_{kull}/a\}^{1/3} \mbox{ for height sabov} \\ \mbox{V=} V_{kouch} + (V_m \cdot V_{kouch})^{1/2} (z \cdot z_{louch})/(z \cdot z_{louch})/(z$	Aerging Occurs Merging Occurs Aerging Occurs (shown above) re total merging elevation -z _{touch})
Revised Virtual Source Height z _h Revised Vertical Velocity V Multiple Plume Calculations Solve for plume-averaged vertical vel Gives the following Height above Stack	n 2.495 96.444 / S ocity at height z 271.769	m/s meters* Solutions in 1,000.0 meters*	8.19 ft/sec 316.4 feet* Tables Below feet 304.8 891.6 feet*	where $a_m = n^{0.25} a_{kull}$ where Total M and $V_m = n^{0.25} V_{kull}$ where Total M Height above stack where Total M $V = \{n(V^3) a_{luul}/a\}^{1/3}$ for heights abov $V = V_{touch} + (V_m \cdot V_{touch})/(z$	Aerging Occurs Merging Occurs Aerging Occurs (shown above) re total merging elevation -z _{touch})
Revised Virtual Source Height z _{tu} Revised Vertical Velocity V Multiple Plume Calculations Solve for plume-averaged vertical vel Gives the following Height above Stack . Plume Top-Hat Radius :	a 2.495 96.444 / S ocity at height z 271.769 a 62.138	m/s meters* solutions in 1,000.0 meters* meters	8.19 ft/sec 316.4 feet* Tables Below feet 304.8 891.6 feet* 203.9 feet	where $a_m = n^{0.25} a_{tuil}$ where Total M and $V_m = n^{0.25} V_{uu}$ where Total M Height above stack where Total M $V = (n(V^3 a)_{lw}(a)^{1/3}$ for heights abov $V = V_{touch} + (V_m - V_{touch})^{1/2} (z_{tuil})$ for height B meters above ground (z+h _a) REGULAR EQNS $a = a_m + 0.16(z - z_{tuil})$ if z>z _{tuil}	Aerging Occurs Merging Occurs Aerging Occurs (shown above) re total merging elevation -z _{touch})
Revised Virtual Source Height z _h Revised Vertical Velocity V Multiple Plume Calculations Solve for plume-averaged vertical vel Gives the following Height above Stack	a 2.495 96.444 / S ocity at height z 271.769 a 62.138	m/s meters* solutions in 1,000.0 meters* meters	8.19 ft/sec 316.4 feet* Tables Below feet 304.6 891.6 feet*	where $a_m = n^{0.25} a_{tull}$ where Total M and $V_m = n^{0.25} V_{tull}$ where Total M Height above stack where Total M $V = (n(V^3 a)_{tull}/a)^{1/3}$ for heights abov $V = V_{bouch} + (V_m - V_{bouch})^* (2 z_{total} - N (2 z_{total})) (2 z_{tull})^{1/3}$ for height meters above ground (z+h _a) REGULAR EQNS $a = a_m + 0.16 (2 - z_{tull})$ ff >> z_{tull} $V = (n(V^3 a)_{tul}/a)^{1/3}$ if >> z_{tull}	Merging Occurs Merging Occurs (Merging Occurs (shown above) re total merging elevation -zouch) is below total merging elevation
Revised Virtual Source Height z _{tu} Revised Vertical Velocity V Multiple Plume Calculations Solve for plume-averaged vertical vel Gives the following Height above Stack . Plume Top-Hat Radius :	a 2.495 96.444 / S ocity at height z 271.769 a 62.138	m/s meters* solutions in 1,000.0 meters* meters	8.19 ft/sec 316.4 feet* Tables Below feet 304.8 891.6 feet* 203.9 feet	where $a_m = n^{0.25} a_{tuil}$ where Total M and $V_m = n^{0.25} V_{tuil}$ where Total M Height above stack where Total M $V = (n(V^3a)_{tuil}/a)^{1/3}$ for heights above $V = V_{touch} + (V_m - V_{touch})^{1/2} - Z_{touch} V(z_{tuil})$ for height B meters above ground $(z + h_s)$ REGULAR EQNS $a = a_m + 0.16(z - z_{tuil})$ if $z > z_{tuil}$ $V = (n(V^3a)_{tuil}/a)^{1/3}$ if $z > z_{tuil}$ $V = V_{touch} + (V_m - V_{touch})^2(z - z_{touch})/(z_{tuil})/(z_{tuil})$	Merging Occurs Merging Occurs (shown above) re total merging elevation -z _{auch}) is below total merging elevation
Revised Virtual Source Height z _h Revised Vertical Velocity \ Multiple Plume Calculations Solve for plume-averaged vertical vel Gives the following Height above Stack Plume Top-Hat Radius \ Vertical Velocity \	a 2.495 96.444 / S ocity at height z 271.769 a 62.138 / 2.042	m/s meters* solutions in 1,000.0 meters* meters	8.19 ft/sec 316.4 feet* Tables Below feet 304.6 891.6 feet* 203.9 feet 6.70 ft/sec	where $a_m = n^{0.25} a_{tull}$ where Total M and $V_m = n^{0.25} V_{tull}$ where Total M Height above stack where Total M $V = (n(V^3 a)_{tull}/a)^{1/3}$ for heights abov $V = V_{bouch} + (V_m - V_{bouch})^* (2 z_{total} - N (2 z_{total})) (2 z_{tull})^{1/3}$ for height meters above ground (z+h _a) REGULAR EQNS $a = a_m + 0.16 (2 - z_{tull})$ ff >> z_{tull} $V = (n(V^3 a)_{tul}/a)^{1/3}$ if >> z_{tull}	Merging Occurs Merging Occurs (shown above) re total merging elevation -z _{touch}) is below total merging elevation
Revised Virtual Source Height z _{tu} Revised Vertical Velocity V Multiple Plume Calculations Solve for plume-averaged vertical vel Gives the following Height above Stack . Plume Top-Hat Radius :	a 2.495 96.444 / S ocity at height z 271.769 a 62.138 / 2.042 al velocity V _{orit}	m/s meters* Solutions in 1 1,000.0 meters* meters m/s 5.30	8.19 ft/sec 316.4 feet* Tables Below feet 304.6 891.6 feet* 203.9 feet 6.70 ft/sec		Merging Occurs Merging Occurs (derging Occurs (shown above) re total merging elevation -z _{louch}) is below total merging elevation is below total merging elevation #PHASE-INTERPOL
Revised Virtual Source Height z _{in} Revised Vertical Velocity V Multiple Plume Calculations Solve for plume-averaged vertical vel Gives the following Height above Stack Plume Top-Hat Radius : Vertical Velocity V Solve for Height of CASC critical vertic	a 2.495 96.444 / S ocity at height z 271.769 a 62.138 / 2.042 al velocity V _{orit} at s1.976	m/s meters* Solutions in 1,000.0 meters* meters m/s 5.30 meters	8.19 ft/sec 316.4 feet* Tables Below feet 304.6 891.6 feet* 203.9 feet 6.70 ft/sec m/s		Merging Occurs Merging Occurs Merging Occurs ve total merging elevation -z _{ouch}) is below total merging elevation merzicuch) if z _{touch} <z<z<sub>full h PHASE-INTERPOL 0.16 if V_{crt}<v<sub>m</v<sub></z<z<sub>
Revised Virtual Source Height z _{in} Revised Vertical Velocity V Multiple Plume Calculations Solve for plume-averaged vertical vel Gives the following Height above Stack 3 Plume Top-Hat Radius 3 Vertical Velocity V Solve for Height of CASC critical vertic Find Height above Stack z _c	a 2.495 96.444 / S ocity at height z 271.769 a 62.138 / 2.042 al velocity V _{crit} at 51.976	m/s meters* colutions in 1,000.0 meters* meters m/s 5.30 meters	8.19 ft/sec 316.4 feet* Tables Below feet 304.8 891.6 feet* 203.9 feet 6.70 ft/sec m/s 170.5 feet	where $a_m = n^{0.25} a_{tull}$ where Total M and $V_m = n^{0.25} V_{tull}$ where Total M Height above stack where Total M $V = (n(V^3 a)_{tull}/a)^{1/3}$ for heights abov $V = V_{tucuch} + (V_m - V_{tucuch})^* (2-z_{tucl})/(2t_{tull})^{1/3}$ B meters above ground (z+h _a) REGULAR EQNS $a=a_m+0.16(z-z_{tull})$ if $z>z_{tull}$ $V = V_{ucuch} + (V_m - V_{tucuch})^* (2-z_{tucl})/(2t_{tull})^{1/3}$ if $z>z_{tull}$ $V = Stack + (n(V^3 a)_{tull}/a)^{1/3}$ if $z>z_{tull}$ $V = Stack + (N_m - V_{tucuch})^* (2-z_{tuclh})/(2t_{tull})^* + (2t_{tucl})^* + (2t_{tu$	Merging Occurs Merging Occurs Merging Occurs ve total merging elevation -z _{ouch}) is below total merging elevation merzicuch) if z _{touch} <z<z<sub>full h PHASE-INTERPOL 0.16 if V_{crt}<v<sub>m</v<sub></z<z<sub>
Revised Virtual Source Height z _h Revised Vertical Velocity V Multiple Plume Calculations Solve for plume-averaged vertical velocity V Gives the following Height above Stack : Plume Top-Hat Radius : Vertical Velocity V Solve for Height of CASC critical vertic Find Height above Stack z _{cr} Height above Stack z _{cr}	a 2.495 a 96.444 / S ocity at height z 271.769 a 62.138 / 2.042 al velocity V _{crit} a 51.976 s 85.007	m/s meters* iolutions in 1,000.0 meters* meters m/s 5.30 meters meters	8.19 ft/sec 316.4 feet* Tables Below feet 304.6 891.6 feet* 203.9 feet 6.70 ft/sec m/s 170.5 feet 278.9 feet	where $a_m = n^{0.25} a_{tuil}$ where Total M and $V_m = n^{0.25} V_{tuil}$ where Total M Height above stack where Total M $V = (n(V^3)_{tuil}/a)^{1/3}$ for heights abov $V = V_{touch} + (V_m \cdot V_{touch})/(2z_{tuil})$ for height a meters above ground (z+h _a) REGULAR EQNS $a=a_m+0.16(z-t_{tuil})$ if $z > t_{tuil}$ $V = (n(V^3a)_{tuil}/a)^{1/3}$ if $z > t_{tuil}$ $V = v_{tuir} + (V_m \cdot V_{touch})/(2z_{-touch})/(2z_{-touch})/(2z_{-tuil})$ U = single plume values if $z < t_{tuil}$ LESS THAN TOP OF MERGING $z_{cnit} = z_{tuil} + ([n(V^3a)_{tuil}/(V_{crit})^3) = a_n)/(2z_{crit} = z_{tuil} + ([n(V^3a)_{tuil}/(V_{crit})^2 - (v_{tuir} - V_{tuoch})/(2z_{crit} = z_{tuil} + ([n(V_{tuir} - V_{tuoch})/(2z_{crit} - T_{tuoch})/(2z_{crit} - T_{tuoch})/(2z$	Merging Occurs Merging Occurs (shown above) ve total merging elevation -zouch) is below total merging elevation in "Ztouch) if ztouch <z<ztrutt PHASE-INTERPOL 0.16 if V_{cttt}<v<sub>m (V_m-V_{touch}) if V_{cttt}>V_m Plume spreadsheet)</v<sub></z<ztrutt
Revised Virtual Source Height z _{in} Revised Vertical Velocity V Multiple Plume Calculations Solve for plume-averaged vertical velo Gives the following Height above Stack 3 Plume Top-Hat Radius 3 Vertical Velocity V Solve for Height of CASC critical vertic Find Height above Stack 2 Height above Ground 2 _{crit} +h Table of MERGED Plume-Averaged Vertical Velocity V	a 2.495 a 96.444 / S ocity at height z 271.769 a 62.138 / 2.042 al velocity V _{crit} a 51.976 s 85.007 elocities startin) (meters)	m/s meters* solutions in in 1,000.0 meters* meters meters meters g at Touchin Plume	8.19 ft/sec 316.4 feet* Tables Below feet 304.6 891.6 feet* 203.9 feet 6.70 ft/sec m/s 170.5 feet 278.9 feet ng Height: Vert.	where $a_m = n^{0.25} a_{tuil}$ where Total M and $V_m = n^{0.25} V_{tuil}$ where Total M Height above stack where Total M $V = (n(V^3a)_{tuil}/a)^{1/3}$ for heights abov $V = V_{tuoin} + (V_m - V_{tuoin})^* (2-z_{tuoin})/(2t_{uil})^{1/3}$ B meters above ground (z+h _s) REGULAR EQNS $a=a_m + 0.16 (2-z_{tuil})$ if $z > z_{tuil}$ $V = V_{uoin} + (V_m - V_{tuoin})^* (2-z_{tuoin})/(2t_{uil})^{1/3}$ if $z > z_{tuil}$ $V = single plume values if z > z_{tuoin}/(Z_{ent})^3 - a_{ij}/J_{z_{ent}}^3 = z_{tuoin} + (z_{tuo} - z_{tuoin})^* (V_{ent})^3 - a_{ij}/J_{z_{ent}}^3 = z_{tuoin} + (z_{tuo} - z_{tuoin})^* (V_{ent})^3 - a_{ij}/J_{z_{ent}}^3 = z_{tuoin} + (z_{tuo} - z_{tuoin})^* (V_{ent}^3 - a_{ij})/J_{z_{ent}}^3 = 2t_{uoin} + (z_{tuo} - z_{tuoin})^* (V_{ent}^3 - a_{ij})/J_{z_{ent}}^3 = 2t_{uoin} + (z_{tuo} - z_{tuoin})^* (V_{ent}^3 - a_{ij})/J_{z_{ent}}^3 = (V_{ent})^3 - 0.12 - (2t_{ent}^2 - (2t_{ent})^2 - (2t_{ent}^2 - 2t_{ent})^3 - 0.12 - (2t_{ent})^2 - (2t_$	Merging Occurs Merging Occurs (shown above) ve total merging elevation zeouch) is below total merging elevation if z _{touch} z <z<sub>full h PHASE-INTERPOL 0.16 if V_{ctt}<v<sub>m (V_m-V_{touch}) if V_{ctt}>V_m Plume spreadsheet)</v<sub></z<sub>
Revised Virtual Source Height z _{in} Revised Vertical Velocity V Multiple Plume Calculations Solve for plume-averaged vertical velo Gives the following Height above Stack z Plume Top-Hat Radius : Vertical Velocity V Solve for Height of CASC critical vertic Find Height above Stack z _{cr} Height above Ground z _{crit} +h Table of MERGED Plume-Averaged Vertical Vo Height (feet above ground	2.495 96.444 96.444 2000 271.769 62.138 2000	m/s meters* solutions in 1,000.0 meters* meters m/s 5.30 meters meters g at Touchil Plume Radius(m)	8.19 ft/sec 316.4 feet* Tables Below feet 304.6 891.6 feet* 203.9 feet 6.70 ft/sec m/s 170.5 feet 278.9 feet ng Height: Vert. Vet. Vet(m/s)	where $a_m = n^{0.25} a_{tuil}$ where Total M and $V_m = n^{0.25} V_{tuil}$ where Total M Height above stack where Total M $V = (n(V^3a)_{tuil}/a)^{1/3}$ for heights abov $V = V_{buch} + (V_m - V_{buch})^{1}(2 < z_{buch})/(2 < z_{$	Merging Occurs Merging Occurs (Merging Occurs (shown above)) re total merging elevation -zouch) is below total merging elevation Merging elevation Merging elevation Merging elevation Merging elevation Merging elevation Merging elevation Merging occurs Merging Occurs Mergi
Revised Virtual Source Height z _h Revised Vertical Velocity V Multiple Plume Calculations Solve for plume-averaged vertical velocity V Gives the following Height above Stack. Plume Top-Hat Radius : Vertical Velocity V Solve for Height of CASC critical vertical Find Height above Stack z _c Height above Stack z _c Height above Ground z _{crit} +h Table of MERGED Plume-Averaged Vertical V Height (feet above groun Begin Merging (touch) = 137.3	a 2.495 96.444 96.444 96.444 20.042 a 271.769 a 62.138 2.042 al velocity V _{orit} a 51.976 5.85.007 elocities startin) (meters) d above stack 9.94	m/s meters* solutions in 1,000.0 meters* meters meters g at Touchin Plume Radius(m) 1.400	8.19 ft/sec 316.4 feet* Tables Below feet 304.6 891.6 feet* 203.9 feet 6.70 ft/sec m/s 170.5 feet 278.9 feet ng Height: Vert. Vel(m/s) 8.01	where $a_m = n^{0.25} a_{tuil}$ where Total M and $V_m = n^{0.25} V_{tuil}$ where Total M Height above stack where Total M $V = (n(V^3a)_{tuil}/a)^{1/3}$ for heights abov $V = V_{touch} + (V_m - V_{touch})^{1/2} (z_{ztourh})/(z_{ztourh})/(z_{tuil})^{1/3}$ B meters above ground $(z + h_u)$ REGULAR EQNS $a = a_m + 0.16(z - z_{tuil})$ if $z > z_{tuil}$ $V = (n(V^3a)_{tuil}/a)^{1/3}$ if $z > z_{tuil}$ $V = single plume values if z < z_{touch}LESS THAN TOP OF MERGINGz_{crit} = z_{tuil} + ([n(V^3a)_{tuil}/(v_{crit})^3] - a_m)/z_{crim} = z_{touch} + (z_{tuil} - z_{touch})^{1/2} (v_{crit} - v_{touch})^{1/2}Single Plume Eqns (see Single PV_{plumer}[(Va)_a^3 - 12F_a[(z - z_a)^2 - (6.25D - z_a)^2])a = 0.16(z - z_a)$	Merging Occurs Merging Occurs (e total merging elevation zouch) is below total merging elevation if ztouch if ztouch <z<ztull h PHASE-INTERPOL 0.16 if V_{crit}<v<sub>m Nume spreadsheet) ¹⁰/_a / a p[*] t^a² t_λ²)))</v<sub></z<ztull
Revised Virtual Source Height z _h Revised Vertical Velocity V Multiple Plume Calculations Solve for plume-averaged vertical velocity V Gives the following Height above Stack z Plume Top-Hat Radius : Vertical Velocity V Solve for Height of CASC critical vertical Find Height above Stack z Height above Ground z _{crit} +h Table of MERGED Plume-Averaged Vertical Vertical Velocity Begin Merging (touch) = 137.7	a 2.495 a 96.444 / S ocity at height 2 z 271.769 a 62.138 / 2.042 al velocity V _{crit} at 51.976 s 85.007 blocities startin) (meters) d above stack / 8.94 0 9.64	m/s meters* iolutions in 1,000.0 meters* meters msters g at Touchin Plume Radius(m) 1.400 #N/A	8.19 ft/sec 316.4 feet* Tables Below feet 304.6 891.6 feet* 203.9 feet 6.70 ft/sec m/s 170.5 feet 278.9 feet ng Height: Vert. Vel(m/s) 8.01 7.97	where $a_m = n^{0.25} a_{tuil}$ where Total M and $V_m = n^{0.25} V_{tuil}$ where Total M Height above stack where Total M $V = (n(V^3a)_{tuil}/a)^{1/3}$ for heights abov $V = V_{bouch} + (V_m - V_{bouch})^{1/2} (z_{courb}) / (Z_{tuil})$ B meters above ground $(z + h_s)$ REGULAR EQNS $a = a_m + 0.16(z - z_{tuil})$ if $z > z_{tuil}$ $V = (n(V^3a)_{tuil}/a)^{1/3}$ if $z > z_{tuil}$ $V = n(V_{aburch} + (Z_{aburch})^{1/2} (Z_{courch})/(Z_{burch})^{1/3}$ $Z_{cm} = Z_{buich} + (Z_{luil} - Z_{bouch})^{1/3} (V_{cril})^{3} - a_{luil}/V_{cril}^{3/3} - a_{luil}/(V_{cril})^{3/3} - a_{luil}/V_{cril}^{3/3} - a_{luil} + ([n(V_{aburch})^{1/2} (Z_{cril}^{-1} - (6.25D - z_{i})^{2}))$ $a = 0.16(z - z_{i})$ $\theta_{p = 0}(1 + (1 - (4y_{bl}))^{1/2} (V_{aut}D^{2}/(4V_{plun})^{1/2} / (A_{plun})^{1/2} $	Merging Occurs Merging Occurs (shown above) we total merging elevation z_{couch}) is below total merging elevation $u^{1-Z_{couch}}$ if $z_{touch} < z < z_{tull}$ PHASE-INTERPOL 0.16 if $V_{crt} < V_m$ $(V_m \cdot V_{couch})$ if $V_{crt} > V_m$ $u^{turne} spreadsheet) u^{t_3} / an_e^* a^{2*} \lambda^2))) 20 ft intervals$
Revised Virtual Source Height z _h Revised Vertical Velocity V Multiple Plume Calculations Solve for plume-averaged vertical velo Gives the following Height above Stack Z Plume Top-Hat Radius : Vertical Velocity V Solve for Height of CASC critical vertic Find Height above Stack Z Height above Ground Z Height above Ground Z Height (feet above groum Begin Merging (touch) = 137. 140.	2.495 96.444 / s ocity at height z 271.769 a 62.138 / 2.042 al velocity V _{crit} at 51.976 s 85.007 cloities startin) (meters) d above stack 0 9.64 0 9.64	m/s meters* solutions in 1,000.0 meters* meters m/s 5.30 meters meters g at Touchia Plume Radius(m) 1.400 #//A #//A	8.19 ft/sec 316.4 feet* Tables Below feet 304.6 891.6 feet* 203.9 feet 6.70 ft/sec m/s 170.5 feet 278.9 feet ng Height: Vert. Vel(m/s) 8.01 7.97 7.59	where $a_m = n^{0.25} a_{tuil}$ where Total M and $V_m = n^{0.25} V_{tuil}$ where Total M Height above stack where Total M $V = (n(V^3a)_{tuil}/a)^{1/3}$ for heights abov $V = V_{touch} + (V_m - V_{touch})^{1/2} (z_{ztourh})/(z_{ztourh})/(z_{tuil})^{1/3}$ B meters above ground $(z + h_u)$ REGULAR EQNS $a = a_m + 0.16(z - z_{tuil})$ if $z > z_{tuil}$ $V = (n(V^3a)_{tuil}/a)^{1/3}$ if $z > z_{tuil}$ $V = single plume values if z < z_{touch}LESS THAN TOP OF MERGINGz_{crit} = z_{tuil} + ([n(V^3a)_{tuil}/(v_{crit})^3] - a_m)/z_{crim} = z_{touch} + (z_{tuil} - z_{touch})^{1/2} (v_{crit} - v_{touch})^{1/2}Single Plume Eqns (see Single PV_{plumer}[(Va)_a^3 - 12F_a[(z - z_a)^2 - (6.25D - z_a)^2])a = 0.16(z - z_a)$	Merging Occurs Merging Occurs (shown above) we total merging elevation z_{couch}) is below total merging elevation $u^{1-Z_{couch}}$, if $z_{touch} < z < z_{tull}$ h PHASE-INTERPOL 0.16 if $V_{crt} < V_m$ ($V_m \cdot V_{couch}$) if $V_{crt} > V_m$ u^{10} / a u^{10} / a u^{10} / $a^{2^{10}}\lambda^{2}$))) 20 ft intervals
Revised Virtual Source Height z _h Revised Vertical Velocity V Multiple Plume Calculations Solve for plume-averaged vertical velo Gives the following Height above Stack Z Plume Top-Hat Radius : Vertical Velocity V Solve for Height of CASC critical vertic Find Height above Stack Z Height above Ground Z Height above Ground Z Height (feet above groun Begin Merging (touch) = 137. 140. 160.	a 2.495 96.444 96.444 96.444 96.444 271.769 a 62.138 72.042 al velocity V _{crit} a 51.976 a 51.976 a 55.007 elocities startin) (meters) d above stack 9.64 0.9.64 15.74 0.21.83	m/s meters* solutions in 1,000.0 meters* meters meters g at Touchin Plume Radius(m) 1.400 #N/A #N/A	8.19 ft/sec 316.4 feet* Tables Below feet 304.6 891.6 feet* 203.9 feet 6.70 ft/sec m/s 170.5 feet 278.9 feet ng Height: Vert. Vet(m/s) 8.01 7.59 7.20	where $a_m = n^{0.25} a_{tuil}$ where Total M and $V_m = n^{0.25} V_{tuil}$ where Total M Height above stack where Total M $V = (n(V^3a)_{tuil}/a)^{1/3}$ for heights abov $V = V_{bouch} + (V_m - V_{bouch})^{1/2} (z_{courb}) (Z_{cuil})$ REGULAR EQNS $a = a_m + 0.16(z_{cuil})$ if $z > t_{tuil}$ $V = (n(V^3a)_{tuil}/a)^{1/3}$ if $z > t_{tuil}$ $Z_{cm} = Z_{buch} + (In(V^3a)_{tuil}/(V_{cuil})^3) = a_{luil}$ $Single Plume Eqns (see Single PV_{plame} [(Va)_{a}^{3-0.125} ((z_{cu})^{-2} (6.25D - z_{u})^{7}])a = 0.16(z - z_{u})\theta_{0} = 0, (1 + (1 - (4)_{du}))^{1} (V_{aut})^{1} (V_{aut})Interpolated Layer Eqns$	Merging Occurs Merging Occurs (shown above) we total merging elevation z_{couch}) is below total merging elevation $u^{1-Z_{couch}}$, if $z_{touch} < z < z_{tull}$ h PHASE-INTERPOL 0.16 if $V_{crt} < V_m$ ($V_m \cdot V_{couch}$) if $V_{crt} > V_m$ u^{10} / a u^{10} / a u^{10} / $a^{2^{10}}\lambda^{2}$))) 20 ft intervals
Revised Virtual Source Height z _h Revised Vertical Velocity V fultiple Plume Calculations Solve for plume-averaged vertical velocity V Gives the following Height above Stack. Plume Top-Hat Radius : Vertical Velocity V Solve for Height of CASC critical vertical Find Height above Stack z _c Height above Ground z _{crit} +h Table of MERGED Plume-Averaged Vertical V Height (feet above groun Begin Merging (touch) = 137. 140. 160. 180.	a 2.495 96.444 96.444 96.444 271.769 a 62.138 2.042 al velocity V _{orit} a 51.976 5.007 elocities startin) (meters) d above stack 9.644 9.9.64 0.9.64 0.21.83 0.27.93	m/s meters* solutions in 1,000.0 meters* meters m/s 5.30 meters g at Touchin Plume Radius(m) 1.400 #N/A #N/A #N/A	8.19 ft/sec 316.4 feet* Tables Below feet 304.6 891.6 feet* 203.9 feet 6.70 ft/sec m/s 170.5 feet 278.9 feet ng Height: Vert. Vel(m/s) 8.01 7.97 7.59 7.20 6.82	where $a_m = n^{0.25} a_{tuil}$ where Total M and $V_m = n^{0.25} V_{tuil}$ where Total M Height above stack where Total M $V = (n(V^3a)_{tuil}/a)^{1/3}$ for heights abov $V = V_{bouch} + (V_m - V_{bouch})^{1/2} (z_{courb}) (Z_{cuil})$ REGULAR EQNS $a = a_m + 0.16(z_{cuil})$ if $z > t_{tuil}$ $V = (n(V^3a)_{tuil}/a)^{1/3}$ if $z > t_{tuil}$ $Z_{cm} = Z_{buch} + (In(V^3a)_{tuil}/(V_{cuil})^3) = a_{luil}$ $Single Plume Eqns (see Single PV_{plame} [(Va)_{a}^{3-0.125} ((z_{cu})^{-2} (6.25D - z_{u})^{7}])a = 0.16(z - z_{u})\theta_{0} = 0, (1 + (1 - (4)_{du}))^{1} (V_{aut})^{1} (V_{aut})Interpolated Layer Eqns$	Merging Occurs Merging Occurs (shown above) we total merging elevation z_{couch}) is below total merging elevation $u^{1-Z_{couch}}$, if $z_{touch} < z < z_{tull}$ h PHASE-INTERPOL 0.16 if $V_{crt} < V_m$ ($V_m \cdot V_{couch}$) if $V_{crt} > V_m$ u^{10} / a u^{10} / a u^{10} / $a^{2^{10}}\lambda^{2}$))) 20 ft intervals
Revised Virtual Source Height z _h Revised Vertical Velocity V fultiple Plume Calculations Solve for plume-averaged vertical velocity V Gives the following Height above Stack 3 Plume Top-Hat Radius 3 Vertical Velocity V Solve for Height of CASC critical vertical Find Height above Ground z _{ort} +h Height above Ground z _{ort} +h Table of MERGED Plume-Averaged Vertical V Height (feel above grouns Begin Merging (touch) = 137.3 140.0 180.0 200.0 200.0	2.495 96.444 96.444 2000 211769 2000	m/s meters* solutions in 1,000.0 meters* meters meters g at Touchin Plume Radius(m) 1.400 #N/A #N/A #N/A	8.19 ft/sec 316.4 feet* Tables Below feet 304.6 891.6 feet* 203.9 feet 6.70 ft/sec m/s 170.5 feet 278.9 feet ng Height: Vert. Vel(m/s) 8.01 7.97 7.59 6.82 6.43	where $a_m = n^{0.25} a_{tuil}$ where Total M and $V_m = n^{0.25} V_{tuil}$ where Total M Height above stack where Total M $V = (n(V^3a)_{tuil}/a)^{1/3}$ for heights abov $V = V_{bouch} + (V_m - V_{bouch})^{1/2} (z_{courb}) (Z_{cuil})$ REGULAR EQNS $a = a_m + 0.16(z_{cuil})$ if $z > t_{tuil}$ $V = (n(V^3a)_{tuil}/a)^{1/3}$ if $z > t_{tuil}$ $Z_{cm} = Z_{buch} + (In(V^3a)_{tuil}/(V_{cuil})^3) = a_{luil}$ $Single Plume Eqns (see Single PV_{plame} [(Va)_{a}^{3-0.125} ((z_{cu})^{-2} (6.25D - z_{u})^{7}])a = 0.16(z - z_{u})\theta_{0} = 0, (1 + (1 - (4)_{du}))^{1} (V_{aut})^{1} (V_{aut})Interpolated Layer Eqns$	Merging Occurs Merging Occurs (shown above) re total merging elevation z_{couch}) is below total merging elevation μ^{rz} -couch) if z_{touch} μ^{rz} -couch) if z_{touch} μ^{rz} -couch) if z_{touch} μ^{rz} -couch) if v_{crit} ν_m $(V_m^{-V_{touch}})$ if V_{crit} ν_m λ^{rz}
Revised Virtual Source Height z _h Revised Vertical Velocity V fultiple Plume Calculations Solve for plume-averaged vertical velocity V Gives the following Height above Stack. Plume Top-Hat Radius : Vertical Velocity V Solve for Height of CASC critical vertical Find Height above Stack z _c Height above Ground z _{crit} +h Table of MERGED Plume-Averaged Vertical V Height (feet above groun Begin Merging (touch) = 137. 140. 160. 180.	a 2.495 a 96.444 / S ocity at height z 271.769 a 62.138 / 2.042 al velocity V _{crit} a 51.976 a 85.007 elocities startin) (meters) d above stack / 9.64 0 9.64	m/s meters* iolutions in 1,000.0 meters* meters g at Touchin Plume Radius(m) 1.400 #N/A #N/A #N/A #N/A #N/A	8.19 ft/sec 316.4 feet* Tables Below feet 304.6 891.6 feet* 203.9 feet 6.70 ft/sec m/s 170.5 feet 278.9 feet Ng Height: Vert. Vet(m/s) 8.01 7.97 7.59 7.20 6.82 6.43 6.05	where $a_m = n^{0.25} a_{tuil}$ where Total M and $V_m = n^{0.25} V_{tuil}$ where Total M Height above stack where Total M $V = (n(V^3a)_{tuil}/a)^{1/3}$ for heights abov $V = V_{bouch} + (V_m - V_{bouch})^{1/2} (z_{courb}) (Z_{cuil})$ REGULAR EQNS $a = a_m + 0.16(z_{cuil})$ if $z > t_{tuil}$ $V = (n(V^3a)_{tuil}/a)^{1/3}$ if $z > t_{tuil}$ $Z_{cm} = Z_{buch} + (In(V^3a)_{tuil}/(V_{cuil})^3) = a_{luil}$ $Single Plume Eqns (see Single PV_{plame} [(Va)_{a}^{3-0.125} ((z_{cu})^{-2} (6.25D - z_{u})^{7}])a = 0.16(z - z_{u})\theta_{0} = 0, (1 + (1 - (4)_{du}))^{1} (V_{aut})^{1} (V_{aut})Interpolated Layer Eqns$	Merging Occurs Merging Occurs (shown above) we total merging elevation z_{couch}) is below total merging elevation $u^{1-Z_{couch}}$, if $z_{touch} < z < z_{tull}$ h PHASE-INTERPOL 0.16 if $V_{crt} < V_m$ ($V_m \cdot V_{couch}$) if $V_{crt} > V_m$ u^{10} / a u^{10} / a u^{10} / $a^{2^{10}}\lambda^{2}$))) 20 ft intervals
Revised Virtual Source Height z _h Revised Vertical Velocity V fultiple Plume Calculations Solve for plume-averaged vertical velo Gives the following Height above Stack z Plume Top-Hat Radius : Vertical Velocity V Solve for Height of CASC critical vertic Find Height above Ground z _{crit} +h rable of MERGED Plume-Averaged Vertical Ve Height (feel above ground Begin Merging (touch) = 137. 140.1 180.1 220.1	a 2.495 96.444 96.444 96.444 96.444 271.769 a 62.138 72.042 al velocity V _{erk} a 51.976 5.007 elocities startin) (meters) d above stack 9.64 9.64 0.15.74 0.21.83 0.27.93 0.34.02 0.40.12 0.40.12 0.40.22	m/s meters* iolutions in 1,000.0 meters* meters g at Touchin Plume Radius(m) 1.400 #N/A #N/A #N/A #N/A #N/A	8.19 ft/sec 316.4 feet* Tables Below feet 304.6 891.6 feet* 203.9 feet 6.70 ft/sec m/s 170.5 feet 278.9 feet ng Height: Vert. Vel(m/s) 8.01 7.97 7.59 6.82 6.43	where $a_m = n^{0.25} a_{tuil}$ where Total M and $V_m = n^{0.25} V_{tuil}$ where Total M Height above stack where Total M $V = (n(V^3a)_{tuil}/a)^{1/3}$ for heights abov $V = V_{bouch} + (V_m - V_{bouch})^{1/2} (z_{courb}) (Z_{cuil})$ REGULAR EQNS $a = a_m + 0.16(z_{cuil})$ if $z > t_{tuil}$ $V = (n(V^3a)_{tuil}/a)^{1/3}$ if $z > t_{tuil}$ $Z_{cm} = Z_{buch} + (In(V^3a)_{tuil}/(V_{cuil})^3) = a_{luil}$ $Single Plume Eqns (see Single PV_{plame} [(Va)_{a}^{3-0.125} ((z_{cu})^{-2} (6.25D - z_{u})^{7}])a = 0.16(z - z_{u})\theta_{0} = 0, (1 + (1 - (4)_{du}))^{1} (V_{aut})^{1} (V_{aut})Interpolated Layer Eqns$	Merging Occurs Merging Occurs (shown above) we total merging elevation z_{couch}) is below total merging elevation $u^{1-Z_{couch}}$, if $z_{touch} < z < z_{tull}$ h PHASE-INTERPOL 0.16 if $V_{crt} < V_m$ ($V_m \cdot V_{couch}$) if $V_{crt} > V_m$ u^{10} / a u^{10} / a u^{10} / $a^{2^{10}}\lambda^{2}$))) 20 ft intervals
Revised Virtual Source Height z _h Revised Vertical Velocity M Multiple Plume Calculations Solve for plume-averaged vertical velo Gives the following Height above Stack Z Plume Top-Hat Radius : Vertical Velocity M Solve for Height of CASC critical vertical Find Height above Stack Z Height above Ground Z _{crit} h Table of MERGED Plume-Averaged Vertical Vertical Velocity Begin Merging (touch) = 137. 140. 180. 200. 201. 201.	2.495 96.444 96.444 271.769 a 62.138 a 51.976 a 51.976 a 51.976 a bove stack 2000000000000000000000000000000000000	m/s meters* solutions in 1,000.0 meters* meters meters g at Touchin Plume Radius(m) 1.400 #N/A #N/A #N/A #N/A	8.19 ft/sec 316.4 feet* Tables Below feet 304.8 891.6 feet* 203.9 feet 6.70 ft/sec m/s 170.5 feet 278.9 feet rest vert. vet(m/s) 8.01 7.97 7.59 7.20 6.82 6.43 6.05 5.66	where $a_m = n^{0.25} a_{tuil}$ where Total M and $V_m = n^{0.25} V_{tuil}$ where Total M Height above stack where Total M $V = (n(V^3a)_{tuil}/a)^{1/3}$ for heights abov $V = V_{bouch} + (V_m - V_{bouch})^{1/2} (z_{courb}) (Z_{cuil})$ REGULAR EQNS $a = a_m + 0.16(z_{cuil})$ if $z > t_{tuil}$ $V = (n(V^3a)_{tuil}/a)^{1/3}$ if $z > t_{tuil}$ $Z_{cm} = Z_{buch} + (In(V^3a)_{tuil}/(V_{cuil})^3) = a_{luil}$ $Single Plume Eqns (see Single PV_{plame} [(Va)_{a}^{3-0.125} ((z_{cu})^{-2} (6.25D - z_{u})^{7}])a = 0.16(z - z_{u})\theta_{0} = 0, (1 + (1 - (4)_{du}))^{1} (V_{aut})^{1} (V_{aut})Interpolated Layer Eqns$	Merging Occurs Merging Occurs (shown above) we total merging elevation z_{couch}) is below total merging elevation $u^{1-Z_{couch}}$, if $z_{touch} < z < z_{tull}$ h PHASE-INTERPOL 0.16 if $V_{crt} < V_m$ ($V_m \cdot V_{couch}$) if $V_{crt} > V_m$ u^{10} / a u^{10} / a u^{10} / $a^{2^{10}}\lambda^{2}$))) 20 ft intervals
Revised Virtual Source Height z _h Revised Vertical Velocity V fultiple Plume Calculations Solve for plume-averaged vertical vel Gives the following Height above Stack. Plume Top-Hat Radius : Vertical Velocity V Solve for Height of CASC critical vertic Find Height above Stack z _c Height above Stack z _c Height above Ground z _{crit} th Begin Merging (touch) = 137. 1400. 1600. 2001. 2200. 2000. 2200. 2000.	2.495 96.444 96.444 2 96.444 2 271.769 a 62.138 4 51.976 a 51.976 a 51.976 a a 51.976 a b above startun above stack 2 30 27.93 34.02 34.02 34.02 34.02 34.02 34.02 34.02 34.02 34.02 34.02 34.02 34.02 <td>m/s meters* solutions in 1,000.0 meters* meters meters g at Touchin Plume Radius(m) 1.400 #N/A #N/A #N/A #N/A #N/A</td> <td>8.19 ft/sec 316.4 feet* Tables Below feet 304.6 891.6 feet* 203.9 feet 6.70 ft/sec m/s 170.5 feet 278.9 feet ng Height: Vert. Vel(m/s) 8.01 7.97 7.59 7.20 6.82 6.43 6.05 5.66 5.28</td> <td>where $a_m = n^{0.25} a_{tull}$ where Total M and $V_m = n^{0.25} V_{tull}$ where Total M Height above stack where Total M $V = \{n(V^3a)_{tull}/a\}^{1/3}$ for heights abov <math>V = V_{bouch} + (V_m - V_{bouch})^2 (2 z_{totach})/(2 tullfor heightB meters above ground (z+ha)REGULAR EQNS$a = a_m + 0.16(z - z_{tull})$ ff z> z_{tull} <math>V = t_{bouch} + (V_m - V_{bouch})^2 (2 z_{totach})/(2 tull$V = single plume values if z = z_{tuoll}$ LESS THAN TOP OF MERGING $Z_{cml} = z_{tull} + (In(V^3a)_{tull}/a)^{1/3} if z = z_{tuol})^2 (z_{turn} - z_{touch})^2 (z_{turn} - z_{turn})^2 (z_{t$</math></math></td> <td>Merging Occurs Merging Occurs (shown above) re total merging elevation zooch) is below total merging elevation z_{zooch} if $z_{touch} < z < z_{full}$ h PHASE-INTERPOL 0.16 if $V_{crit} < V_m$ $(V_m - V_{touch})$ if $V_{crit} > V_m$ Nume spreadsheet) $z_{a} ^{1/2}$ z_{zouch} 20 ft Intervals z_{zouch}</td>	m/s meters* solutions in 1,000.0 meters* meters meters g at Touchin Plume Radius(m) 1.400 #N/A #N/A #N/A #N/A #N/A	8.19 ft/sec 316.4 feet* Tables Below feet 304.6 891.6 feet* 203.9 feet 6.70 ft/sec m/s 170.5 feet 278.9 feet ng Height: Vert. Vel(m/s) 8.01 7.97 7.59 7.20 6.82 6.43 6.05 5.66 5.28	where $a_m = n^{0.25} a_{tull}$ where Total M and $V_m = n^{0.25} V_{tull}$ where Total M Height above stack where Total M $V = \{n(V^3a)_{tull}/a\}^{1/3}$ for heights abov $V = V_{bouch} + (V_m - V_{bouch})^2 (2 z_{totach})/(2 tullfor heightB meters above ground (z+ha)REGULAR EQNSa = a_m + 0.16(z - z_{tull}) ff z> ztullV = t_{bouch} + (V_m - V_{bouch})^2 (2 z_{totach})/(2 tullV = single plume values if z = z_{tuoll}LESS THAN TOP OF MERGINGZ_{cml} = z_{tull} + (In(V^3a)_{tull}/a)^{1/3} if z = z_{tuol})^2 (z_{turn} - z_{touch})^2 (z_{turn} - z_{turn})^2 (z_{t$	Merging Occurs Merging Occurs (shown above) re total merging elevation zooch) is below total merging elevation $ z_{zooch} $ if $z_{touch} < z < z_{full}$ h PHASE-INTERPOL 0.16 if $V_{crit} < V_m$ $ (V_m - V_{touch})$ if $V_{crit} > V_m$ Nume spreadsheet) $ z_{a} ^{1/2}$ $ z_{zouch} $ 20 ft Intervals $ z_{zouch} $
Revised Virtual Source Height z _h Revised Vertical Velocity V Multiple Plume Calculations Solve for plume-averaged vertical velocity V Gives the following Height above Stack : Plume Top-Hat Radius : Vertical Velocity V Solve for Height of CASC critical vertical Find Height above Ground z _{ort} +h Table of MERGED Plume-Averaged Vertical V Height above ground Begin Merging (touch) = 137.7 140.0 180.0 200.0 2	2.495 96.444 96.444 2 271.769 a 62.138 2.042 al velocity V _{orit} a 51.976 s 85.007 elocities startin) (meters) a 0 9.64 0 15.74 0 21.83 0 21.83 0 21.83 0 21.83 0 21.83 0 21.83 0 21.83 0 21.83 21.83 21.83 21.83 21.83 21.83 21.83 21.83 21.84 21.85 21.81 21.83 21.85	m/s meters* solutions in 1,000.0 meters* meters meters g at Touchin Plume Radius(m) 1.400 #N/A #N/A #N/A #N/A #N/A #N/A	8.19 ft/sec 316.4 feet* 316.4 feet* 304.6 891.6 feet* 203.9 feet 6.70 ft/sec m/s 170.5 feet 278.9 feet Nert. Vel(m/s) 8.01 7.97 7.59 7.59 7.59 7.59 6.82 6.43 6.05 5.66 5.28 4.89	where $a_m = n^{0.25} a_{tuil}$ where Total M and $V_m = n^{0.25} V_{tuil}$ where Total M Height above stack where Total M $V = (n(V^3a)_{tuil}/a)^{1/3}$ for heights abov $V = V_{bouch} + (V_m - V_{bouch})^* (2 - z_{totach}) / (2 - tuil)$ REGULAR EQNS $a = a_m + 0.16(2 - z_{tuil})$ if $2 - 2 - t_{tuil}$ $V = (n(V^3a)_{tuil}/a)^{1/3}$ if $2 - 2 - t_{tuil}$ $V = single plume values if 2 - 2 - t_{tuil}V = single plume values if 2 - 2 - t_{tuil}LESS THAN TOP OF MERGINGz_{crit} = z_{tuil} + ([n(V^3a)_{tuil}/(V_{crit})^3] - a_{tuil})^2 - z_{crit} = z_{tuil} + ([n(V^3a)_{tuil}/(V_{crit})^3] - a_{tuil})^2 - z_{crit} = z_{cuil} + (z_{tui} - z_{bouch})^* (V - a_{tuil} + (z_{tui} - z_{bouch})^* (V - a_{tuil} + z_{tuil})^2 - a_{tuil} - z_{crit} = z_{tuil} + ([n(V_{a})_{a})_{a}, U_{a})^2 - z_{crit} = z_{tuil} + (z_{tui} - z_{bouch})^* (V - a_{tuil} + V_{tuon})^2 - a_{tuil} - z_{tuil} + (z_{tui} - z_{bouch})^* (V - a_{tuon})^2 - (z_{tui} - z_{tuoin})^2 - (z_{tui} - z_{tui})^2 - (z_{tui} - z_{tuoin})^2 - (z_{tui} - z_{tuoin})^2 - (z_{tui} - z_{tuoin})^2 - (z_{tui} - z_{tuoin})^2 - (z_{tuoin} - z_{tuoin})^2 - (z_{tui} - z_{tuoin})^2 - (z_{tuoin} - z_{tuoin})^2 - (z_$	Merging Occurs Merging Occurs (shown above) re total merging elevation zooch) is below total merging elevation $ z_{zooch} $ if $z_{touch} < z < z_{full}$ h PHASE-INTERPOL 0.16 if $V_{crit} < V_m$ $ (V_m - V_{touch})$ if $V_{crit} > V_m$ Nume spreadsheet) $ z_{a} ^{1/2}$ $ z_{zouch} $ 20 ft Intervals $ z_{zouch} $
Revised Virtual Source Height z _h Revised Vertical Velocity V Multiple Plume Calculations Solve for plume-averaged vertical velocity V Gives the following Height above Stack z Plume Top-Hat Radius : Vertical Velocity V Solve for Height of CASC critical vertic Find Height above Stack z Height above Ground z _{crit} +h Table of MERGED Plume-Averaged Vertical V Height (feel above groun Begin Merging (touch) = 137. 140. 180. 200. 220. 240. 280. 280. 300. 300.	2.495 96.444 2 96.444 2 271.769 a 62.138 7 2.042 al velocity V _{erit} a 51.976 a a 51.976 a b cocity at height a colority Cerit a b a b b a cocity at height a b a b b a b a b a b a b b b cocity at the at	m/s meters* iolutions in 1,000.0 meters* meters msters g at Touchin Plume Radius(m) 1.400 #N/A #N/A #N/A #N/A #N/A #N/A #N/A	8.19 ft/sec 316.4 feet* 316.4 feet* 316.4 feet* 304.8 891.6 feet* 203.9 feet 6.70 ft/sec m/s 170.5 feet 278.9 feet ng Height: Vert. Vel(m/s) 8.01 7.97 7.59 6.82 6.82 6.43 6.05 5.66 5.28 4.89 4.51	where $a_{m} = n^{0.25} a_{tuil}$ where Total M and $V_{m} = n^{0.25} V_{uil}$ where Total M Height above stack where Total M $V = (n(V^3 a)_{tui}/a)^{1/3}$ for height above $V = V_{touch} + (V_m - V_{touch})^* (2 - z_{100ch})/(2 tuilB meters above ground (2 + h_s)REGULAR EQNSa = a_m + 0.16 (Z - z_{tuil}) if z > z_{tuil}V = V_{couch} + (V_m - V_{couch}) (2 - z_{100ch})/(2 tuilV = v_{couch} + (2 - z_{100ch})/(2 - z_{$	Merging Occurs Merging Occurs (shown above) re total merging elevation zooch) is below total merging elevation $ z_{zooch} $ if $z_{touch} < z < z_{full}$ h PHASE-INTERPOL 0.16 if $V_{crit} < V_m$ $ (V_m - V_{touch})$ if $V_{crit} > V_m$ Nume spreadsheet) $ z_{a} ^{1/2}$ $ z_{zouch} $ 20 ft Intervals $ z_{zouch} $
Revised Virtual Source Height z _h Revised Vertical Velocity V Aultiple Plume Calculations Solve for plume-averaged vertical velocity Gives the following Height above Stack Z Plume Top-Hat Radius : Vertical Velocity V Solve for Height of CASC critical vertic Find Height above Stack Z Height above Ground Z Height (feet above groun Begin Merging (touch) = 137. 140. 180. 220. 240. 24	2.495 96.444 271.769 a 62.138 2.042 al velocity V _{orit} a 51.976 a 51.976 a 51.976 a 51.976 a 51.976 a bove stack 2 2 al velocity V _{orit} a 51.976 a bove stack 2 3 4 9.644 0 271.769 a 64.50 0	m/s meters* solutions in meters* meters meters meters g at Touchin Plume Radius(m) 1.400 #N/A #N/A #N/A #N/A #N/A #N/A #N/A	8.19 ft/sec 316.4 feet* 316.4 feet* 316.4 feet* 304.8 891.6 feet* 6.70 ft/sec m/s 170.5 feet 278.9 feet 170.5 feet 278.9 feet Net(m/s) 8.01 7.97 7.59 7.20 6.82 6.43 6.05 5.66 5.28 4.89 4.51 4.13	where $a_{m} = n^{0.25} a_{tuil}$ where Total M and $V_{m} = n^{0.25} V_{uil}$ where Total M Height above stack where Total M $V = (n(V^3 a)_{tui}/a)^{1/3}$ for height above $V = V_{touch} + (V_m - V_{touch})^* (2 - z_{100ch})/(2 tuilB meters above ground (2 + h_s)REGULAR EQNSa = a_m + 0.16 (Z - z_{tuil}) if z > z_{tuil}V = V_{couch} + (V_m - V_{couch}) (2 - z_{100ch})/(2 tuilV = v_{couch} + (2 - z_{100ch})/(2 - z_{$	Merging Occurs Merging Occurs (shown above) re total merging elevation zooch) is below total merging elevation $ z_{zooch} $ if $z_{touch} < z < z_{full}$ h PHASE-INTERPOL 0.16 if $V_{crit} < V_m$ $ (V_m - V_{touch})$ if $V_{crit} > V_m$ Nume spreadsheet) $ z_{a} ^{1/2}$ $ z_{zouch} $ 20 ft Intervals $ z_{zouch} $
Revised Virtual Source Height z _h Revised Vertical Velocity V fultiple Plume Calculations Solve for plume-averaged vertical velocity V Gives the following Height above Stack z Plume Top-Hat Radius : Vertical Velocity V Solve for Height of CASC critical vertic Find Height above Stack z Height above Ground z _{ort} +h Table of MERGED Plume-Averaged Vertical V Height (fed above groun Begin Merging (touch) = 137.7 140. 180. 200. 200. 200. 200. 200. 200. 200. 2	2.495 96.444 96.444 2 271.769 a 62.138 2.042 al velocity Voriti a 51.976 a blocities startini) (meters) al obve stack 2 8.94 9 9.64 15.74 20 46.22 20 52.31 20 58.41 20 64.50 20 70.60 21.83 9.64.55	m/s meters* solutions in 1,000.0 meters* meters g at Touchin Plume Radius(m) 1.400 #N/A #N/A #N/A #N/A #N/A #N/A #N/A #N/A	8.19 ft/sec 316.4 feet* 316.4 feet* 316.4 feet* 203.9 feet 6.70 ft/sec m/s 170.5 feet 278.9 feet 170.5 feet 278.9 feet Netting 8.01 7.97 7.59 7.20 6.82 6.43 6.05 5.66 5.28 4.89 4.51 4.13 3.74 3.36 2.49	where $a_{m} = n^{0.25} a_{tuil}$ where Total M and $V_{m} = n^{0.25} V_{uil}$ where Total M Height above stack where Total M $V = (n(V^3 a)_{tui}/a)^{1/3}$ for height above $V = V_{touch} + (V_m - V_{touch})^* (2 - z_{100ch})/(2 tuilB meters above ground (2 + h_s)REGULAR EQNSa = a_m + 0.16 (Z - z_{tuil}) if z > z_{tuil}V = V_{couch} + (V_m - V_{couch}) (2 - z_{100ch})/(2 tuilV = v_{couch} + (2 - z_{100ch})/(2 - z_{$	Arriging Occurs Arriging Occurs Arriging Occurs (shown above) te total merging elevation -z _{touch}) is below total merging elevation T_{touch} if $z_{touch} < z < z_{tuil}$ PHASE-INTERPOL 0.16 if $V_{crit} < V_m$ $V_{ume} spreadsheet$) T_{a} T_{a
Revised Virtual Source Height z _h Revised Vertical Velocity V Aultiple Plume Calculations Solve for plume-averaged vertical velocity V Filme Top-Hat Radius : Plume Top-Hat Radius : Vertical Velocity V Solve for Height of CASC critical vertic Find Height above Stack z _c Height above Ground z _{crit} +h Table of MERGED Plume-Averaged Vertical V Height (feel above ground Begin Merging (touch) = 137. 140. 180. 200. 200. 200. 200. 200. 200. 200. 2	2.495 96.444 2 96.444 2 271.769 a a 2.138 2 a a 2.1769 a a 2.138 7 a a b a b c a b a b a b a b a b a b a b b b b b b a b b b b b b b b <trb< td=""> b</trb<>	m/s meters* solutions in 1,000.0 meters* meters meters g at Touchin Plume Radius(m) 1.400 #N/A #N/A #N/A #N/A #N/A #N/A #N/A #N/A	8.19 ft/sec 316.4 feet* Tables Below feet 303.9 feet 203.9 feet 6.70 ft/sec m/s 170.5 feet 278.9 feet 170.5 feet 278.9 feet Net(m/s) 8.01 7.97 7.59 7.20 6.82 6.43 6.05 5.66 5.28 4.89 4.51 4.13 3.74 3.36 2.49 2.41	where $a_{m} = n^{0.25} a_{tuil}$ where Total M and $V_{m} = n^{0.25} V_{uil}$ where Total M Height above stack where Total M $V = (n(V^3 a)_{tui}/a)^{1/3}$ for height above $V = V_{touch} + (V_m - V_{touch})^* (2 - z_{100ch})/(2 tuilB meters above ground (2 + h_s)REGULAR EQNSa = a_m + 0.16 (Z - z_{tuil}) if z > z_{tuil}V = V_{couch} + (V_m - V_{couch}) (2 - z_{100ch})/(2 tuilV = v_{couch} + (2 - z_{100ch})/(2 - z_{$	Arriging Occurs Arriging Occurs Arriging Occurs (shown above) te total merging elevation -z _{touch}) is below total merging elevation T_{touch} if $z_{touch} < z < z_{tuil}$ PHASE-INTERPOL 0.16 if $V_{crit} < V_m$ $V_{ume} spreadsheet$) T_{a} T_{a
Revised Virtual Source Height z _h Revised Vertical Velocity V fultiple Plume Calculations Solve for plume-averaged vertical vel Gives the following Height above Stack. Plume Top-Hat Radius : Vertical Velocity V Solve for Height of CASC critical vertic Find Height above Ground z _{ent} +h Height above Ground z _{ent} +h Solve of MERGED Plume-Averaged Vertical V Height (feet above ground Begin Merging (touch) = 137. 140. 160. 220. 220. 220. 220. 220. 220. 220. 2	2.495 96.444 271.769 a 62.138 2.042 al velocity V _{crit} a 51.976 a 51.976 a 55.007 blocities startin) (meters) d above stack 9.644 9.64 0 3.02 1.574 0 3.02 0 4.02 0 34.02 0 40.12 0 46.22 0 52.31 0 70.60 0 70.60 0 76.70 0 76.70 10 54.50 0 119.37 149.85	m/s meters* solutions in 1,000.0 meters* meters meters meters g at Touchin Plume Radius(m) 1.400 #N/A #N/A #N/A #N/A #N/A #N/A #N/A #N/A	8.19 ft/sec 316.4 feet* 316.4 feet* 316.4 feet* 304.6 891.6 feet* 203.9 feet 6.70 ft/sec m/s 170.5 feet 278.9 feet 170.5 feet 278.9 feet ng Height: Vert. Vet(m/s) 8.01 7.97 7.59 7.20 6.82 6.43 6.05 5.66 5.28 4.89 4.51 4.13 3.74 3.36 2.49 2.41 2.32	where $a_{m} = n^{0.25} a_{tuil}$ where Total M and $V_{m} = n^{0.25} V_{uil}$ where Total M Height above stack where Total M $V = (n(V^3 a)_{tui}/a)^{1/3}$ for height above $V = V_{touch} + (V_m - V_{touch})^* (2 - z_{100ch})/(2 tuilB meters above ground (2 + h_s)REGULAR EQNSa = a_m + 0.16 (Z - z_{tuil}) if z > z_{tuil}V = V_{couch} + (V_m - V_{couch}) (2 - z_{100ch})/(2 tuilV = v_{couch} + (2 - z_{100ch})/(2 - z_{$	Arriging Occurs Arriging Occurs Arriging Occurs (shown above) te total merging elevation -z _{touch}) is below total merging elevation III ² _{touch}) if z _{touch} <z<z<sub>tull h PHASE-INTERPOL 0.16 if V_{crit}<v<sub>m (V_m V_{touch}) if V_{crit}>V_m Plume spreadsheet) ¹⁰/_a / a $n_e^* a^2 + \lambda^2$))) 20 ft Intervals (20 ft Intervals</v<sub></z<z<sub>
Revised Virtual Source Height z _h Revised Vertical Velocity V fultiple Plume Calculations Solve for plume-averaged vertical velocity Gives the following Height above Stack Plume Top-Hat Radius Vertical Velocity V Solve for Height of CASC critical vertica Find Height above Ground z _{ort} +h Table of MERGED Plume-Averaged Vertical V Height above grouns Begin Merging (touch) = 137. 140. 160. 200. 220. 240. 240. 240. 240. 240. 24	2.495 96.444 96.444 271.769 a 271.769 62.138 2.042 al velocity V _{orit} a 51.976 5 5.1976 al velocity V _{orit} al velocity V _{orit} al velocity V _{orit} al velocity V _{orit} al ove stack 9.64 9.64 0 1 above stack 9.64 0.27.93 0.27.93 0.34.02 0.40.12 0.40.12 0.40.21.83 0.27.93 0.40.12 0.40.12 0.40.12 0.40.21.83 0.70.60 0.70.60 0.70.60 0.70.60 0.70.60 0.70.60 0.70.70 149.85 0.149.85 0.149.85	m/s meters* solutions in 1,000.0 meters* meters m/s 5.30 meters meters g at Touchin Plume Radius(m) 1.400 #N/A #N/A #N/A #N/A #N/A #N/A #N/A #N/A	8.19 ft/sec 316.4 feet* 316.4 feet* 316.4 feet* 203.9 feet 6.70 ft/sec m/s 170.5 feet 278.9 feet 170.5 feet 278.9 feet ng Height: Vert. Vel(m/s) 8.01 7.97 7.59 7.20 6.82 6.43 6.05 5.66 5.28 4.89 4.51 4.13 3.74 3.36 2.49 2.41 2.32 2.23	where $a_{m} = n^{0.25} a_{tuil}$ where Total M and $V_{m} = n^{0.25} V_{uil}$ where Total M Height above stack where Total M $V = (n(V^3 a)_{tui}/a)^{1/3}$ for height above $V = V_{touch} + (V_m - V_{touch})^* (2 - z_{100ch})/(2 tuilB meters above ground (2 + h_s)REGULAR EQNSa = a_m + 0.16 (Z - z_{tuil}) if z > z_{tuil}V = V_{couch} + (V_m - V_{couch}) (2 - z_{100ch})/(2 tuilV = v_{couch} + (2 - z_{100ch})/(2 - z_{$	Arriging Occurs Arriging Occurs Arriging Occurs (shown above) te total merging elevation -z _{touch}) is below total merging elevation III ² _{touch}) if z _{touch} <z<z<sub>tull h PHASE-INTERPOL 0.16 if V_{crit}<v<sub>m (V_m V_{touch}) if V_{crit}>V_m Plume spreadsheet) ¹⁰/_a / a $n_e^* a^2 + \lambda^2$))) 20 ft Intervals (20 ft Intervals</v<sub></z<z<sub>
Revised Virtual Source Height z _h Revised Vertical Velocity V fultiple Plume Calculations Solve for plume-averaged vertical velocity Gives the following Height above Stack : Plume Top-Hat Radius : Vertical Velocity V Solve for Height of CASC critical vertical Find Height above Ground z _{ort} +h Height above Ground z _{ort} +h Table of MERGED Plume-Averaged Vertical V Height (feet above groun Begin Merging (touch) = 137.3 140.1 200	2.495 96.444 96.444 2 211.69 2271.769 2271.769 200000 200000 200000 200000 200000 200000 200000 2000000 2000000 20000000 20000000000 200000000000 2000000000000000000000000000000000000	m/s meters* solutions in 1,000.0 meters* meters meters g at Touchin Plume Radius(m) 1.400 #N/A #N/A #N/A #N/A #N/A #N/A #N/A #N/A	8.19 ft/sec 316.4 feet* 316.4 feet* 316.4 feet* 203.9 feet 6.70 ft/sec m/s 170.5 feet 278.9 feet 170.5 feet 278.9 fe	where $a_{m} = n^{0.25} a_{tuil}$ where Total M and $V_{m} = n^{0.25} V_{uil}$ where Total M Height above stack where Total M $V = (n(V^3 a)_{tui}/a)^{1/3}$ for height above $V = V_{touch} + (V_m - V_{touch})^* (2 - z_{100ch})/(2 tuilB meters above ground (2 + h_s)REGULAR EQNSa = a_m + 0.16 (Z - z_{tuil}) if z > z_{tuil}V = V_{couch} + (V_m - V_{couch}) (2 - z_{100ch})/(2 tuilV = v_{couch} + (2 - z_{100ch})/(2 - z_{$	Arriging Occurs Arriging Occurs Arriging Occurs (shown above) te total merging elevation -z _{touch}) is below total merging elevation III ² _{touch}) if z _{touch} <z<z<sub>tull h PHASE-INTERPOL 0.16 if V_{crit}<v<sub>m (V_m V_{touch}) if V_{crit}>V_m Plume spreadsheet) ¹⁰/_a / a $n_e^* a^2 + \lambda^2$))) 20 ft Intervals (20 ft Intervals</v<sub></z<z<sub>
Revised Virtual Source Height z _h Revised Vertical Velocity V Aultiple Plume Calculations Solve for plume-averaged vertical velocity V Plume Top-Hat Radius : Plume Top-Hat Radius : Vertical Velocity V Solve for Height of CASC critical vertical Find Height above Stack z _c Height above Ground z _{crit} +h Table of MERGED Plume-Averaged Vertical V Height (feel above groun Begin Merging (touch) = 137.7 140.1 180.1 200.1 2	2.495 96.444 96.454 2271.769 a 62.138 2271.769 a 62.138 22022 al velocity V _{ent} a 51.976 a 51.976 a 51.976 a 62.138 / 2.042 al velocity V _{ent} a 51.976 a bove startin) (meters) d above stack 23.00 21.83 20.27.93 34.02 20.46.22 20.46.22 20.46.22 20.46.22 20.46.20 20.46.20 20.46.20 20.46.20 20.46.20 20.46.20 20.46.20 20.46.20 20.46.45 20.46.45 20.46.45 21.93 96.45 21.19.37 21.42.9	m/s meters* solutions in 1,000.0 meters* meters meters g at Touchin Plume Radius(m) 1.400 #N/A #N/A #N/A #N/A #N/A #N/A #N/A #N/A	8.19 ft/sec 316.4 feet* 316.4 feet* 316.4 feet* 316.4 feet* 304.8 891.6 feet* 203.9 feet 6.70 ft/sec m/s 170.5 feet 278.9 feet 7.89 feet 170.5 feet 278.9 feet 4.70 ft/sec 6.82 6.43 6.05 5.66 5.28 4.89 4.51 4.13 3.74 3.36 2.49 2.41 2.32 2.16 2.16	where $a_{m} = n^{0.25} a_{tuil}$ where Total M and $V_{m} = n^{0.25} V_{uil}$ where Total M Height above stack where Total M $V = (n(V^3 a)_{tui}/a)^{1/3}$ for height above $V = V_{touch} + (V_m - V_{touch})^* (2 - z_{100ch})/(2 tuilB meters above ground (2 + h_s)REGULAR EQNSa = a_m + 0.16 (Z - z_{tuil}) if z > z_{tuil}V = V_{couch} + (V_m - V_{couch}) (2 - z_{100ch})/(2 tuilV = v_{couch} + (2 - z_{100ch})/(2 - z_{$	Arriging Occurs Arriging Occurs Arriging Occurs (shown above) te total merging elevation -z _{touch}) is below total merging elevation III ² _{touch}) if z _{touch} <z<z<sub>tull h PHASE-INTERPOL 0.16 if V_{crit}<v<sub>m (V_m V_{touch}) if V_{crit}>V_m Plume spreadsheet) ¹⁰/_a / a $n_e^* a^2 + \lambda^2$))) 20 ft Intervals (20 ft Intervals</v<sub></z<z<sub>
Revised Virtual Source Height z _h Revised Vertical Velocity V fultiple Plume Calculations Solve for plume-averaged vertical vel Gives the following Height above Stack. Plume Top-Hat Radius : Vertical Velocity V Solve for Height of CASC critical vertic Find Height above Ground z _{ent} +h eight above Ground z _{ent} +h fable of MERGED Plume-Averaged Vertical V Height (feet above ground Begin Merging (touch) = 137. 140. 160. 2200. 2200. 2200. 2200. 2200. 2200. 2200. 2200. 2200. 2200. 20	2.495 96.444 271.769 a 62.138 2271.769 a 62.138 2.042 al velocity V _{orit} a 51.976 a 51.976 a 51.976 a 51.976 a bove stack 9.644 9.64 10 a bove stack 9.64 0.27.93 0.34.02 0.46.22 0.52.31 0.56.41 0.64.50 0.70.60 76.70 10.64.50 119.37 149.85 1180.33 2210.81 120.21.81 120.21.81 120.21.81 120.21.81 120.21.81 130.221.81 149.85 140.33 2210.81 120.21.81 120.21.81 120.21.81 120.21.81 120.21.81 130.221.81 <td>m/s meters* solutions in meters* meters meters meters g at Touchin Plume Radius(m) 1.400 #N/A #N/A #N/A #N/A #N/A #N/A #N/A #N/A</td> <td>8.19 ft/sec 316.4 feet* 316.4 feet* 316.4 feet* 304.6 891.6 feet* 203.9 feet 6.70 ft/sec m/s 170.5 feet 278.9 feet 170.5 feet 278.9 feet 170.5 feet 278.9 feet Net(m/s) 8.01 7.97 7.59 7.20 6.82 6.43 6.05 5.66 5.28 4.89 4.51 4.13 3.74 3.36 2.49 4.51 4.13 3.74 3.36 2.41 2.32 2.23 2.16 2.10 2.04</td> <td>where $a_{m} = n^{0.25} a_{tuil}$ where Total M and $V_{m} = n^{0.25} V_{uil}$ where Total M Height above stack where Total M $V = (n(V^3 a)_{tui}/a)^{1/3}$ for height above <math>V = V_{touch} + (V_m - V_{touch})^* (2 - z_{100ch})/(2 tuilB meters above ground (2 + h_s)REGULAR EQNS$a = a_m + 0.16 (Z - z_{tuil})$ if $z > z_{tuil}$ $V = V_{couch} + (V_m - V_{couch}) (2 - z_{100ch})/(2 tuilV = v_{couch} + (2 - z_{100ch})/(2 - z_{$</math></td> <td>Aerging Occurs Aerging Occurs Aerging Occurs (shown above) te total merging elevation -z_{touch}) is below total merging elevation III²z_{touch}) if z_{touch}<z<z<sub>tull h PHASE-INTERPOL 0.16 if V_{crit}<v<sub>m (V_m V_{touch}) if V_{crit}>V_m Plume spreadsheet) ¹⁰ / a $n_{e}^{*}a^{2*}\lambda^{2}$))) 20 ft Interval: III²z_{touch})</v<sub></z<z<sub></td>	m/s meters* solutions in meters* meters meters meters g at Touchin Plume Radius(m) 1.400 #N/A #N/A #N/A #N/A #N/A #N/A #N/A #N/A	8.19 ft/sec 316.4 feet* 316.4 feet* 316.4 feet* 304.6 891.6 feet* 203.9 feet 6.70 ft/sec m/s 170.5 feet 278.9 feet 170.5 feet 278.9 feet 170.5 feet 278.9 feet Net(m/s) 8.01 7.97 7.59 7.20 6.82 6.43 6.05 5.66 5.28 4.89 4.51 4.13 3.74 3.36 2.49 4.51 4.13 3.74 3.36 2.41 2.32 2.23 2.16 2.10 2.04	where $a_{m} = n^{0.25} a_{tuil}$ where Total M and $V_{m} = n^{0.25} V_{uil}$ where Total M Height above stack where Total M $V = (n(V^3 a)_{tui}/a)^{1/3}$ for height above $V = V_{touch} + (V_m - V_{touch})^* (2 - z_{100ch})/(2 tuilB meters above ground (2 + h_s)REGULAR EQNSa = a_m + 0.16 (Z - z_{tuil}) if z > z_{tuil}V = V_{couch} + (V_m - V_{couch}) (2 - z_{100ch})/(2 tuilV = v_{couch} + (2 - z_{100ch})/(2 - z_{$	Aerging Occurs Aerging Occurs Aerging Occurs (shown above) te total merging elevation -z _{touch}) is below total merging elevation III ² z _{touch}) if z _{touch} <z<z<sub>tull h PHASE-INTERPOL 0.16 if V_{crit}<v<sub>m (V_m V_{touch}) if V_{crit}>V_m Plume spreadsheet) ¹⁰ / a $n_{e}^{*}a^{2*}\lambda^{2}$))) 20 ft Interval: III²z_{touch})</v<sub></z<z<sub>
Revised Virtual Source Height z _h Revised Vertical Velocity V fultiple Plume Calculations Solve for plume-averaged vertical velocity Gives the following Height above Stack Plume Top-Hat Radius : Vertical Velocity V Solve for Height of CASC critical vertica Find Height above Stack z _c Height above Ground z _{crit} +h above grouns Begin Merging (touch) = 137.3 140.1 160.1 200.1	2.495 96.444 96.444 271.769 a 62.138 2.042 al velocity V _{erit} a 51.976 b 65.007 clocities startin) (meters) d above stack 2.894 0 9.64 0 34.02 0 40.12 0 40.12 0 40.12 0 40.22 0 52.31 0 70.60 76.70 9.644 19.976.41 19.976.21 140.22 2.40.21 140.22 140.22 140.21.83 10 27.93 10 46.22 10 58.41 10 64.50 119.37 149.85 180.33 210.81 210.81 210.81 210.81 210.81 210.83 210.81 210.81 210.81	m/s meters* solutions in 1,000.0 meters* meters meters g at Touchin Plume Radius(m) 1.400 #W/A #W/A #W/A #W/A #W/A #W/A #W/A #W/A	8.19 ft/sec 316.4 feet* 316.4 feet* 316.4 feet* 203.9 feet 6.70 ft/sec m/s 170.5 feet 278.9 feet 170.5 feet 278.9 feet ng Height: Vert. Vel(m/s) 8.01 7.97 7.59 7.59 7.20 6.82 6.43 6.05 5.66 5.28 4.89 4.51 4.13 3.74 3.36 2.49 2.41 2.32 2.23 2.16 2.10 2.04 1.99	where $a_{m} = n^{0.25} a_{tuil}$ where Total M and $V_{m} = n^{0.25} V_{uil}$ where Total M Height above stack where Total M $V = (n(V^3 a)_{tui}/a)^{1/3}$ for height above $V = V_{touch} + (V_m - V_{touch})^* (2 - z_{100ch})/(2 tuilB meters above ground (2 + h_s)REGULAR EQNSa = a_m + 0.16 (Z - z_{tuil}) if z > z_{tuil}V = V_{couch} + (V_m - V_{couch}) (2 - z_{100ch})/(2 tuilV = v_{couch} + (2 - z_{100ch})/(2 - z_{$	Aerging Occurs Aerging Occurs Aerging Occurs (shown above) te total merging elevation -z _{touch}) is below total merging elevation III ² z _{touch}) if z _{touch} <z<z<sub>tull h PHASE-INTERPOL 0.16 if V_{crit}<v<sub>m (V_m V_{touch}) if V_{crit}>V_m Plume spreadsheet) ¹⁰ / a $n_{e}^{*}a^{2*}\lambda^{2}$))) 20 ft Interval: III²z_{touch})</v<sub></z<z<sub>
Revised Virtual Source Height z _h Revised Vertical Velocity V fultiple Plume Calculations Solve for plume-averaged vertical vel Gives the following Height above Stack : Plume Top-Hat Radius : Vertical Velocity V Solve for Height of CASC critical vertica Find Height above Ground z _{ort} +h Height above Ground z _{ort} +h Sable of MERGED Plume-Averaged Vertical V Height (feet above grouns Begin Merging (touch) = 137.3 140.1 180.1 20	2.495 96.444 96.444 271.769 a 2.042 al velocity V _{orti} a 51.976 a 51.976 a 51.976 a a 51.976 a a 51.976 a b c alove stack above stack above stack 34.02 34.02 34.02 34.02 446.22 52.31 58.41 64.50 70.60 70.60 70.60 70.149.85 180.33 210.81 2210.81 2210.81 2210.81 2210.81 232.25 332.73	m/s meters* solutions in 1,000.0 meters* meters m/s 5.30 meters g at Touchin Plume Radius(m) 1.400 #N/A #N/A #N/A #N/A #N/A #N/A #N/A #N/A	8.19 ft/sec 316.4 feet* 316.4 feet* 316.4 feet* 203.9 feet 6.70 ft/sec m/s 170.5 feet 278.9 feet 170.5 feet 278.9 feet ng Height: Vert. Vel(m/s) 8.01 7.97 7.59 7.20 6.82 6.43 6.05 5.66 5.28 4.89 4.51 4.13 3.74 3.36 2.49 2.41 2.32 2.23 2.16 2.10 2.04 1.99 1.95	where $a_{m} = n^{0.25} a_{tuil}$ where Total M and $V_{m} = n^{0.25} V_{uil}$ where Total M Height above stack where Total M $V = (n(V^3 a)_{tui}/a)^{1/3}$ for height above $V = V_{touch} + (V_m - V_{touch})^* (2 - z_{100ch})/(2 tuilB meters above ground (2 + h_s)REGULAR EQNSa = a_m + 0.16 (Z - z_{tuil}) if z > z_{tuil}V = V_{couch} + (V_m - V_{couch}) (2 - z_{100ch})/(2 tuilV = v_{couch} + (2 - z_{100ch})/(2 - z_{$	Aerging Occurs Aerging Occurs Aerging Occurs (shown above) te total merging elevation -z _{touch}) is below total merging elevation # PHASE-INTERPOL 0.16 if V _{crt} <v<sub>m (V_m-V_{touch}) if V_{crt}>V_m Plume spreadsheet) ¹⁰ / a m^e*a²*λ²))) 20 ft Interval: 100 ft Interval:</v<sub>
Revised Virtual Source Height z _k Revised Vertical Velocity V fultiple Plume Calculations Solve for plume-averaged vertical velocity Plume Top-Hat Radius : Vertical Velocity V Solve for Height of CASC critical vertical Find Height above Stack z _c Height above Ground z _{crit} +h fable of MERGED Plume-Averaged Vertical V Height (fed above groun Begin Merging (touch) = 137.7 140. 180. 200. 200. 200. 200. 200. 200. 200. 2	2.495 96.444 96.454 271.769 a 62.138 2.042 al velocity V _{ent} a 51.976 s 85.007 clocities startin a dove stack a bove stack 9.644 9.644 9.9.64 9.642 9.645 9.645 9.645 9.645 9.19.770 14.80.33 9.21.97 9.64.50 9.19.31 19.32 9.21.777 9.24.129 9.24.129 9.24.129 9.24.129 9.24.129 9.24.129 9.24.129 9.24.129 9.24.129 9.24.129 9.24.129 9.24.129 9.24.129 9.24.129 12.24.129 12.24.129 12.24.129 12.24.129 12.24.2	m/s meters* solutions in 1,000.0 meters* meters g at Touchin Plume Radius(m) 1.400 #N/A #N/A #N/A #N/A #N/A #N/A #N/A #N/A	8.19 ft/sec 316.4 feet* 316.4 feet* 316.4 feet* 203.9 feet 6.70 ft/sec 3170.5 feet 278.9 feet 3170.5 feet 278.9 feet 3170.5 feet 278.9 feet 3170.5 feet 278.9 feet 3170.5 fee	where $a_{m} = n^{0.25} a_{tuil}$ where Total M and $V_{m} = n^{0.25} V_{uil}$ where Total M Height above stack where Total M $V = (n(V^3 a)_{tui}/a)^{1/3}$ for height above $V = V_{touch} + (V_m - V_{touch})^* (2 - z_{100ch})/(2 tuilB meters above ground (2 + h_s)REGULAR EQNSa = a_m + 0.16 (Z - z_{tuil}) if z > z_{tuil}V = V_{couch} + (V_m - V_{couch}) (2 - z_{100ch})/(2 tuilV = v_{couch} + (2 - z_{100ch})/(2 - z_{$	Aerging Occurs Aerging Occurs Aerging Occurs (shown above) te total merging elevation -z _{touch}) is below total merging elevation # PHASE-INTERPOL 0.16 if V _{crt} <v<sub>m (V_m-V_{touch}) if V_{crt}>V_m Plume spreadsheet) ¹⁰ / a m^e*a²*λ²))) 20 ft Interval: 100 ft Interval:</v<sub>
Revised Virtual Source Height z _h Revised Vertical Velocity V Autiple Plume Calculations Solve for plume-averaged vertical vel Gives the following Height above Stack. Plume Top-Hat Radius : Vertical Velocity V Solve for Height of CASC critical vertic Find Height above Ground z _{ent} +h Height above Ground z _{ent} +h fable of MERGED Plume-Averaged Vertical V Height (feet above ground Begin Merging (touch) = 137. 140. 200. 2200. 2200. 240. 200. 2200. 240. 200. 20	2.495 96.444 271.769 a 62.138 2271.769 a 62.138 2.042 al velocity V _{orit} a 51.976 a 51.976 a 51.976 a 51.976 a 51.976 a bove startin) (meters) d above stack 9.644 271.73 30.27.93 30.34.02 20.40.12 20.46.22 34.02 21.83 30.34.02 30.40.12 30.40.12 30.40.22 46.22 52.31 58.41 364.50 70.60 76.70 30.210.81 19.37 149.85 30.210.81 241.29 241.29 241.29 241.29 332.73 332.73 363.21 363.21 <t< td=""><td>m/s meters* solutions in meters* meters meters meters meters g at Touchin Plume Radius(m) 1.400 #N/A #N/A #N/A #N/A #N/A #N/A #N/A #N/A</td><td>8.19 ft/sec 316.4 feet* 316.4 feet* 316.4 feet* 304.6 891.6 feet* 203.9 feet 6.70 ft/sec m/s 170.5 feet 278.9 feet 170.5 feet 278.9 feet Net(m/s) 8.01 7.97 7.59 7.20 6.82 6.43 6.05 5.66 5.28 4.89 4.51 4.13 3.74 3.36 2.49 4.51 4.13 3.74 3.36 2.49 4.51 4.13 3.74 3.36 2.49 4.51 4.13 3.74 3.36 2.49 4.51 4.13 3.74 3.36 2.49 4.51 4.13 3.74 3.36 2.49 4.51 4.13 3.74 3.36 2.49 4.51 4.13 3.74 3.36 2.49 4.51 4.13 3.74 3.36 2.49 4.51 4.13 3.74 3.36 2.49 2.41 2.32 2.23 2.16 2.10 2.04 1.99 1.95 1.90 1.90 1.90 1.90 1.90</td><td>where $a_{m} = n^{0.25} a_{tuil}$ where Total M and $V_{m} = n^{0.25} V_{uil}$ where Total M Height above stack where Total M $V = (n(V^3 a)_{tui}/a)^{1/3}$ for height above <math>V = V_{touch} + (V_m - V_{touch})^* (2 - z_{100ch})/(2 tuilB meters above ground (2 + h_s)REGULAR EQNS$a = a_m + 0.16 (Z - z_{tuil})$ if $z > z_{tuil}$ $V = V_{couch} + (V_m - V_{couch}) (2 - z_{100ch})/(2 tuilV = v_{couch} + (2 - z_{100ch})/(2 - z_{$</math></td><td>Aerging Occurs Aerging Occurs Aerging Occurs (shown above) te total merging elevation -z_{touch}) is below total merging elevation # PHASE-INTERPOL 0.16 if V_{crt}<v<sub>m (V_m-V_{touch}) if V_{crt}>V_m Plume spreadsheet) ¹⁰ / a m^e*a²⁺λ²))) 20 ft Intervals 100 ft Intervals</v<sub></td></t<>	m/s meters* solutions in meters* meters meters meters meters g at Touchin Plume Radius(m) 1.400 #N/A #N/A #N/A #N/A #N/A #N/A #N/A #N/A	8.19 ft/sec 316.4 feet* 316.4 feet* 316.4 feet* 304.6 891.6 feet* 203.9 feet 6.70 ft/sec m/s 170.5 feet 278.9 feet 170.5 feet 278.9 feet Net(m/s) 8.01 7.97 7.59 7.20 6.82 6.43 6.05 5.66 5.28 4.89 4.51 4.13 3.74 3.36 2.49 4.51 4.13 3.74 3.36 2.49 4.51 4.13 3.74 3.36 2.49 4.51 4.13 3.74 3.36 2.49 4.51 4.13 3.74 3.36 2.49 4.51 4.13 3.74 3.36 2.49 4.51 4.13 3.74 3.36 2.49 4.51 4.13 3.74 3.36 2.49 4.51 4.13 3.74 3.36 2.49 4.51 4.13 3.74 3.36 2.49 2.41 2.32 2.23 2.16 2.10 2.04 1.99 1.95 1.90 1.90 1.90 1.90 1.90	where $a_{m} = n^{0.25} a_{tuil}$ where Total M and $V_{m} = n^{0.25} V_{uil}$ where Total M Height above stack where Total M $V = (n(V^3 a)_{tui}/a)^{1/3}$ for height above $V = V_{touch} + (V_m - V_{touch})^* (2 - z_{100ch})/(2 tuilB meters above ground (2 + h_s)REGULAR EQNSa = a_m + 0.16 (Z - z_{tuil}) if z > z_{tuil}V = V_{couch} + (V_m - V_{couch}) (2 - z_{100ch})/(2 tuilV = v_{couch} + (2 - z_{100ch})/(2 - z_{$	Aerging Occurs Aerging Occurs Aerging Occurs (shown above) te total merging elevation -z _{touch}) is below total merging elevation # PHASE-INTERPOL 0.16 if V _{crt} <v<sub>m (V_m-V_{touch}) if V_{crt}>V_m Plume spreadsheet) ¹⁰ / a m^e*a²⁺λ²))) 20 ft Intervals 100 ft Intervals</v<sub>
Revised Virtual Source Height z _k Revised Vertical Velocity V Multiple Plume Calculations Solve for plume-averaged vertical vel Gives the following Height above Stack Plume Top-Hat Radius : Vertical Velocity V Solve for Height of CASC critical vertic Find Height above Stack z _c Height above Ground z _{crit} th Solve for Height of CASC critical vertic Find Height above Ground z _{crit} th Solve for Height of CASC critical vertic Find Height above Ground z _{crit} th Begin Merging (touch) = 137. 140. 160. 200. 220. 240. 240. 240. 240. 240. 24	2.495 96.444 96.444 271.769 a 62.138 2.042 al velocity V _{enit} a 51.976 b 65.007 clocities startin a) (meters) d above stack 8.94 9.64 15.74 20.27.93 21.40.12 20.42.21 34.02 21.83 21.40.12 20.46.22 32.733 21.40.12 40.12 34.02 21.40.12 40.12 34.02 22.31 34.02 34.02 34.02 35.73 30.279 30.200 318.33 20.217.77 30.225 332.73 32.273 332.73 332.73 332.73 332.73 332.73 332	m/s meters* solutions in meters* meters m/s 5.30 meters meters g at Touchin Plume Radius(m) 1.400 #N/A #N/A #N/A #N/A #N/A #N/A #N/A #N/A	8.19 ft/sec 316.4 feet* 316.4 feet* 203.9 feet 6.70 ft/sec m/s 170.5 feet 278.9 feet 170.5 feet 278.9 feet ng Height: Vert. Vel(m/s) 8.01 7.97 7.59 7.59 7.20 6.82 6.43 6.05 5.66 5.28 4.89 4.51 4.13 3.74 3.36 2.49 2.41 2.32 2.23 2.16 2.10 2.04 1.99 1.95 1.90 1.83 1.83 1.83 1.83	where $a_{m} = n^{0.25} a_{tuil}$ where Total M and $V_{m} = n^{0.25} V_{uil}$ where Total M Height above stack where Total M $V = (n(V^3 a)_{tui}/a)^{1/3}$ for height above $V = V_{touch} + (V_m - V_{touch})^* (2 - z_{100ch})/(2 tuilB meters above ground (2 + h_s)REGULAR EQNSa = a_m + 0.16 (Z - z_{tuil}) if z > z_{tuil}V = V_{couch} + (V_m - V_{couch}) (2 - z_{100ch})/(2 tuilV = v_{couch} + (2 - z_{100ch})/(2 - z_{$	Aerging Occurs Aerging Occurs Aerging Occurs (shown above) te total merging elevation -z _{touch}) is below total merging elevation # PHASE-INTERPOL 0.16 if V _{crt} <v<sub>m (V_m-V_{touch}) if V_{crt}>V_m Plume spreadsheet) ¹⁰ / a m^e*a²⁺λ²))) 20 ft Intervals 100 ft Intervals</v<sub>
Revised Virtual Source Height z _h Revised Vertical Velocity V Multiple Plume Calculations Solve for plume-averaged vertical vel Gives the following Height above Stack : Plume Top-Hat Radius : Vertical Velocity V Solve for Height of CASC critical vertic Find Height above Stack z _m Height above Ground z _{ont} th Fable of MERGED Plume-Averaged Vertical V Height (feet above groun Begin Merging (touch) = 137.3 140.0 180.0 20	2.495 96.444 96.444 2 271.769 62.138 2.042 al velocity V _{orit} a 51.976 5 50.007 elocities startin a) velocities velocities a) velocities velocities a) velocities velocities a) velocities b) velocities b) velocities b) velocities c) veloci	m/s meters* solutions in meters* meters m/s 5.30 meters meters g at Touchin Plume Radius(m) 1.400 #N/A #N/A #N/A #N/A #N/A #N/A #N/A #N/A	8.19 ft/sec 316.4 feet* 316.4 feet* 316.4 feet* 203.9 feet 6.70 ft/sec m/s 170.5 feet 278.9 feet 170.5 feet 278.9 feet ng Height: Vert. Vel(m/s) 8.01 7.97 7.59 7.20 6.82 6.43 6.05 5.66 5.28 4.89 4.51 4.13 3.74 3.36 2.49 2.41 2.32 2.23 2.16 2.10 2.04 1.99 1.99 1.99 1.99 1.99 1.99 1.99 1.90 1.83 1.68 1.58	where $a_{m} = n^{0.25} a_{tuil}$ where Total M and $V_{m} = n^{0.25} V_{uil}$ where Total M Height above stack where Total M $V = (n(V^3 a)_{tui}/a)^{1/3}$ for height above $V = V_{touch} + (V_m - V_{touch})^* (2 - z_{100ch})/(2 tuilB meters above ground (2 + h_s)REGULAR EQNSa = a_m + 0.16 (Z - z_{tuil}) if z > z_{tuil}V = V_{couch} + (V_m - V_{couch}) (2 - z_{100ch})/(2 tuilV = v_{couch} + (2 - z_{100ch})/(2 - z_{$	Aerging Occurs Aerging Occurs Aerging Occurs (shown above) to total merging elevation -z _{touch}) is below total merging elevation # ² _{touch}) if z _{touch} <z<z<sub>tull h PHASE-INTERPOL 0.16 if V_{crt}<v<sub>m (V_m·V_{touch}) if V_{crt}>V_m Plume spreadsheet) ¹⁰ / a ne⁺a²⁺λ²))) 20 ft Intervals 100 ft Intervals</v<sub></z<z<sub>
Revised Virtual Source Height z _k Revised Vertical Velocity V Multiple Plume Calculations Solve for plume-averaged vertical vel Gives the following Height above Stack 2 Plume Top-Hat Radius 3 Vertical Velocity V Solve for Height of CASC critical vertic Find Height above Stack z _c Height above Ground z _{ort} +h Fable of MERGED Plume-Averaged Vertical V Height (feet above groun Begin Merging (touch) = 137.3 140.1 200	2.495 96.444 271.769 a 2271.769 a a 2.138 2.042 al velocity V _{ent} a biocities startin above stack above stack above stack 2.7.93 above stack 2.34.02 0	m/s meters* solutions in meters* meters meters g at Touchin Plume Radius(m) 1.400 #N/A #N/A #N/A #N/A #N/A #N/A #N/A #N/A	8.19 ft/sec 316.4 feet* 316.4 feet* 316.4 feet* 203.9 feet 6.70 ft/sec m/s 170.5 feet 278.9 feet 170.5 feet 278.9 feet 170.5 feet 278.9 feet 4.80 6.82 6.43 6.05 5.66 5.28 4.89 4.51 4.13 3.74 3.36 2.49 2.41 2.32 2.23 2.16 2.10 2.41 2.32 2.23 2.16 2.10 2.04 1.99 1.95 1.90 1.83 1.68 1.58 1.49	where $a_{m} = n^{0.25} a_{tuil}$ where Total M and $V_{m} = n^{0.25} V_{uil}$ where Total M Height above stack where Total M $V = (n(V^3 a)_{tui}/a)^{1/3}$ for height above $V = V_{touch} + (V_m - V_{touch})^* (2 - z_{100ch})/(2 tuilB meters above ground (2 + h_s)REGULAR EQNSa = a_m + 0.16 (Z - z_{tuil}) if z > z_{tuil}V = V_{couch} + (V_m - V_{couch}) (2 - z_{100ch})/(2 tuilV = S_{100ch} + (2 - z_{100ch})/(2 - z_{$	Aerging Occurs Aerging Occurs Aerging Occurs Aerging Occurs (shown above) to total merging elevation -z _{touch}) is below total merging elevation # ² _{touch}) if z _{touch} <z<z<sub>tull h PHASE-INTERPOL 0.16 if V_{crit}<v<sub>m (V_m -V_{touch}) if V_{crit}>V_m Plume spreadsheet) ¹⁰ / a m^e * a² + λ²))) 20 ft Intervals 100 ft Intervals</v<sub></z<z<sub>
Revised Virtual Source Height z _k Revised Vertical Velocity V Multiple Plume Calculations Solve for plume-averaged vertical velocity V Plume Top-Hat Radius : Vertical Velocity V Solve for Height of CASC critical vertic Find Height above Stack z _c Height above Ground z _{ort} +h Table of MERGED Plume-Averaged Vertical V Height (feet above ground Begin Merging (touch) = 137. 140. 200. 220. 240. 240. 240. 200. 220. 240. 24	2.495 96.444 271.769 a 62.138 2.042 al velocity V _{orit} a 51.976 a 0.0000 a 0.0000 a 0.0000 a 0.0000 a 0.0000 a 0.0000 a 0.00000 a 0.000000 a 0.0000000000 a 0.00000000000000000000000000000000000	m/s meters* solutions in meters* meters meters meters meters g at Touchin Plume Radius(m) 1.400 #N/A #N/A #N/A #N/A #N/A #N/A #N/A #N/A	8.19 ft/sec 316.4 feet* 316.4 feet* 316.4 feet* 203.9 feet 6.70 ft/sec m/s 170.5 feet 278.9 feet 170.5 feet 278.9 feet rg Height: Vert. Vet(m/s) 8.01 7.97 7.59 7.20 6.82 6.43 6.05 5.66 5.28 4.89 4.51 4.13 3.74 3.36 2.49 2.41 2.32 2.23 2.16 2.10 2.04 1.99 1.95 1.90 1.90 1.95 1.90 1.90 1.95 1.49 1.49 1.42	where $a_{m} = n^{0.25} a_{tuil}$ where Total M and $V_{m} = n^{0.25} V_{uil}$ where Total M Height above stack where Total M $V = (n(V^3 a)_{tui}/a)^{1/3}$ for height above $V = V_{touch} + (V_m - V_{touch})^* (2 - z_{100ch})/(2 tuilB meters above ground (2 + h_s)REGULAR EQNSa = a_m + 0.16 (Z - z_{tuil}) if z > z_{tuil}V = V_{couch} + (V_m - V_{couch}) (2 - z_{100ch})/(2 tuilV = S_{100ch} + (2 - z_{100ch})/(2 - z_{$	Merging Occurs Merging Occurs (shown above) we total merging elevation z_{couch}) is below total merging elevation $m^{-2}z_{couch}$) if $z_{touch} < z < z_{tull}$ PHASE-INTERPOL 0.16 if $V_{crit} < V_m$ ($V_m \cdot V_{couch}$) if $V_{crit} > V_m$ hume spreadsheet) V_a / a $m_e^* a^{2*} \lambda^2$))) 20 ft intervals
Revised Virtual Source Height z _k Revised Vertical Velocity V Multiple Plume Calculations Solve for plume-averaged vertical vel Gives the following Height above Stack 2 Plume Top-Hat Radius 3 Vertical Velocity V Solve for Height of CASC critical vertic Find Height above Stack z _c Height above Ground z _{ort} +h Fable of MERGED Plume-Averaged Vertical V Height (feet above groun Begin Merging (touch) = 137.3 140.1 200	2.495 96.444 271.769 a 62.138 2.042 al velocity V _{orit} a 51.976 a bove startin a bove stack 2.9.42 a bove stack 2.9.33 3.402	m/s meters* solutions in meters* meters meters g at Touchin Plume Radius(m) 1.400 #N/A #N/A #N/A #N/A #N/A #N/A #N/A #N/A	8.19 ft/sec 316.4 feet* 316.4 feet* 316.4 feet* 203.9 feet 6.70 ft/sec m/s 170.5 feet 278.9 feet 170.5 feet 278.9 feet 170.5 feet 278.9 feet 4.80 6.82 6.43 6.05 5.66 5.28 4.89 4.51 4.13 3.74 3.36 2.49 2.41 2.32 2.23 2.16 2.10 2.41 2.32 2.23 2.16 2.10 2.04 1.99 1.95 1.90 1.83 1.68 1.58 1.49	where $a_{m} = n^{0.25} a_{tuil}$ where Total M and $V_{m} = n^{0.25} V_{uil}$ where Total M Height above stack where Total M $V = (n(V^3 a)_{tui}/a)^{1/3}$ for height above $V = V_{touch} + (V_m - V_{touch})^* (2 - z_{100ch})/(2 tuilB meters above ground (2 + h_s)REGULAR EQNSa = a_m + 0.16 (Z - z_{tuil}) if z > z_{tuil}V = V_{couch} + (V_m - V_{couch}) (2 - z_{100ch})/(2 tuilV = S_{100ch} + (2 - z_{100ch})/(2 - z_{$	Aerging Occurs Aerging Occurs Aerging Occurs Aerging Occurs (shown above) to total merging elevation -z _{touch}) is below total merging elevation # ² _{touch}) if z _{touch} <z<z<sub>tull h PHASE-INTERPOL 0.16 if V_{crit}<v<sub>m (V_m -V_{touch}) if V_{crit}>V_m Plume spreadsheet) ¹⁰ / a m^e * a² + λ²))) 20 ft Intervals 100 ft Intervals</v<sub></z<z<sub>

MERGED (along width) Plume Average Vertical Velocities for SVY03A Chillers using CEC Staff Methodology - Summer Max*

		Aviation Safety					no of Vorious Heishts in the F	ad
	"1	ne Evaluation			-		ns at Various Heights in the Merg at Oakey, Queensland, Australia ,	
Ambient Conditions:							sume neutral conditions (d0/dz=0 or	
	Potential Temp θ_a	302.21 Kel	lvins	84.3	°F		0.3048 meters/feet	
Plume Exit Conditions:	0					Gravity g	9.81 m/s ²	
Individual	Stack Height hs	33.03 me 1.73736 me		108 4/12	inches	λ	1.11 ~1.0	
	Stack Diameter D tack Velocity V _{exit}	13.20 m/s		43.30		λ _o 4Vol/(60πD ²)	-1.0	
	Volumetric Flow	31.29 cu.		66,300		4V0/(0011D) πV _{exit} D ² /4		Sect.2/¶1
	Potential Temp θ _s	313.32 Kel		104.3		···exit= · ·		
Initial Stack I	Buoyancy Flux F₀	3.46 m ⁴ /	/s ³	20.0	ΔT(°F)	$gV_{exit}D^2(1-\theta_a/\theta_s$)/4 = Vol.Flow(g/ π)(1- θ_a/θ_s)	Sect.2/¶1
Plume	Buoyancy Flux F	N/A m ⁴ /	/s ³			$\lambda^2 g V a^2 (1 - \theta_a / \theta_D)$	for a, V, θ_{D} at plume height (see bel	ow)
	mber of Stacks n	24						
Average Adjacent St		4.36 me	eters	14.3	feet		multiple plume treatment in Peter B	
Number of Stacks alo	ong Orientation N	8					s increased by N ^{0.25} at the height wh Iterp. below ht, single merged stack	
Conditions at End (Top) of Jet	Phase					runy merged (m	nerp. below ni, single merged stack	above nt)
	t above Stack z _{iet}	10.859 me	eters*	35.6	feet*	z _{iet} = 6.25D, me	eters*=meters above stack top	Sect.3/¶1
	ve Ground z _{jet} +h _s	43.890 me		144.0		,		
Ve	rtical Velocity V _{jet}	6.599 m/s	s	21.65	ft/sec	$V_{jet} = 0.5V_{exit} =$	V _{exit} /2	
Plume Top-H	lat Diameter 2a _{jet}	3.475 me	eters	11.4	feet	2a _{jet} = 2D	Conservation of momentur	m "
Spillane Methodology - Analyt								
Single Plume-averaged Ve Single Plume Values: Plume				Merging Only			or linear increase with height	Sect.2/Eq.6
-	Source Height z _v	0.194 me			feet*		$_{\rm e}/\theta_{\rm s})^{1/2}$], meters*=meters above stack top	Sect.2/Eq.6
	ove Ground z _v +h _s	33.225 me		109.0			where $(\theta_2/\theta_2)^{1/2} = (\theta_2/\theta_2)^{1/2}$	
-	/ertical Velocity V			Merging Only		{(Va) _o ³ + 0.12F	$(a_{\mu}^{2}a_{\mu}^{2})^{2} - (6.25D-z_{\nu})^{2}]^{(1/3)} / a$	Sect.2.1(6)
	Product (Va) _o	11.261 m ² /	/s			$V_{exit}(D/2)(\theta_e/\theta_s)$		
Plume Merging - Based on Sir	-					A		Sect.3/¶3
Begin Merging Plume Top-Ha		4.360 me		14.3		2a _{touch} =d, (or a		, top
-	above Stack z _{touch} e Ground z _{touch} +h _s	13.819 me 46.850 me		45.3 153.7		$z_{touch} = z_v + d/(2)$	*0.16), meters*=meters above stack	сюр
-	cal Velocity V _{touch}	40.000 me 5.201 m/s			ft/sec	$V_{trust} = {(1/2)^{3}}$	+ 0.12F ₀ [(z-z _v) ² - (6.25D-z _v) ²] ^(1/3)	/ a
Total Merging Plume Top-H		30.520 me		100.1			, (or a _{full} =d(N-1)/2) FOR 2 STACKS	
	t above Stack z _{full}	95.569 me		313.5			0.16), meters*=meters above stack	
Height abov	ve Ground z _{full} +h _s	128.600 me	eters	421.9	feet			
Ver	rtical Velocity V _{full}	1.132 m/s		3.7	ft/sec	$V_{full} = {(Va)_{0}^{3} + }$	$0.12F_{o} [(z_{full} - z_{v})^{2} - (6.25D - z_{v})^{2}]^{(1/3)}$	/ a _{full}
	Product (V ³ a) _{full}	22 m ⁴ /						
Conditions at End (Top) of Me					l Plume ca			1
Merged Plume Values: Plu Bovioed Merged		33.776 me		able Below 110.8	foot		0.16(z-z _{full})), or linear increase with	neight
Revised Merged F Revised Merged P		2.507 m/s					¹⁵ a _{full} where Total Merging Occurs	
nornood morgou i	ianto volocity vm				ft/sec			
Revised Virtual S	Source Height Zea	95.569 me			ft/sec feet*		⁵ V _{full} where Total Merging Occurs tack where Total Merging Occurs (s	shown above)
Revised Virtual S Revised V	Source Height z _{full} /ertical Velocity V	95.569 me Solu	eters*	313.5 ables Below		Height above s	tack where Total Merging Occurs (s	
	-		eters*	313.5		Height above s V={n(V ³ a) _{full} /a} ¹	tack where Total Merging Occurs (s ^{1/3} for heights above total merging e	
Revised V	-		eters*	313.5		Height above s V={n(V ³ a) _{full} /a} ¹	tack where Total Merging Occurs (s / ^{/3} for heights above total merging e / _{touch})*(z-z _{touch})/(z _{full} -z _{touch})	levation
Revised V	/ertical Velocity V	Solu	eters*	313.5 ables Below	feet*	Height above s V={n(V ³ a) _{full} /a} ¹	tack where Total Merging Occurs (s for heights above total merging e fouch)*(z-z _{touch})/(z _{full} -z _{touch}) for heights below total mer	levation
Revised V Multiple Plume Calculations Solve for plume-avera Gives the following Heig	Vertical Velocity V ged vertical velocit ght above Stack z	Solu	eters* itions in Ta 1,000.0 fe	313.5 ables Below	feet* 304.8	Height above s V={n(V ³ a) _{full} /a) ¹ V=V _{touch} +(V _m -V B meters above Q REGULAR EQ	tack where Total Merging Occurs (s ¹³ for heights above total merging e ¹ _{souch})*(z-z _{louch})(z _{tull} -z _{louch}) for heights below total mer ground (z+h _a) NS	levation
Revised V Multiple Plume Calculations Solve for plume-avera Gives the following Heig Plume	Yertical Velocity V ged vertical velocit ght above Stack z Top-Hat Radius a	Solut y at height 271.769 me 61.968 me	eters* tions in Ta 1,000.0 fe eters* eters	313.5 ables Below eet 891.6 203.3	feet* 304.8 feet* feet	Height above s $V=\{n(V^3a)_{tull}/a\}^2$ $V=V_{touch}+(V_m-V_m)^2$ B meters above g REGULAR EQ $a=a_m+0.16(z-z_l)^2$	tack where Total Merging Occurs (s ¹³ for heights above total merging e ¹ _{fouch})*(2-z _{touch}) (Z _{lul} -z _{touch}) for heights below total mer yround (z+h _s) NS u) jf z>z _{tull}	levation
Revised V Multiple Plume Calculations Solve for plume-avera Gives the following Heig Plume	Vertical Velocity V ged vertical velocit ght above Stack z	Solut y at height 271.769 me	eters* tions in Ta 1,000.0 fe eters* eters	313.5 ables Below eet 891.6 203.3	feet* 304.8 feet*	Height above s $V=\{n(V^3a)_{tull}/a\}$ $V=V_{touch}+(V_m-V)$ meters above g REGULAR EQ $a=a_m+0.16(z-z_r)$ $V=\{n(V^3a)_{tull}/a\}$	tack where Total Merging Occurs (s ^{1/3} for heights above total merging e ¹ _{touch} ¹ (2-z _{touch}) (Z _{tul} =Z _{touch}) for heights below total mer pround (z+h _a) NS ^{1/3} if z>z _{tull} ^{1/3} if z>z _{tull}	elevation ging elevation
Revised V Multiple Plume Calculations Solve for plume-avera Gives the following Heig Plume	Yertical Velocity V ged vertical velocit ght above Stack z Top-Hat Radius a	Solut y at height 271.769 me 61.968 me	eters* tions in Ta 1,000.0 fe eters* eters	313.5 ables Below eet 891.6 203.3	feet* 304.8 feet* feet	Height above s $V=\{n(V^3a)_{tull}/a\}$ $V=V_{touch}+(V_m-V_m)$ meters above g REGULAR EQ $a=a_m+0.16(z-z_t)$ $V=\{n(V^3a)_{tull}/a\}$ $V'=V_{touch}+(V_m-V_m)$	tack where Total Merging Occurs (s ¹³ for heights above total merging e ¹ ouch)*(2-z _{louch}) (z _{hill} -z _{louch}) for heights below total mer ground (z+h _s) NS NS Ji f z Z _{totil} ³ f z Z _{totil} ¹ z _{tocch})*(z ⁻ z _{louch}) (f z _{touch} <	elevation
Revised V Multiple Plume Calculations Solve for plume-avera Gives the following Heig Plume ' V	fertical Velocity V ged vertical velocit ght above Stack z Top-Hat Radius a fertical Velocity V	Solut y at height 271.769 me 61.968 me 2.048 m/s	eters* tions in Ta 1,000.0 fe eters* eters s	313.5 ables Below eet 891.6 203.3 6.72	feet* 304.8 feet* feet	Height above s $V=\{n(V^3a)_{tul}/a\}^2$ $V=V_{touch}+(V_m-V_m)^2$ REGULAR EQ $a=a_m+0.16(z-z_l)^2$ $V=(n(V^3a)_{tul}/a)^2$ $V=V_{touch}+(V_m-V_m)^2$	tack where Total Merging Occurs (s ¹³ for heights above total merging e ¹ _{touch} *(z-z _{touch}) (z _{tul} -z _{touch}) for heights below total mer ground (z+h _s) NS NS ¹³ if z>z _{tull} ¹³ if z>z _{tull} f z>z _{tull} e values if z <z<sub>touch</z<sub>	elevation ging elevation z <z<sub>full</z<sub>
Revised V Multiple Plume Calculations Solve for plume-avera Gives the following Heig Plume V Solve for Height of CAS	vertical Velocity V ged vertical velociti ht above Stack z Top-Hat Radius a vertical Velocity V C critical vertical vert	Solut y at height 271.769 me 61.968 me 2.048 m/s elocity V _{crit}	eters* tions in Ta 1,000.0 fe eters* eters s 5.30 m	313.5 ables Below eet 891.6 203.3 6.72	feet* 304.8 feet* feet ft/sec	$\begin{array}{l} \mbox{Height above s}\\ \mbox{V=}\{n(V^3a)_{hal}/a\}\\ \mbox{V=V}_{touch}+(V_m-V\\ \mbox{V=}touch+(V_m-V\\ \mbox{Regular Babove g}\\ \mbox{V=}\{n(V^3a)_{hal}/a\}\\ \mbox{V=}\{n(V^3a)_{hal}/a\\\\ \mbox{V=}\{n(V^3a)_{hal}/a\}\\ \mbox{V=}\{n(V^3a)_{hal}/a\\\\ \mbox{V=}\{n(V^3a)_{hal}/a\\\\ \mbox{V=}\{n(V^3a)_{hal}/a\\\\ \mbox{V=}\{n(V^3a)_{hal}/a\\\\ \mbox{V=}\{n(V^3a)_{hal}/a\\\\ \mbox{V=}\{n(V^3a)_{ha$	tack where Total Merging Occurs (s ¹³ for heights above total merging e ¹ ouch)*(Z-z _{louch}) (z _{full} -z _{louch}) for heights below total mer ground (z+h _a) NS NS NS U) if z>z _{full} ¹³ if z>z _{full} (_{ouch})*(z'-z _{louch})/(z _{full} -z _{louch}) if z _{fuluch} <: v values if z <z<sub>louch CHING Critic</z<sub>	elevation ging elevation z <z<sub>full</z<sub>
Revised V Multiple Plume Calculations Solve for plume-avera Gives the following Heig Plume V Solve for Height of CAS Find Height	fertical Velocity V ged vertical velocit ght above Stack z Top-Hat Radius a fertical Velocity V	Solut y at height 271.769 me 61.968 me 2.048 m/s	eters* tions in Ta 1,000.0 fe eters* eters s 5.30 m eters	313.5 ables Below eet 891.6 203.3 6.72	feet* 304.8 feet* feet ft/sec feet	$\begin{array}{l} \mbox{Height above s}\\ V=\{n(V^3a)_{n,u}/a\}\\ V=V_{touch}+(V_m-V)\\ \mbox{B}\\ \mbox{meters above g}\\ \mbox{REGULAR EQ}\\ \mbox{a=}a_m+0.16(z-z_l\\ V=\{n(V^3a)_{n,u}/a\}\\ V=V_{touch}+(V_m-V)\\ V=single plum\\ \mbox{S}\\ \mbox{Formal EFORE TOU}\\ \mbox{B}\\ \mbox{EFORE TOU}\\ \mbox{z}_{crit}=z_{hill}+\{[n(v_m-V_m-V_m)], v_m(v_m-V_m)\}\\ \mbox{S}\\ \mbox{S}$	tack where Total Merging Occurs (s ^{1/3} for heights above total merging e ^{1/2} icut) ¹ (2-t ₂ couch) (Zt _M =Ztouch) for heights below total mer pround (z+h _a) NS ^{1/3} if z >z _{tull} ^{1/3} cuch) ¹ (Zt _M =Ztouch) if z _{touch} <: Critic ^{1/3} Critic ^{1/3} O Critic	elevation ging elevation z <z<sub>rull cal VV < Top of J</z<sub>
Revised V Multiple Plume Calculations Solve for plume-avera Gives the following Heig Plume V Solve for Height of CAS Find Height	Vertical Velocity V ged vertical velocit ht above Stack z Top-Hat Radius a Vertical Velocity V C critical vertical v t above Stack z _{crit}	Solut y at height 271.769 me 61.968 me 2.048 m/s elocity V _{crit} JET me	eters* tions in Ta 1,000.0 fe eters* eters s 5.30 m eters	313.5 ables Below eet 891.6 203.3 6.72 v/s	feet* 304.8 feet* feet ft/sec feet	$\begin{array}{l} \mbox{Height above s}\\ V=\{n(V^3a)_{n,u}/a\}\\ V=V_{touch}+(V_m-V)\\ \mbox{B}\\ \mbox{meters above g}\\ \mbox{REGULAR EQ}\\ \mbox{a=}a_m+0.16(z-z_l\\ V=\{n(V^3a)_{n,u}/a\}\\ V=V_{touch}+(V_m-V)\\ V=single plum\\ \mbox{S}\\ \mbox{Formal EFORE TOU}\\ \mbox{B}\\ \mbox{EFORE TOU}\\ \mbox{z}_{crit}=z_{hill}+\{[n(v_m-V_m-V_m)], v_m(v_m-V_m)\}\\ \mbox{S}\\ \mbox{S}$	tack where Total Merging Occurs (s ¹³ for heights above total merging e ¹ ouch)*(Z-z _{louch}) (z _{full} -z _{louch}) for heights below total mer ground (z+h _a) NS NS NS U) if z>z _{full} ¹³ if z>z _{full} (_{ouch})*(z'-z _{louch})/(z _{full} -z _{louch}) if z _{fuluch} <: v values if z <z<sub>louch CHING Critic</z<sub>	elevation ging elevation z <z<sub>ruli cal VV < Top of J</z<sub>
Revised V dultiple Plume Calculations Solve for plume-avera Gives the following Heig Plume V Solve for Height of CAS Find Height Height abov	vertical Velocity V ged vertical velocit ht above Stack z Top-Hat Radius a vertical Velocity V C critical vertical vo t above Stack z _{orit} ve Ground z _{orit} +h _s raged Vertical Veloc	Solut y at height 271.769 me 61.968 me 2.048 m/s elocity V _{crit} JET me JET me cities starting a	aters* titions in Ta 1,000.0 fe aters* aters 5.30 m aters aters at Touchin	313.5 ables Below eet 891.6 203.3 6.72 JET JET g Height:	feet* 304.8 feet* feet ft/sec feet	$\begin{array}{l} \mbox{Height above s}\\ V=\{n(V^3a)_{nul}/a\}\\ V=V_{touch}+(V_m-V\\ B\\ meters above g\\ REGULAR EQ\\ a=a_m+0.16z_{cz}\\ V=\{n(V^3a)_{nul}/a\}\\ V=V_{touch}+(V_m-V\\ V=single plum\\ BEFORE TOU\\ z_{cnt}=z_{touch}+(Z_{tull})\\ Single Plume E\\ \end{array}$	tack where Total Merging Occurs (s ¹³ for heights above total merging e ¹ ouch ³ (2-z _{louch}) (z _{lul} -z _{louch}) for heights below total mer ground (z+h _a) NS NS 13 ¹ if z>z_{lull} ¹³ if z>z_{lull} ¹⁴ if z>z_{lull} ¹⁴ if z>z_{lull} ¹⁵ if z>z_{lull} ¹⁶ if z -z _{luuch}) (z _{lul} -z _{louch}) if z _{louch} < CHING Critico ¹⁰ ³ _j -a _m)/0.16 if V_{crit}<v< b="">m z_{luuch})*(V_{rri}-V_{luuch}) /(V_{rri}-V_{luuch}) if V_{crit} ¹⁵ <i>if</i> V_{crit} ¹⁵ <i>if if if if if if if if</i></v<>	levation ging elevation z <z<sub>full :al VV < Top of J >V_m</z<sub>
Revised V dultiple Plume Calculations Solve for plume-avera Gives the following Heig Plume V Solve for Height of CAS Find Height Height abov	Yertical Velocity V ged vertical velociti that above Stack z Top-Hat Radius a Yertical Velocity V C critical vertical velocity V t above Stack z _{crit} ve Ground z _{crit} +h _s raged Vertical Veloci Height (feet)	Solut y at height 271.769 me 61.968 me 2.048 m/s elocity V _{crit} JET me JET me JET me cities starting a (meters)	ttions in Ta 1,000.0 fe tters* s 5.30 m tters s tters at Touchin Plume	313.5 bables Below eet 891.6 203.3 6.72 JET JET JET ug Height: Vert.	feet* 304.8 feet* feet ft/sec feet	$\begin{array}{l} \mbox{Height above s} \\ \mbox{V=}(n(V_3)_{a),u(3)} \\ \mbox{V=}V_{touch}+(V_m-V_m-V_m)_{a} \\ \mbox{Bers above (} \\ \mbox{REGULAR EQ} \\ \mbox{a=}a_m+0.16(z_{-z}) \\ \mbox{V=}t_{touch}+(V_m-V_m-V_m)_{a} \\ \mbox{V=}t_{touch}+0.6(z_{-z}) \\ \mbox{V=}t_{touch}+(V_m-V_m-V_m)_{a} \\ \mbox{V=}t_{touch}+0.6(z_{-z}) \\ \mbox{V=}t_{touch$	tack where Total Merging Occurs (s 13 for heights above total merging e 1 fourh 1 (z - z _{touch}) (z _{tull} - z _{touch}) for heights below total mer ground (z +h _a) NS NS 13 if z > z _{tull} 1 if z > z _{tull} 2 z _{tull}) if z (z - z _{tull}) if z (z - z _{tull}) if z (z - z _{tull}) if z - z _{tull}) if z (z - z - z) z(z - z - z) is a standard z (z - z) z(z - z) is a standard z (z - z) is a standard z (z - z) z(z - z) is a standard z (z - z) is a standard z (z - z) is a standard z (z - z) is a standard z (z - z) is a standard z (z - z) is a standard z (z - z) is a standard z (z - z) is a standard z (z - z) is a standard z (z) is a standard z (z) is a standard z) is a standard z (z) is a standard z) is a standard z (z) is a standard z (z) is a standard z) is a standard z (z) (z	levation ging elevation z <z<sub>full :al VV < Top of J >V_m</z<sub>
Revised V Multiple Plume Calculations Solve for plume-avera Gives the following Heig Plume ⁻ V Solve for Height of CAS Find Height Height abov	Yertical Velocity V ged vertical velociti Int above Stack z Top-Hat Radius a Yertical Velocity V C critical vertical veloc t above Stack z _{crit} ve Ground z _{crit} +h _s raged Vertical Veloc Height (fet) above ground al	Solut y at height 271.769 me 61.968 me 2.048 m/s elocity V _{crit} JET me JET me JET me cities starting a (meters) bove stack Ra	ttions in Ta 1,000.0 fe eters* eters s 5.30 m eters eters at Touchim Plume dius(m)	313.5 ables Below eet 891.6 203.3 6.72 JET JET Vert. Vel(m/s)	feet* 304.8 feet* feet ft/sec feet	$\begin{array}{l} \mbox{Height above s} \\ \mbox{V=}\{n(V_{3}^{2})_{m,0}/a\}^{2} \\ \mbox{V=}V_{touch}+(V_{m}-V$	tack where Total Merging Occurs (s ¹³ for heights above total merging e i_{totah})*(z_{talm} 2 i_{totah}) for heights below total mer ground (z +h _a) NS u _a) if z > z_{tall} ¹³ if z > z_{tall} ¹³ if z > z_{tall} ¹³ if z > z_{tall} ¹⁴ z > z_{totah})*(z_{talm} 2 z_{totah}) if z_{totah} V all z if z > z_{totah})*(z_{talm} 2 z_{totah}) V all z if z z_{totah})*(z' - z_{totah})*(z_{talm} 2 z_{totah}) z_{totah})*(z' - z_{totah})*(z_{talm} 2 z_{totah}) z_{totah} Critic z_{totah})*(z' - z_{totah})*(z' + z' - z_{totah}) z_{totah})*(z' - z_{totah})*(z' + z' -	levation ging elevation z <z<sub>full :al VV < Top of J >V_m</z<sub>
Revised V Multiple Plume Calculations Solve for plume-avera Gives the following Heig Plume ⁻ V Solve for Height of CAS Find Height Height abov	vertical Velocity V ged vertical velocit Int above Stack z Top-Hat Radius a vertical Velocity V C critical vertical v t above Stack z _{crit} ve Ground z _{crit} +h _s raged Vertical Veloc Height (feu) above ground al (touch) = 153.7	Solut y at height 271.769 me 61.968 me 2.048 m/s elocity V _{crit} JET me JET me cities starting a (meters) bove stack Rat 13.82	ttions in Ta 1,000.0 fe ters* ters 5.30 m eters ters at Touchin Plume dius(m) 2.180	313.5 bbles Below eet 891.6 203.3 6.72 JET JET JET g Height: Vert. Vert. Vel(m/s) 5.20	feet* 304.8 feet* feet ft/sec feet	$\begin{array}{l} \mbox{Height above s} \\ \mbox{V=}[n(V^3a)_{nul}A]^3 \\ \mbox{V=V}_{inuch+}(V_m-V \\ \mbox{B} meters above s \\ \mbox{REGULAR EQ} \\ \mbox{a=}a_m+0.16(z-z_l \\ \mbox{V=}[n(V^3a)_{nul}A]^3 \\ \mbox{V=}V_{inuch+}(V_m-V \\ \mbox{V=}single plum \\ \mbox{BEFORE TOU} \\ \mbox{Z}_{crit} = z_{kull} + [(n(z_{crit})_{crit}^{-1} - z_{crit}^{-1} - z_{kull}^{-1} + (z_{kull}^{-1} - z_{crit}^{-1} - z_{kull}^{-1} + (z_{kull}^{-1} - z_{kull}^{-1} - z_{kull}^{-1} - z_{kull}^{-1} - z_{kull}^{-1} - z_{kull}^{-1} + (z_{kull}^{-1} - z_{kull}^{-1} - z_{kull$	tack where Total Merging Occurs (s ¹³ for heights above total merging e ¹ ouch)*(Z=Zouch) (ZtulT=Zouch) for heights below total mer ground (z+h _s) NS u) if z>Ztult ¹ if z>Zt	ilevation ging elevation z <z<sub>full :al VV < Top of J >Vm t)</z<sub>
Revised V Multiple Plume Calculations Solve for plume-avera Gives the following Heig Plume ⁻ V Solve for Height of CAS Find Height Height abov	retrical Velocity V ged vertical velociti ght above Stack z Top-Hat Radius a retrical Velocity V C critical vertical v t above Stack z _{ort} ve Ground z _{ort} +h _s raged Vertical Veloc Height (feet) above ground al (touch) = 153.7 160.0	Solur y at height 271.769 me 61.968 me 2.048 m/s JET me JET me JET me cities starting a (metrs) bove stack Ra 13.82 15.74	ttions in Ta 1,000.0 fe ters* ters 5.30 m eters at Touchin Plume dius(m) 2.180 #N/A	313.5 ables Below eet 891.6 203.3 6.72 JET JET Vel Wert. Vel(m/s) 5.20 5.14	feet* 304.8 feet* feet ft/sec feet	Height above s $V=\{n(V^3a)_{nul}/a\}$ $V=V_{touch}+(V_m-V$ P meters above (REGULAR EQ $a=a_m+0.16(z-z_l)$ $V=\{n(V^3a)_{nul}/a\}$ $V=V_{touch}+(V_m-V$ $V=single plume BEFORE TOU z_{cnt} = z_{clut} + \{[n(z_{cnt} = z_{clut}) + ([n(z_{cnt} = z_{clut} + ([n(z_{cnt} = z_{clut}) + ([n(z_{cnt} = z_{clut} + ([n(z_{cnt} + [n(z_{cnt} + ([n(z_{cnt} + [n(z_{cnt} + ([n(z_{cnt} + [n(z_{cnt} + [n(z_{cnt} + ([n(z_{cnt} + [n(z_{cnt} + [n($	tack where Total Merging Occurs (stata where Total Merging Occurs (stata and the stata and the stat	ilevation ging elevation z <z<sub>full :al VV < Top of J >Vm t)</z<sub>
Revised V Multiple Plume Calculations Solve for plume-avera Gives the following Heig Plume ⁻ V Solve for Height of CAS Find Height Height abov	retrical Velocity V ged vertical velociti that above Stack z Top-Hat Radius a retrical Velocity V C critical vertical velocity V C critical vertical velocity to bove Stack z _{ort} raged Vertical Velocit Height (feet) above ground al (touch) = 153.7 160.0 180.0	Solut 271.769 me 61.968 me 2.048 m/s elocity V _{orit} JET me JET me cities starting a (meters) bove stack Rat 13.82 15.74 21.83	ttions in Ta 1,000.0 fe ters* ters 5.30 m ters at Touchin Plume dius(m) 2.180 #N/A #N/A	313.5 ables Below 891.6 203.3 6.72 V/s JET JET Vert. Vert. Vert. Ver(m/s) 5.20 5.14 4.94	feet* 304.8 feet* feet ft/sec feet	Height above s $V=\{n(V^3a)_{nul}/a\}$ $V=V_{touch}+(V_m-V$ P meters above (REGULAR EQ $a=a_m+0.16(z-z_l)$ $V=\{n(V^3a)_{nul}/a\}$ $V=V_{touch}+(V_m-V$ $V=single plume BEFORE TOU z_{cnt} = z_{clut} + \{[n(z_{cnt} = z_{clut}) + ([n(z_{cnt} = z_{clut} + ([n(z_{cnt} = z_{clut}) + ([n(z_{cnt} = z_{clut} + ([n(z_{cnt} + [n(z_{cnt} + ([n(z_{cnt} + [n(z_{cnt} + ([n(z_{cnt} + [n(z_{cnt} + [n(z_{cnt} + ([n(z_{cnt} + [n(z_{cnt} + [n($	tack where Total Merging Occurs (s ¹³ for heights above total merging e ¹ ouch)*(Z=Zouch) (ZtulT=Zouch) for heights below total mer ground (z+h _s) NS u) if z>Ztult ¹ if z>Zt	ilevation ging elevation z <z<sub>full :al VV < Top of J >Vm t)</z<sub>
Revised V Multiple Plume Calculations Solve for plume-avera Gives the following Heig Plume ⁻ V Solve for Height of CAS Find Height Height abov	rertical Velocity V ged vertical velocit Int above Stack z Top-Hat Radius a rertical Velocity V C critical vertical veloc t above Stack z _{ent} ve Ground z _{ont} +h _s raged Vertical Veloc Height (fet) above ground al (touch) = 153.7 160.0 200.0	Solut y at height 271.769 me 61.968 me 2.048 m/s elocity V _{erit} JET me JET me JET me cities starting a (meters) bove stack Ra 13.82 15.74 21.83 27.93	ttions in Ta 1,000.0 fe ters* ters 5.30 m ters ters at Touchin Plume dius(m) 2.180 #N/A #N/A	313.5 ables Below eet 891.6 203.3 6.72 JET JET Vert. Vel(m/s) 5.20 5.14 4.94 4.74	feet* 304.8 feet* feet ft/sec feet	Height above s $V=\{n(V^3a)_{nul}/a\}$ $V=V_{touch}+(V_m-V$ P meters above (REGULAR EQ $a=a_m+0.16(z-z_l)$ $V=\{n(V^3a)_{nul}/a\}$ $V=V_{touch}+(V_m-V$ $V=single plume BEFORE TOU z_{cnt} = z_{clut} + \{[n(z_{cnt} = z_{clut}) + ([n(z_{cnt} = z_{clut} + ([n(z_{cnt} = z_{clut}) + ([n(z_{cnt} = z_{clut} + ([n(z_{cnt} + [n(z_{cnt} + ([n(z_{cnt} + [n(z_{cnt} + ([n(z_{cnt} + [n(z_{cnt} + [n(z_{cnt} + ([n(z_{cnt} + [n(z_{cnt} + [n($	tack where Total Merging Occurs (stata where Total Merging Occurs (stata and the stata and the stat	ilevation ging elevation z <z<sub>full :al VV < Top of J >Vm t)</z<sub>
Revised V Multiple Plume Calculations Solve for plume-avera Gives the following Heig Plume ⁻ V Solve for Height of CAS Find Height Height abov	retrical Velocity V ged vertical velociti that above Stack z Top-Hat Radius a retrical Velocity V C critical vertical velocity V C critical vertical velocity to bove Stack z _{ort} raged Vertical Velocit Height (feet) above ground al (touch) = 153.7 160.0 180.0	Solut 271.769 me 61.968 me 2.048 m/s elocity V _{orit} JET me JET me cities starting a (meters) bove stack Rat 13.82 15.74 21.83	ttions in Ta 1,000.0 fe ters* ters 5.30 m ters at Touchin Plume dius(m) 2.180 #N/A #N/A	313.5 ables Below 891.6 203.3 6.72 V/s JET JET Vert. Vert. Vert. Ver(m/s) 5.20 5.14 4.94	feet* 304.8 feet* feet ft/sec feet	Height above s $V=\{n(V^3a)_{nul}/a\}$ $V=V_{touch}+(V_m-V$ P meters above (REGULAR EQ $a=a_m+0.16(z-z_l)$ $V=\{n(V^3a)_{nul}/a\}$ $V=V_{touch}+(V_m-V$ $V=single plume BEFORE TOU z_{cnt} = z_{clut} + \{[n(z_{cnt} = z_{clut}) + ([n(z_{cnt} = z_{clut} + ([n(z_{cnt} = z_{clut}) + ([n(z_{cnt} = z_{clut} + ([n(z_{cnt} + [n(z_{cnt} + ([n(z_{cnt} + [n(z_{cnt} + ([n(z_{cnt} + [n(z_{cnt} + [n(z_{cnt} + ([n(z_{cnt} + [n(z_{cnt} + [n($	tack where Total Merging Occurs (stata where Total Merging Occurs (stata and the stata and the stat	ilevation ging elevation z <z<sub>full :al VV < Top of J >Vm t)</z<sub>
Revised V Multiple Plume Calculations Solve for plume-avera Gives the following Heig Plume ⁻ V Solve for Height of CAS Find Height Height abov	retrical Velocity V ged vertical velocit above Stack z Top-Hat Radius a vertical Velocity V C critical vertical v c Ground z _{crit} +h _s raged Vertical Veloc Height (feet) above ground at (touch) = 153.7 160.0 200.0 220.0	Solut y at height 271.769 me 61.968 me 2.048 m/s elocity V _{crit} JET me JET me cities starting a (meters) bove stack Rat 13.82 15.74 21.83 27.93 34.02	ttions in Ta 1,000.0 fe ters* ters 5.30 m ters ters at Touchin Plume dius(m) 2.180 #N/A #N/A #N/A	313.5 bbles Below eet 891.6 203.3 6.72 JET JET JET Vet. Vet. Vet. 9 5.20 5.14 4.94 4.74 4.54	feet* 304.8 feet* feet ft/sec feet	Height above s $V=\{n(V^3a)_{nul}/a\}$ $V=V_{touch}+(V_m-V$ P meters above (REGULAR EQ $a=a_m+0.16(z-z_l)$ $V=\{n(V^3a)_{nul}/a\}$ $V=V_{touch}+(V_m-V$ $V=single plume BEFORE TOU z_{cnt} = z_{clut} + \{[n(z_{cnt} = z_{clut}) + ([n(z_{cnt} = z_{clut} + ([n(z_{cnt} = z_{clut}) + ([n(z_{cnt} = z_{clut} + ([n(z_{cnt} + [n(z_{cnt} + ([n(z_{cnt} + [n(z_{cnt} + ([n(z_{cnt} + [n(z_{cnt} + [n(z_{cnt} + ([n(z_{cnt} + [n(z_{cnt} + [n($	tack where Total Merging Occurs (stata where Total Merging Occurs (stata and the stata and the stat	levation ging elevation z <z<sub>full :al VV < Top of J >Vm t)</z<sub>
Revised V Multiple Plume Calculations Solve for plume-avera Gives the following Heig Plume ⁻ V Solve for Height of CAS Find Height Height abov	retrical Velocity V ged vertical velocit pht above Stack z Top-Hat Radius a vertical Velocity V C critical vertical vertical ve Ground z _{crit} +h _s raged Vertical Veloc Height (feet) above ground al (touch) = 153.7 160.0 180.0 220.0 240.0	Solut y at height 271.769 me 61.968 me 2.048 m/s elocity V _{orit} JET me JET me JET me cities starting a (metrs) bove stack Rat 15.74 21.83 27.93 34.02 40.12	ttions in Ta 1,000.0 fe tters* ters 5.30 m etters ters at Touchin Plume dius(m) #N/A #N/A #N/A #N/A	313.5 ables Below eet 891.6 203.3 6.72 JET JET y Height: Vert. Vert. Vel(m/s) 5.20 5.14 4.94 4.54 4.33	feet* 304.8 feet* feet ft/sec feet	Height above s $V=\{n(V^3a)_{nul}/a\}$ $V=V_{touch}+(V_m-V$ P meters above (REGULAR EQ $a=a_m+0.16(z-z_l)$ $V=\{n(V^3a)_{nul}/a\}$ $V=V_{touch}+(V_m-V$ $V=single plume BEFORE TOU z_{cnt} = z_{clut} + \{[n(z_{cnt} = z_{clut}) + ([n(z_{cnt} = z_{clut} + ([n(z_{cnt} = z_{clut}) + ([n(z_{cnt} = z_{clut} + ([n(z_{cnt} + [n(z_{cnt} + ([n(z_{cnt} + [n(z_{cnt} + ([n(z_{cnt} + [n(z_{cnt} + [n(z_{cnt} + ([n(z_{cnt} + [n(z_{cnt} + [n($	tack where Total Merging Occurs (stata where Total Merging Occurs (stata and the stata and the stat	Ilevation ging elevation z <z<sub>full al VV < Top of J >V_m () 20 ft Intervals</z<sub>
Revised V Multiple Plume Calculations Solve for plume-avera Gives the following Heig Plume ⁻ V Solve for Height of CAS Find Height Height abov	retrical Velocity V ged vertical velocit ph above Stack z Top-Hat Radius a vertical Velocity V C critical vertical v c Ground z _{crit} +h _s raged Vertical Veloc Height (feu) above ground a t (touch) = 153.7 160.0 180.0 220.0 220.0 220.0 220.0 260.0 300.0 300.0	Solut 271.769 me 61.968 me 2.048 m/s elocity V _{crit} JET me cities starting a (meters) bove stack Rat 13.82 15.74 21.83 27.93 34.02 40.12 46.22 52.31 58.41	ttions in Ta 1,000.0 fe ters* s 5.30 m ters sters at Touchin Plume dius(m) 2.180 #N/A #N/A #N/A #N/A #N/A #N/A	313.5 bbles Below eet 891.6 203.3 6.72 JET JET JET Vet. Vet. vet. 4.74 4.54 4.33 4.13 3.93 3.73	feet* 304.8 feet* feet ft/sec feet	Height above s $V=\{n(V^3a)_{nul}/a\}$ $V=V_{touch}+(V_m-V$ P meters above (REGULAR EQ $a=a_m+0.16(z-z_l)$ $V=\{n(V^3a)_{nul}/a\}$ $V=V_{touch}+(V_m-V$ $V=single plume BEFORE TOU z_{cnt} = z_{clut} + \{[n(z_{cnt} = z_{clut}) + ([n(z_{cnt} = z_{clut} + ([n(z_{cnt} = z_{clut}) + ([n(z_{cnt} = z_{clut} + ([n(z_{cnt} + [n(z_{cnt} + ([n(z_{cnt} + [n(z_{cnt} + ([n(z_{cnt} + [n(z_{cnt} + [n(z_{cnt} + ([n(z_{cnt} + [n(z_{cnt} + [n($	tack where Total Merging Occurs (stata where Total Merging Occurs (stata and the stata and the stat	Ilevation ging elevation z <z<sub>full al VV < Top of J >V_m () 20 ft Intervals</z<sub>
Revised V Multiple Plume Calculations Solve for plume-avera Gives the following Heig Plume ⁻ V Solve for Height of CAS Find Height Height abov	retrical Velocity V ged vertical velocit pht above Stack z Top-Hat Radius a vertical Velocity V C critical vertical v c ground z _{crit} +h _s raged Vertical Veloc Height (feet) above ground al (touch) = 153.7 160.0 180.0 220.0 240.0 260.0 300.0 320.0	Solut 271.769 me 61.968 me 2.048 m/s elocity V _{orit} JET me JET me cities starting a (metrs) bove stack Rat 15.74 21.83 27.93 34.02 40.12 46.22 52.31 58.41 64.50	ttions in Ta 1,000.0 fe ters* ters 5.30 m ters s 5.30 m ters ters ters at Touchin Plume dius(m) dius(m) #N/A #N/A #N/A #N/A #N/A	313.5 ables Below eet 891.6 203.3 6.72 JET JET y Height: Vert. Vert. Vert. 4.54 4.33 4.13 3.93 3.73 3.53	feet* 304.8 feet* feet ft/sec feet	Height above s $V=\{n(V^3a)_{nul}/a\}$ $V=V_{touch}+(V_m-V$ P meters above (REGULAR EQ $a=a_m+0.16(z-z_l)$ $V=\{n(V^3a)_{nul}/a\}$ $V=V_{touch}+(V_m-V$ $V=single plume BEFORE TOU z_{cnt} = z_{clut} + \{[n(z_{cnt} = z_{clut}) + ([n(z_{cnt} = z_{clut} + ([n(z_{cnt} = z_{clut}) + ([n(z_{cnt} = z_{clut} + ([n(z_{cnt} + [n(z_{cnt} + ([n(z_{cnt} + [n(z_{cnt} + ([n(z_{cnt} + [n(z_{cnt} + [n(z_{cnt} + ([n(z_{cnt} + [n(z_{cnt} + [n($	tack where Total Merging Occurs (stata where Total Merging Occurs (stata and the stata and the stat	Ilevation ging elevation z <z<sub>full al VV < Top of J >V_m () 20 ft Intervals</z<sub>
Revised V Multiple Plume Calculations Solve for plume-avera Gives the following Heig Plume ⁻ V Solve for Height of CAS Find Height Height abov	retrical Velocity V ged vertical velocit ht above Stack z Top-Hat Radius a vertical Velocity V C critical vertical veloc t above Stack z _{ert} ve Ground z _{ert} +h _s raged Vertical Veloc Height (feet) above ground al (touch) = 153.7 160.0 200.0 200.0 240.0 260.0 280.0 300.0 320.0 340.0	Solut 271.769 me 61.968 me 2.048 m/s elocity V _{erit} JET me JET me cities starting a (meters) bove stack Raa 13.74 21.83 27.93 34.02 40.12 46.22 52.31 58.41 64.50 70.60	ttions in Ta 1,000.0 fe teters* teters s 5.30 m eters ters at Touchin Plume dius(m) 2.180 #N/A #N/A #N/A #N/A #N/A #N/A	313.5 ables Below 891.6 203.3 6.72 ys JET JET Vert. Vel(m/s) 5.14 4.94 4.74 4.54 4.33 4.13 3.93 3.73 3.53 3.33	feet* 304.8 feet* feet ft/sec feet	Height above s $V=\{n(V^3a)_{nul}/a\}$ $V=V_{touch}+(V_m-V$ P meters above (REGULAR EQ $a=a_m+0.16(z-z_l)$ $V=\{n(V^3a)_{nul}/a\}$ $V=V_{touch}+(V_m-V$ $V=single plume BEFORE TOU z_{cnt} = z_{clut} + \{[n(z_{cnt} = z_{clut}) + ([n(z_{cnt} = z_{clut} + ([n(z_{cnt} = z_{clut}) + ([n(z_{cnt} = z_{clut} + ([n(z_{cnt} = z_{cnt} + ([n(z_{cnt} = z_{cnt} + ([n(z_{cnt} = z_{cnt} + ([n(z_{cnt} = z_{cnt} + ([n(z_{cnt} + ([n(z_{cnt} + ([n(z_{cnt} = z_{cnt} + ([n(z_{cnt} + ([n(z_{cnt} + ([n(z_{cnt} + ([n(z_{cnt} + ([n(z_{cnt} + [n(z_{cnt} + ([n(z_{cnt} + ([n(z_{cn} + ([n$	tack where Total Merging Occurs (stata where Total Merging Occurs (stata and the stata and the stat	Idevation ging elevation z <z<sub>full cal VV < Top of >V_m t) 20 ft Intervals</z<sub>
Revised V Multiple Plume Calculations Solve for plume-avera Gives the following Heig Plume ⁻ V Solve for Height of CAS Find Height Height abov	rertical Velocity V ged vertical velocit Int above Stack z Top-Hat Radius a rertical Velocity V C critical vertical vertical veloc t above Stack z _{ent} re Ground z _{on} +h _s raged Vertical Veloc Height (feet) above ground at (touch) = 153.7 160.0 280.0 200.0 220.0 240.0 260.0 280.0 300.0 320.0 340.0 360.0	Solut 271.769 me 61.968 me 2.048 m/s elocity V _{erit} JET me JET me cities starting a (meters) bove stack Ra 13.82 15.74 21.83 27.93 34.02 40.12 46.22 52.31 58.41 64.50 70.60 76.70	ttions in Ta 1,000.0 fe teters* s 5.30 m teters at Touchin Plume dius(m) 2.180 #N/A #N/A #N/A #N/A #N/A #N/A #N/A #N/A	313.5 ables Below 891.6 203.3 6.72 JET JET Vert. Vel(m/s) 5.20 5.14 4.94 4.74 4.54 4.33 4.13 3.93 3.73 3.53 3.33 3.33 3.31	feet* 304.8 feet* feet ft/sec feet	Height above s $V=\{n(V^3a)_{nul}/a\}$ $V=V_{touch}+(V_m-V$ P meters above (REGULAR EQ $a=a_m+0.16(z-z_l)$ $V=\{n(V^3a)_{nul}/a\}$ $V=V_{touch}+(V_m-V$ $V=single plume BEFORE TOU z_{cnt} = z_{clut} + \{[n(z_{cnt} = z_{clut}) + ([n(z_{cnt} = z_{clut} + ([n(z_{cnt} = z_{clut}) + ([n(z_{cnt} = z_{clut} + ([n(z_{cnt} = z_{cnt} + ([n(z_{cnt} = z_{cnt} + ([n(z_{cnt} = z_{cnt} + ([n(z_{cnt} = z_{cnt} + ([n(z_{cnt} + ([n(z_{cnt} + ([n(z_{cnt} = z_{cnt} + ([n(z_{cnt} + ([n(z_{cnt} + ([n(z_{cnt} + ([n(z_{cnt} + ([n(z_{cnt} + [n(z_{cnt} + ([n(z_{cnt} + ([n(z_{cn} + ([n$	tack where Total Merging Occurs (stata where Total Merging Occurs (stata and the stata and the stat	Idevation ging elevation z <z<sub>full cal VV < Top of >V_m t) 20 ft Intervals</z<sub>
Revised V Multiple Plume Calculations Solve for plume-avera Gives the following Heig Plume ⁻ V Solve for Height of CAS Find Height Height abov	ged vertical velocity V ged vertical velocit int above Stack z Top-Hat Radius a vertical Velocity V C critical vertical velocity v C add vertical velocity v C add vertical velocity v C add vertical velocity v Add vertical velocity v raged Vertical velocity v above ground at the velocity v 160.0 200.0 220.0 240.0 300.0 320.0 300.0 320.0 360.0 380.0	Solut 271.769 me 61.968 me 2.048 m/s elocity V _{crit} JET me cities starting a (meters) bove stack Rat 13.82 15.74 21.83 27.93 34.02 40.12 46.22 52.31 58.41 64.50 70.60 70.60 70.60 82.79	ttions in Ta 1,000.0 fe ters* s 5.30 m ters ters at Touchin Plume dius(m) 2.180 #N/A #N/A #N/A #N/A #N/A #N/A #N/A #N/A #N/A #N/A	313.5 ables Below 891.6 203.3 6.72 JET JET Vert. Vert. Vel(m/s) 5.20 5.14 4.94 4.74 4.54 4.33 4.13 3.93 3.73 3.53 3.33 3.13 2.93	feet* 304.8 feet* feet ft/sec feet	Height above s $V=\{n(V^3a)_{nul}/a\}$ $V=V_{touch}+(V_m-V$ P meters above (REGULAR EQ $a=a_m+0.16(z-z_l)$ $V=\{n(V^3a)_{nul}/a\}$ $V=V_{touch}+(V_m-V$ $V=single plume BEFORE TOU z_{cnt} = z_{clut} + \{[n(z_{cnt} = z_{clut}) + ([n(z_{cnt} = z_{clut} + ([n(z_{cnt} = z_{clut}) + ([n(z_{cnt} = z_{clut} + ([n(z_{cnt} = z_{cnt} + ([n(z_{cnt} = z_{cnt} + ([n(z_{cnt} = z_{cnt} + ([n(z_{cnt} = z_{cnt} + ([n(z_{cnt} + ([n(z_{cnt} + ([n(z_{cnt} = z_{cnt} + ([n(z_{cnt} + ([n(z_{cnt} + ([n(z_{cnt} + ([n(z_{cnt} + ([n(z_{cnt} + [n(z_{cnt} + ([n(z_{cnt} + ([n(z_{cn} + ([n$	tack where Total Merging Occurs (stata where Total Merging Occurs (stata and the stata and the stat	Ilevation ging elevation z <z<sub>full al VV < Top of J >V_m () 20 ft Intervals</z<sub>
Revised V Multiple Plume Calculations Solve for plume-avera Gives the following Heig Plume ' V Solve for Height of CAS Find Height Height about Table of MERGED Plume-Aver Begin Merging	retrical Velocity V ged vertical velocit pht above Stack z Top-Hat Radius a vertical Velocity V C critical vertical vertical ve Ground z _{crit} +h _s raged Vertical Veloc Height (feet) above ground al (touch) = 153.7 160.0 180.0 220.0 240.0 220.0 240.0 260.0 300.0 300.0 300.0 300.0 300.0 340.0 380.0 400.0	Solut 271.769 me 61.968 me 2.048 m/s elocity V _{crit} JET me JET me cities starting a (metrs) bove stack Rat 15.74 21.83 27.93 34.02 40.12 46.22 52.31 58.41 64.50 70.60 70.60 76.70 88.89	ttors* 1,000.0 fe ters* ters* 5 5 5 5 5 5 5 5 5 5 5 5 5	313.5 ables Below 891.6 203.3 6.72 Vs JET JET Vert. Vel(m/s) 5.20 5.14 4.94 4.74 4.54 4.53 4.13 3.73 3.33 3.33 3.33 3.33 3.33 3.293 2.73	feet* 304.8 feet* feet ft/sec feet	Height above s $V=\{n(V^3a)_{nul}/a\}$ $V=V_{touch}+(V_m-V$ P meters above (REGULAR EQ $a=a_m+0.16(z-z_l)$ $V=\{n(V^3a)_{nul}/a\}$ $V=V_{touch}+(V_m-V$ $V=single plume BEFORE TOU z_{cnt} = z_{clut} + \{[n(z_{cnt} = z_{clut}) + ([n(z_{cnt} = z_{clut} + ([n(z_{cnt} = z_{clut}) + ([n(z_{cnt} = z_{clut} + ([n(z_{cnt} = z_{cnt} + ([n(z_{cnt} = z_{cnt} + ([n(z_{cnt} = z_{cnt} + ([n(z_{cnt} = z_{cnt} + ([n(z_{cnt} + ([n(z_{cnt} + ([n(z_{cnt} = z_{cnt} + ([n(z_{cnt} + ([n(z_{cnt} + ([n(z_{cnt} + ([n(z_{cnt} + ([n(z_{cnt} + [n(z_{cnt} + ([n(z_{cnt} + ([n(z_{cn} + ([n$	tack where Total Merging Occurs (stata where Total Merging Occurs (stata and the stata and the stat	Ilevation ging elevation z <z<sub>full al VV < Top of J >V_m () 20 ft Intervals</z<sub>
Revised V Multiple Plume Calculations Solve for plume-avera Gives the following Heig Plume ' V Solve for Height of CAS Find Height Height abov Table of MERGED Plume-Aver Begin Merging	retrical Velocity V ged vertical velocity pht above Stack z Top-Hat Radius a vertical Velocity V C critical vertical veloc t above Stack z _{eit} ve Ground z _{eit} +h _s raged Vertical Veloc Height (feet) above ground al (touch) = 153.7 160.0 200.0 220.0 240.0 260.0 280.0 300.0 320.0 340.0 320.0 340.0 360.0 380.0 400.0 (full/mp) = 421.9	Solut 271.769 me 61.968 me 2.048 m/s elocity V _{crit} JET me JET me cities starting a (meters) bove stack Rat 13.82 15.74 21.83 27.93 34.02 40.12 46.22 52.31 58.41 64.50 70.60 70.60 76.70 88.89 95.56	ttions in Ta 1,000.0 fe teters* s 5.30 m eters ters at Touchin Plume dius(m) 2.180 #N/A	313.5 ables Below 891.6 203.3 6.72 JET JET Vert. Vel(m/s) 5.20 5.14 4.94 4.74 4.54 4.54 4.53 4.13 3.93 3.73 3.53 3.33 3.13 2.737 2.51	feet* 304.8 feet* feet ft/sec feet	Height above s $V=\{n(V^3a)_{nul}/a\}$ $V=V_{touch}+(V_m-V$ P meters above (REGULAR EQ $a=a_m+0.16(z-z_l)$ $V=\{n(V^3a)_{nul}/a\}$ $V=V_{touch}+(V_m-V$ $V=single plume BEFORE TOU z_{cnt} = z_{clut} + \{[n(z_{cnt} = z_{clut}) + ([n(z_{cnt} = z_{clut} + ([n(z_{cnt} = z_{clut}) + ([n(z_{cnt} = z_{clut} + ([n(z_{cnt} = z_{cnt} + ([n(z_{cnt} = z_{cnt} + ([n(z_{cnt} = z_{cnt} + ([n(z_{cnt} = z_{cnt} + ([n(z_{cnt} + ([n(z_{cnt} + ([n(z_{cnt} = z_{cnt} + ([n(z_{cnt} + ([n(z_{cnt} + ([n(z_{cnt} + ([n(z_{cnt} + ([n(z_{cnt} + [n(z_{cnt} + ([n(z_{cnt} + ([n(z_{cn} + ([n$	tack where Total Merging Occurs (stata where Total Merging Occurs (stata and the stata and the stat	Ilevation ging elevation z <z<sub>full al VV < Top of J >V_m () 20 ft Intervals</z<sub>
Revised V Multiple Plume Calculations Solve for plume-avera Gives the following Heig Plume ' V Solve for Height of CAS Find Height Height abov Table of MERGED Plume-Aver Begin Merging	retrical Velocity V ged vertical velocit pht above Stack z Top-Hat Radius a vertical Velocity V C critical vertical vertical ve Ground z _{crit} +h _s raged Vertical Veloc Height (feet) above ground al (touch) = 153.7 160.0 180.0 220.0 240.0 220.0 240.0 260.0 300.0 300.0 300.0 300.0 300.0 340.0 380.0 400.0	Solut 271.769 me 61.968 me 2.048 m/s elocity V _{crit} JET me JET me cities starting a (metrs) bove stack Rat 15.74 21.83 27.93 34.02 40.12 46.22 52.31 58.41 64.50 70.60 70.60 76.70 88.89	ttors* 1,000.0 fe ters* ters* 5 5 5 5 5 5 5 5 5 5 5 5 5	313.5 ables Below 891.6 203.3 6.72 Vs JET JET Vert. Vel(m/s) 5.20 5.14 4.94 4.74 4.54 4.53 4.13 3.73 3.33 3.33 3.33 3.33 3.33 3.293 2.73	feet* 304.8 feet* feet ft/sec feet	Height above s $V=\{n(V^3a)_{nul}/a\}$ $V=V_{touch}+(V_m-V$ P meters above (REGULAR EQ $a=a_m+0.16(z-z_l)$ $V=\{n(V^3a)_{nul}/a\}$ $V=V_{touch}+(V_m-V$ $V=single plume BEFORE TOU z_{cnt} = z_{clut} + \{[n(z_{cnt} = z_{clut}) + ([n(z_{cnt} = z_{clut} + ([n(z_{cnt} = z_{clut}) + ([n(z_{cnt} = z_{clut} + ([n(z_{cnt} = z_{cnt} + ([n(z_{cnt} = z_{cnt} + ([n(z_{cnt} = z_{cnt} + ([n(z_{cnt} = z_{cnt} + ([n(z_{cnt} + ([n(z_{cnt} + ([n(z_{cnt} = z_{cnt} + ([n(z_{cnt} + ([n(z_{cnt} + ([n(z_{cnt} + ([n(z_{cnt} + ([n(z_{cnt} + [n(z_{cnt} + ([n(z_{cnt} + ([n(z_{cn} + ([n$	tack where Total Merging Occurs (stata where Total Merging Occurs (stata and the stata and the stat	Idevation ging elevation z<2 _{full} cal VV < Top of J >Vm t) 20 ft Intervals 50 ft Intervals
Revised V fultiple Plume Calculations Solve for plume-avera Gives the following Heig Plume ' V Solve for Height of CAS Find Height Height abov fable of MERGED Plume-Aver Begin Merging	rertical Velocity V ged vertical velocit pht above Stack z Top-Hat Radius a rertical Velocity V C critical vertical vertical vertical Velocity V C critical vertical vertical vertical Velocity reged Vertical Veloc Height (feet) above ground al (touch) = 153.7 160.0 200	Solut y at height 271.769 me 61.968 me 2.048 m/s elocity V _{ent} JET me JET me cities starting a (meters) bove stack Ra 13.82 15.74 21.83 27.93 34.02 40.12 46.22 52.31 58.41 64.50 70.60 76.70 82.79 88.89 95.56 104.13	ttions in Ta 1,000.0 fe teters* s 5.30 m teters at Touchin Plume dius(m) 2.180 #N/A	313.5 ables Below 891.6 203.3 6.72 JET JET Vert. Vel(m/s) 5.20 5.14 4.94 4.74 4.54 4.33 3.13 3.33 3.33 3.31 3.33 3.31 2.51 2.47	feet* 304.8 feet* feet ft/sec feet	Height above s $V=\{n(V^3a)_{nul}/a\}$ $V=V_{touch}+(V_m-V$ P meters above (REGULAR EQ $a=a_m+0.16(z-z_l)$ $V=\{n(V^3a)_{nul}/a\}$ $V=V_{touch}+(V_m-V$ $V=single plume BEFORE TOU z_{cnt} = z_{clut} + \{[n(z_{cnt} = z_{clut}) + ([n(z_{cnt} = z_{clut} + ([n(z_{cnt} = z_{clut}) + ([n(z_{cnt} = z_{clut} + ([n(z_{cnt} = z_{cnt} + ([n(z_{cnt} = z_{cnt} + ([n(z_{cnt} = z_{cnt} + ([n(z_{cnt} = z_{cnt} + ([n(z_{cnt} + ([n(z_{cnt} + ([n(z_{cnt} = z_{cnt} + ([n(z_{cnt} + ([n(z_{cnt} + ([n(z_{cnt} + ([n(z_{cnt} + ([n(z_{cnt} + [n(z_{cnt} + ([n(z_{cnt} + ([n(z_{cn} + ([n$	tack where Total Merging Occurs (stata where Total Merging Occurs (stata and the stata and the stat	Idevation ging elevation z<2 _{full} cal VV < Top of J >Vm t) 20 ft Intervals 50 ft Intervals
Revised V Multiple Plume Calculations Solve for plume-avera Gives the following Heig Plume ' V Solve for Height of CAS Find Height Height abov Table of MERGED Plume-Aver Begin Merging	vertical Velocity V ged vertical velociti int above Stack z Top-Hat Radius a vertical Velocity V C critical vertical velocity v C discover vertical velocity v C discover vertical velocity v C discover vertical velocity vertical velocity vertical velocity vertical velocity vertical velocity vertical velocity above ground at the velocity vertical velocity vertical velocity velocity vertical velocity vertical velocity vertical velocity vertical velocity vertical velocity	Solut 271.769 me 61.968 me 2.048 m/s elocity V _{crit} JET me cities starting a (meters) bove stack Rat 13.82 15.74 21.83 27.93 34.02 40.12 46.22 52.31 58.41 64.50 70.60 70.60 70.60 70.60 70.60 88.99 95.56 104.13 119.37	ttions in Ta 1,000.0 fe teters* s 5.30 m teters at Touchin Plume dius(m) 2.180 #N/A	313.5 ables Below 891.6 203.3 6.72 JET JET Vert. Vel(m/s) 5.20 5.14 4.74 4.54 4.74 4.54 4.33 3.93 3.73 3.53 3.33 3.13 3.13 3.13 2.93 2.73 2.51 2.47 2.42	feet* 304.8 feet* feet ft/sec feet	Height above s $V=\{n(V^3a)_{nul}/a\}$ $V=V_{touch}+(V_m-V$ P meters above (REGULAR EQ $a=a_m+0.16(z-z_l)$ $V=\{n(V^3a)_{nul}/a\}$ $V=V_{touch}+(V_m-V$ $V=single plume BEFORE TOU z_{cnt} = z_{clut} + \{[n(z_{cnt} = z_{clut}) + ([n(z_{cnt} = z_{clut} + ([n(z_{cnt} = z_{clut}) + ([n(z_{cnt} = z_{clut} + ([n(z_{cnt} = z_{cnt} + ([n(z_{cnt} = z_{cnt} + ([n(z_{cnt} = z_{cnt} + ([n(z_{cnt} = z_{cnt} + ([n(z_{cnt} + ([n(z_{cnt} + ([n(z_{cnt} = z_{cnt} + ([n(z_{cnt} + ([n(z_{cnt} + ([n(z_{cnt} + ([n(z_{cnt} + ([n(z_{cnt} + [n(z_{cnt} + ([n(z_{cnt} + ([n(z_{cn} + ([n$	tack where Total Merging Occurs (stata where Total Merging Occurs (stata and the stata and the stat	Idevation ging elevation z<2 _{full} cal VV < Top of J >Vm t) 20 ft Intervals 50 ft Intervals
Revised V Multiple Plume Calculations Solve for plume-avera Gives the following Heig Plume ' V Solve for Height of CAS Find Height Height abov Table of MERGED Plume-Aver Begin Merging	vertical Velocity V ged vertical velocit ght above Stack z Top-Hat Radius a vertical Velocity V C critical vertical vertical ve Ground z _{crit} +h _s raged Vertical Velocit Height (feet) above Stack z _{crit} raged Vertical Velocit Height (feet) above ground ad (fouch) = 153.7 160.0 180.0 200.0 240.0 266.0 300.0 320.0 340.0 360.0 380.0 400.0 600.0 380.0 450.0 500.0 600.0	Solut 271.769 me 61.968 me 2.048 m/s elocity V _{erit} JET me JET me cities starting a (meters) bove stack Rat 15.74 21.83 27.93 34.02 40.12 46.22 52.31 58.41 64.50 70.60 76.70 88.89 95.56 104.13 119.37 149.85	ttors* 1,000.0 fe ters* ters* 5.30 m ters ters ters at Touchin Plume dius(m) 2.180 #N/A	313.5 ables Below 891.6 203.3 6.72 Vs JET JET Vert. Vert. Vert. Vert. Vert. Vert. Vert. 4.94 4.74 4.33 4.13 3.53 3.33 3.53 3.33 3.13 2.93 3.2.73 2.51 2.47 2.42 2.32	feet* 304.8 feet* feet ft/sec feet	Height above s $V=\{n(V^3a)_{nul}/a\}$ $V=V_{touch}+(V_m-V$ P meters above (REGULAR EQ $a=a_m+0.16(z-z_l)$ $V=\{n(V^3a)_{nul}/a\}$ $V=V_{touch}+(V_m-V$ $V=single plume BEFORE TOU z_{cnt} = z_{clut} + \{[n(z_{cnt} = z_{clut}) + ([n(z_{cnt} = z_{clut} + ([n(z_{cnt} = z_{clut}) + ([n(z_{cnt} = z_{clut} + ([n(z_{cnt} = z_{cnt} + ([n(z_{cnt} = z_{cnt} + ([n(z_{cnt} = z_{cnt} + ([n(z_{cnt} = z_{cnt} + ([n(z_{cnt} + ([n(z_{cnt} + ([n(z_{cnt} = z_{cnt} + ([n(z_{cnt} + ([n(z_{cnt} + ([n(z_{cnt} + ([n(z_{cnt} + ([n(z_{cnt} + [n(z_{cnt} + ([n(z_{cnt} + ([n(z_{cn} + ([n$	tack where Total Merging Occurs (stata where Total Merging Occurs (stata and the stata and the stat	Idevation ging elevation z<2 _{full} cal VV < Top of J >Vm t) 20 ft Intervals 50 ft Intervals
Revised V Multiple Plume Calculations Solve for plume-avera Gives the following Heig Plume ' V Solve for Height of CAS Find Height Height abov Table of MERGED Plume-Aver Begin Merging	retical Velocity V ged vertical velocit pht above Stack z Top-Hat Radius a vertical Velocity V C critical vertical veloc t above Stack Z _{ent} reged Vertical Veloc Height (feet) above ground al (touch) = 153.7 160.0 200.0	Solut 271.769 me 61.968 me 2.048 m/s elocity V _{crit} JET me JET me JET me cities starts ga (meters) bove stack Ra 13.82 15.74 21.83 27.93 34.02 40.12 46.22 52.31 58.41 64.50 70.60 76.70 88.89 95.56 104.13 119.37 148.85 180.33	ttions in Ta 1,000.0 fe teters* s 5.30 m eters ters at Touchin Plume dius(m) 2.180 #N/A #N	313.5 ables Below 891.6 203.3 6.72 JET JET Vert. Vel(m/s) 5.20 5.14 4.94 4.74 4.54 4.54 4.53 4.13 3.93 3.73 3.535 3.33 3.13 2.737 2.51 2.47 2.42 2.42 2.24	feet* 304.8 feet* feet ft/sec feet	Height above s $V=\{n(V^3a)_{nul}/a\}$ $V=V_{touch}+(V_m-V$ P meters above (REGULAR EQ $a=a_m+0.16(z-z_l)$ $V=\{n(V^3a)_{nul}/a\}$ $V=V_{touch}+(V_m-V$ $V=single plume BEFORE TOU z_{cnt} = z_{clut} + \{[n(z_{cnt} = z_{clut}) + ([n(z_{cnt} = z_{clut} + ([n(z_{cnt} = z_{clut}) + ([n(z_{cnt} = z_{clut} + ([n(z_{cnt} = z_{cnt} + ([n(z_{cnt} = z_{cnt} + ([n(z_{cnt} = z_{cnt} + ([n(z_{cnt} = z_{cnt} + ([n(z_{cnt} + ([n(z_{cnt} + ([n(z_{cnt} = z_{cnt} + ([n(z_{cnt} + ([n(z_{cnt} + ([n(z_{cnt} + ([n(z_{cnt} + ([n(z_{cnt} + [n(z_{cnt} + ([n(z_{cnt} + ([n(z_{cn} + ([n$	tack where Total Merging Occurs (stata where Total Merging Occurs (stata and the stata and the stat	Idevation ging elevation z<2 _{full} cal VV < Top of J >Vm t) 20 ft Intervals 50 ft Intervals
Revised V fultiple Plume Calculations Solve for plume-avera Gives the following Heig Plume ' V Solve for Height of CAS Find Height Height abov fable of MERGED Plume-Aver Begin Merging	Vertical Velocity V ged vertical velociti pht above Stack z Top-Hat Radius a (ertical Velocity V C critical vertical vertical velocity vertical velocity vertical velocity vertical velocity reged Vertical Velocity vertical velocity above ground at (touch) = 153.7 160.0 200.0 220.0 240.0 260.0 280.0 300.0 400.0 400.0 400.0 450.0 500.0 600.0 380.0 300.0	Solut y at height 271.769 me 61.968 me 2.048 m/s elocity V _{ent} JET me JET me cities starting a (meters) bove stack Ra 13.82 15.74 21.83 27.93 34.02 40.12 40.22 52.31 58.41 64.50 70.60 76.70 82.79 88.89 95.56 104.13 119.37 149.85 180.33 210.81	ttions in Ta 1,000.0 fe teters* s 5.30 m teters at Touchin Plume dius(m) 2.180 #N/A #D/A #	313.5 ables Below 891.6 203.3 6.72 JET JET Vert. Vel(m/s) 5.20 5.14 4.94 4.74 4.54 4.33 3.13 3.33 3.33 3.33 3.31 2.51 2.47 2.42 2.24 2.24 2.24 2.24	feet* 304.8 feet* feet ft/sec feet	Height above s $V = \{n(V_3)_{3,m}(a)\}$ $V = V_{touch} + (V_m - V_m - V_{touch} + (V_m - V_m - V_{touch} + (V_m - V_m $	tack where Total Merging Occurs (s 1 ³³ for heights above total merging e 1 ³⁴ for heights above total merging e 1 ³⁵ for heights below total mer 1 ³⁵ if 2^{2} for heights below total mer 1 ³⁶ if 2^{2} for heights below total mer 1 ³⁷ if 2^{2} for heights below total mer 1 ³⁸ if 2^{2} for heights below total mer 1 ³⁸ if 2^{2} for heights below total mer 1 ³⁹ for heights below total mer	Idevation ging elevation z<2 _{full} cal VV < Top of >V _m t) 20 ft Intervals 50 ft Intervals
Revised V Multiple Plume Calculations Solve for plume-avera Gives the following Heig Plume ' V Solve for Height of CAS Find Height Height abov Table of MERGED Plume-Aver Begin Merging	vertical Velocity V ged vertical velociti (ht above Stack z Top-Hat Radius a vertical Velocity V C critical vertical vertical ve Ground z _{crit} +h _s raged Vertical Velocity (biotechine) above Stack z _{crit} ve Ground z _{crit} +h _s raged Vertical Velocity (biotechine) above ground a (touch) = 153.7 160.0 200.0 220.0 240.0 300.0 320.0 300.0 300.0 300.0 360.0 380.0 400.0 360.0 380.0 400.0 360.0 380.0 400.0 360.0 380.0 400.0 360.0 380.0 400.0 600.0 800.0 900.0	Solut 271.769 me 61.968 me 2.048 m/s elocity V _{crit} JET me cities starting a (meters) bove stack Rat 13.82 15.74 21.83 27.93 34.02 40.12 58.41 64.22 52.31 58.41 64.50 70.60 70.70 8.89 70.60 70.00 7	ttions in Ta 1,000.0 fe teters* s 5.30 m teters at Touchin Plume dius(m) 2.180 #N/A #D # # # # # # # # # # # # #	313.5 ables Below 891.6 203.3 6.72 JET JET Vert. Vert. Vel(m/s) 5.20 5.14 4.74 4.54 4.74 4.54 4.73 3.93 3.73 3.53 3.33 3.13 3.13 3.293 2.73 2.51 2.47 2.42 2.32 2.44 2.17	feet* 304.8 feet* feet ft/sec feet	Height aboves s $V = \{n(V_3)_{build}\}$ $V = V_{touch} + (V_m - V_{touch} + (V_m - V_{touch} + (V_m - V_{touch} + (V_m - V_m - V_m$	tack where Total Merging Occurs (s 1 ³³ for heights above total merging e 1 ³⁴ for heights above total merging e 1 ³⁵ for heights below total mer 1 ³⁵ if 2^{2} for heights below total mer 1 ³⁶ if 2^{2} for heights below total mer 1 ³⁷ if 2^{2} for heights below total mer 1 ³⁸ if 2^{2} for heights below total mer 1 ³⁸ if 2^{2} for heights below total mer 1 ³⁹ for heights below total mer	Idevation ging elevation z<2 _{full} cal VV < Top of >V _m t) 20 ft Intervals 50 ft Intervals
Revised V Multiple Plume Calculations Solve for plume-avera Gives the following Heig Plume ' V Solve for Height of CAS Find Height Height abov Table of MERGED Plume-Aver Begin Merging	vertical Velocity V ged vertical velociti pht above Stack z Top-Hat Radius a vertical Velocity V C critical vertical vertical vertical Vertical Velocity above ground at vertical vertica	Solut y at height 271.769 me 61.968 me 2.048 m/s elocity V _{ent} JET me JET me cities starting a (meters) bove stack Rat 13.82 15.74 21.83 27.93 34.02 40.12 46.22 52.31 58.41 64.50 70.60 70.60 76.70 82.79 88.89 95.56 104.13 119.37 149.85 104.13 119.37 149.85 104.13 119.37 149.85 106.13 210.81 221.777 271.777 302.25	ttors* 1,000.0 fe teters* s 5.30 m eters at Touchin Plume dius(m) 2.180 #N/A #N	313.5 ables Below 891.6 203.3 6.72 Vs JET JET Vert. Vert. Vert. Vel(m/s) 5.20 5.14 4.94 4.74 4.94 4.74 4.54 4.33 3.53 3.33 3.13 3.53 3.33 3.13 2.69 3.2.61 2.47 2.42 2.42 2.42 2.24 2.24 2.24 2.25	feet* 304.8 feet* feet ft/sec feet	Height above s $V = \{n(V_3)_{3,m}(a)\}$ $V = V_{touch} + (V_m - V_m - V_{touch} + (V_m - V_m - V_{touch} + (V_m - V_m $	tack where Total Merging Occurs (s ¹³ for heights above total merging e ¹ fourh)*(2-z _{louch})/(z _{hul} -z _{louch}) for heights below total mer pround (z+h _a) NS ₁₀) if z=z _{hul} / _{(ouch})*(z'=z _{hul})/(z _{hil} -z _{huch}) if z _{louch} (z) Critic V ³ a) _{hul} /(V _{crit}) ³ [-a _m]/0.16 if V _{crit} <v<sub>m z_{huch})*(V_{crit}-V_{buch})/(V_m-V_{buch}) if V_{crit} (d) Si (z=z_{huch})*(V_{crit}-V_{buch})/(V_m-V_{buch})) (v) Critic (z=z_{huch})*(V_{crit}-V_{buch})/(V_m-V_{buch})) (v) Cost (z) (2+z_{huch})*(Z¹+Z_{buch})/(Z_{hil}-Z_{buch}) (z) (z+z_{huch})*(Z¹+Z_{buch})/(Z_{hil}-Z_{buch})</v<sub>	Idevation ging elevation z<2 _{full} cal VV < Top of J >Vm t) 20 ft Intervals 50 ft Intervals
Revised V Multiple Plume Calculations Solve for plume-avera Gives the following Heig Plume ' V Solve for Height of CAS Find Height Height abov Table of MERGED Plume-Aver Begin Merging	vertical Velocity V ged vertical velociti (ht above Stack z Top-Hat Radius a vertical Velocity V C critical vertical vertical ve Ground z _{ort} +h _a raged Vertical Velocity Height (feu) above ground a (touch) = 153.7 160.0 1800 220.0 240.0 280.0 300.0 280.0 300.0 280.0 300.0 280.0 300.0 280.0 300.0 280.0 300.0 280.0 300.0 <	Solut 271.769 me 61.968 me 2.048 m/s elocity V _{erit} JET me cities starting a (meters) bove stack Rat 13.82 15.74 21.83 27.93 34.02 40.12 46.22 52.31 58.41 64.50 70.60 70.60 76.70 88.89 95.56 104.13 119.37 149.85 180.33 2(10.81 241.29 271.77 302.25 424.17	ttors* 1,000.0 fe ters* tors* ters s 5.30 m ters* ters ters at Touchin Plume dius(m) 2.180 #N/A #D # # # # # # # # # # # # #	313.5 ables Below 891.6 203.3 6.72 JET JET Vert. Vert. Vel(m/s) 5.20 5.14 4.94 4.74 4.54 4.54 4.54 4.53 3.93 3.73 3.53 3.33 3.13 3.13 3.13 3.13 3.293 2.73 2.51 2.47 2.42 2.32 2.44 2.10 2.05 2.00 2.05 2.00 1.83	feet* 304.8 feet* feet ft/sec feet	Height above s $V = \{n(V_3)_{3,m}/4\}$ $V = V_{touch} + (V_m - V_m - V_{touch} + (V_m - V_m - V_{touch} + (V_m - V_m -$	tack where Total Merging Occurs (s ¹³ for heights above total merging e ¹ fourh)*(2-z _{louch})/(z _{hul} -z _{louch}) for heights below total mer pround (z+h _a) NS ₁₀) if z=z _{hul} / _{(ouch})*(z'=z _{hul})/(z _{hil} -z _{huch}) if z _{louch} (z) Critic V ³ a) _{hul} /(V _{crit}) ³ [-a _m]/0.16 if V _{crit} <v<sub>m z_{huch})*(V_{crit}-V_{buch})/(V_m-V_{buch}) if V_{crit} (d) Si (z=z_{huch})*(V_{crit}-V_{buch})/(V_m-V_{buch})) (v) Critic (z=z_{huch})*(V_{crit}-V_{buch})/(V_m-V_{buch})) (v) Cost (z) (2+z_{huch})*(Z¹+Z_{buch})/(Z_{hil}-Z_{buch}) (z) (z+z_{huch})*(Z¹+Z_{buch})/(Z_{hil}-Z_{buch})</v<sub>	Idevation ging elevation z<2 _{full} cal VV < Top of J >Vm t) 20 ft Intervals 50 ft Intervals
Revised V Multiple Plume Calculations Solve for plume-avera Gives the following Heig Plume ' V Solve for Height of CAS Find Height Height abov Table of MERGED Plume-Aver Begin Merging	retrical Velocity V ged vertical velocit pht above Stack z Top-Hat Radius a vertical Velocity V C critical vertical veloc tabove Stack Z _{eft} ve Ground Z _{eft} +h _s raged Vertical Veloc Height (feet) above ground al (touch) = 153.7 160.0 200.	Solut y at height 271.769 me 61.968 me 2.048 m/s elocity V _{crit} JET me JET me JET me cities starting a (meters) bove stack Ra 13.82 15.74 21.83 27.93 34.02 40.22 52.31 58.41 64.50 70.60 70.60 76.70 88.89 95.56 104.13 119.37 149.85 180.33 210.81 241.29 271.77 30.225 424.17 576.57	ttors* 1,000.0 fe teters* s 5.30 m teters teters at Touchin Plume dius(m) 2.180 #N/A # # # # # # # # # # # # #	313.5 ables Below 891.6 203.3 6.72 JET JET Vert. Vel(m/s) 5.20 5.14 4.94 4.74 4.54 4.33 3.63 3.33 3.13 3.73 3.53 3.33 3.13 2.73 2.61 2.47 2.42 2.32 2.24 2.42 2.24 2.51 2.47 2.42 2.55 2.05 2.05 2.05 2.05 2.00 1.63 1.69	feet* 304.8 feet* feet ft/sec feet	Height above s $V = \{n(V_3)_{3,m}/4\}$ $V = V_{touch} + (V_m - V_m - V_{touch} + (V_m - V_m - V_{touch} + (V_m - V_m -$	tack where Total Merging Occurs (s ¹³ for heights above total merging e ¹ fourh)*(2-z _{louch})/(z _{hul} -z _{louch}) for heights below total mer pround (z+h _a) NS ₁₀) if z=z _{hul} / _{(ouch})*(z'=z _{hul})/(z _{hil} -z _{huch}) if z _{louch} (z) Critic V ³ a) _{hul} /(V _{crit}) ³ [-a _m]/0.16 if V _{crit} <v<sub>m z_{huch})*(V_{crit}-V_{buch})/(V_m-V_{buch}) if V_{crit} (d) Si (z=z_{huch})*(V_{crit}-V_{buch})/(V_m-V_{buch})) (v) Critic (z=z_{huch})*(V_{crit}-V_{buch})/(V_m-V_{buch})) (v) Cost (z) (2+z_{huch})*(Z¹+Z_{buch})/(Z_{hil}-Z_{buch}) (z) (z+z_{huch})*(Z¹+Z_{buch})/(Z_{hil}-Z_{buch})</v<sub>	Hevation ging elevation z <z<sub>full cal VV < Top of , >Vm () 20 ft intervals 50 ft intervals 100 ft interval</z<sub>
Revised V Multiple Plume Calculations Solve for plume-avera Gives the following Heig Plume ' V Solve for Height of CAS Find Height Height about Table of MERGED Plume-Aver Begin Merging	Vertical Velocity V ged vertical velocit Int above Stack z Top-Hat Radius a vertical Velocity V C critical vertical velocit vertical Velocity V C critical vertical velocity C critical vertical velocity vertical Velocity V C critical vertical velocity vertical Velocity raged Vertical Velocity Height (fet) above ground at (touch) = 153.7 160.0 200.0 240.0 240.0 260.0 280.0 300.0 200.0 240.0 240.0 240.0 240.0 360.0 300.0 400.0 400.0 400.0 600.0 700.0 800.0 900.0 1000.0 1000.0 1000.0 1000.0 1000.0 1000.0	Solut 271.769 me 61.968 me 2.048 m/s elocity V _{erit} JET me JET me cities starting a (meters) bove stack Ra 13.82 15.74 27.93 34.02 40.12 46.22 52.31 658.41 64.50 70.60 76.70 88.89 95.56 104.13 119.37 149.85 100.13 119.37 149.85 100.13 119.37 149.85 100.13 119.37 149.85 100.13 119.37 149.85 100.13 119.37 149.85 100.13 119.37 149.85 100.13 119.37 149.85 100.13 119.37 149.85 100.13 119.37 149.85 100.13 119.37 149.85 100.13 119.37 149.85 100.13 119.37 149.85 100.13 119.37 149.85 100.13 119.37 149.85 100.13 120.25 424.17 576.57 728.97	ttions in Ta 1,000.0 fe teters* s 5.30 m eters at Touchin Plume dius(m) 2.180 #N/A #N	313.5 ables Below 891.6 203.3 6.72 JET JET Vel(m/s) 5.20 5.14 4.94 4.4 4.4 4.54 4.33 3.93 3.73 3.53 3.33 3.33 3.33 3.33 3.33 3.3	feet* 304.8 feet* feet ft/sec feet	Height above s $V = \{n(V_3)_{3,m}/4\}$ $V = V_{touch} + (V_m - V_m - V_{touch} + (V_m - V_m - V_{touch} + (V_m - V_m -$	tack where Total Merging Occurs (s ¹³ for heights above total merging e ¹ fourh)*(2-z _{louch})/(z _{hul} -z _{louch}) for heights below total mer pround (z+h _a) NS ₁₀) if z=z _{hul} / _{(ouch})*(z'=z _{hul})/(z _{hil} -z _{huch}) if z _{louch} (z) Critic V ³ a) _{hul} /(V _{crit}) ³ [-a _m]/0.16 if V _{crit} <v<sub>m z_{huch})*(V_{crit}-V_{buch})/(V_m-V_{buch}) if V_{crit} (d) Si (z=z_{huch})*(V_{crit}-V_{buch})/(V_m-V_{buch})) (v) Critic (z=z_{huch})*(V_{crit}-V_{buch})/(V_m-V_{buch})) (v) Cost (z) (2+z_{huch})*(Z¹+Z_{buch})/(Z_{hil}-Z_{buch}) (z) (z+z_{huch})*(Z¹+Z_{buch})/(Z_{hil}-Z_{buch})</v<sub>	elevation ging elevation z <z<sub>ruil cal VV < Top of J >Vm () 20 ft Intervals 50 ft Intervals 100 ft Interval</z<sub>
Revised V Multiple Plume Calculations Solve for plume-avera Gives the following Heig Plume ' V Solve for Height of CAS Find Height Height abov Fable of MERGED Plume-Aver Begin Merging	vertical Velocity V ged vertical velociti pht above Stack z Top-Hat Radius a vertical Velocity V C critical vertical velocity V caged Vertical Velocity V raged Vertical Velocity V raged vertical velocity V above ground z _{ort} +h _s raged Vertical Velocity V 2aged Vertical Velocity V above ground zont 160.0 200.0 220.0 240.0 260.0 300.0 300.0 300.0 300.0 400.0 400.0 400.0 400.0 400.0 400.0 400.0 400.0 400.0 600.0 800.0 900.0 1000.0 1000.0	Solut 271.769 me 61.968 me 2.048 m/s elocity V _{ent} JET me cities starting a (meters) bove stack Rat 13.82 15.74 21.83 27.93 34.02 40.12 46.22 52.31 58.41 64.50 70.60 76.70 82.79 88.89 95.56 104.13 119.37 149.85 104.13 119.37 149.85 108.13 210.81 221.77 271.77 302.25 424.17 302.25 424.17 576.57 728.97 881.37	ttions in Ta 1,000.0 fe teters* s 5.30 m teters at Touchin Plume dius(m) 2.180 #N/A #D/A #	313.5 ables Below 891.6 203.3 6.72 JET JET Vert. Vel(m/s) 5.20 5.14 4.94 4.74 4.54 4.33 3.93 3.33 3.33 3.33 3.33 3.33 3.3	feet* 304.8 feet* feet ft/sec feet	Height above s $V = \{n(V_3)_{3,m}/4\}$ $V = V_{touch} + (V_m - V_m - V_{touch} + (V_m - V_m - V_{touch} + (V_m - V_m -$	tack where Total Merging Occurs (s ¹³ for heights above total merging e ¹ fourh)*(2-z _{louch})/(z _{hul} -z _{louch}) for heights below total mer pround (z+h _a) NS ₁₀) if z=z _{hul} / _{(ouch})*(z'=z _{hul})/(z _{hil} -z _{huch}) if z _{louch} (z) Critic V ³ a) _{hul} /(V _{crit}) ³ [-a _m]/0.16 if V _{crit} <v<sub>m z_{huch})*(V_{crit}-V_{buch})/(V_m-V_{buch}) if V_{crit} (d) Si (z=z_{huch})*(V_{crit}-V_{buch})/(V_m-V_{buch})) (v) Critic (z=z_{huch})*(V_{crit}-V_{buch})/(V_m-V_{buch})) (v) Cost (z) (2+z_{huch})*(Z¹+Z_{buch})/(Z_{hil}-Z_{buch}) (z) (z+z_{huch})*(Z¹+Z_{buch})/(Z_{hil}-Z_{buch})</v<sub>	elevation ging elevation z <z<sub>ruil cal VV < Top of J >Vm () 20 ft Intervals 50 ft Intervals 100 ft Interval</z<sub>
Revised V Multiple Plume Calculations Solve for plume-avera Gives the following Heig Plume ' V Solve for Height of CAS Find Height Height abov Fable of MERGED Plume-Aver Begin Merging	vertical Velocity V ged vertical velociti (ht above Stack z Top-Hat Radius a vertical Velocity V C critical vertical vertical ve Ground z _{ort} +h _a raged Vertical Velocity Height (feu) above ground a (touch) = 153.7 160.0 1800 220.0 240.0 280.0 300.0 220.0 240.0 260.0 300.0 <	Solut 271.769 me 61.968 me 2.048 m/s elocity V _{erit} JET me cities starting a (meters) bove stack Rat 13.82 15.74 21.83 27.93 34.02 40.12 46.22 52.31 58.41 64.50 70.60 76.70 88.89 95.56 104.13 119.37 149.85 180.33 221.77 149.85 180.33 221.77 149.85 180.33 221.77 149.85 180.33 221.77 149.85 180.33 221.77 149.85 180.33 21.77 78.97 88.137 1033.77	ters* tions in Ta 1,000.0 fe ters* s 5.30 m ters ters at Touchim Plume dius(m) 2.180 #N/A # # # # # # # # # # # # #	313.5 bbles Below 891.6 203.3 6.72 JET JET Vs Vs Vs Vs Vert. Vel(m/s) 5.20 5.14 4.94 4.74 4.54 4.94 4.73 3.73 3.53 3.33 3.73 3.53 3.33 3.13 2.93 2.73 2.51 2.47 2.42 2.32 2.24 2.77 2.42 2.32 2.24 2.17 2.40 2.05 2.05 2.00 1.83 1.69 1.58 1.69 1.58 1.69 1.58 1.69 1.58 1.69 1.69 1.69	feet* 304.8 feet* feet ft/sec feet	Height above s $V = \{n(V_3)_{3,m}/4\}$ $V = V_{touch} + (V_m - V_m - V_{touch} + (V_m - V_m - V_{touch} + (V_m - V_m -$	tack where Total Merging Occurs (s ¹³ for heights above total merging e ¹ fourh)*(2-z _{louch})/(z _{hul} -z _{louch}) for heights below total mer pround (z+h _a) NS ₁₀) if z>z _{hul} / _{(ouch})*(z'-z _{hul})/(z _{hul} -z _{hul}) if z _{hub} (z _{hul})*(z'-z _{hub})/(z _{hul} -z _{hub}) if z _{hub} (z _{hub})*(z'-z _{hub})/(z _{hul} -z _{hub}) if z _{hub} z _{hub})*(z _{hub})*(z'-z _{hub})/(z _{hu} -z _{hub}) if v _{ert} z _{hub})*(z _{hub})*(z _{hub})/(z _{hub} -z _{hub}) if v _{ert} z _{hub})*(z _{hub})*(z _{hub})/(z _{hub} -z _{hub}) if v _{ert} z _{hub})*(z _{hub})*(z _{hub})/(z _{hub} -z _{hub}) (z _{hub})*(z'-z _{hub})/(z _{hub} -z _{hub})) (z _{hub})*(z'-z _{hub})/(z _{hub} -z _{hub})	elevation ging elevation z <z<sub>full cal VV < Top of J >Vm () 20 ft intervals 50 ft intervals 100 ft intervals</z<sub>
Revised V Multiple Plume Calculations Solve for plume-avera Gives the following Heig Plume ' V Solve for Height of CAS Find Height Height abov Fable of MERGED Plume-Aver Begin Merging	vertical Velocity V ged vertical velociti pht above Stack z Top-Hat Radius a vertical Velocity V C critical vertical velocity V caged Vertical Velocity V raged Vertical Velocity V raged vertical velocity V above ground z _{ort} +h _s raged Vertical Velocity V 2aged Vertical Velocity V above ground zont 160.0 200.0 220.0 240.0 260.0 300.0 300.0 300.0 300.0 400.0 400.0 400.0 400.0 400.0 400.0 400.0 400.0 400.0 600.0 800.0 900.0 1000.0 1000.0	Solut 271.769 me 61.968 me 2.048 m/s 2.048 m/s elocity V _{crit} JET me JET me JET me cities starting a (meters) bove stack Ra 13.82 15.74 21.83 27.93 34.02 40.12 40.12 40.12 40.22 52.31 58.41 68.450 70.60 76.70 88.89 95.56 104.13 119.37 148.85 180.33 210.81 241.29 271.77 302.25 424.17 576.57 728.97 88.137 1033.77 1186.17	ttions in Ta 1,000.0 fe teters* s 5.30 m teters at Touchin Plume dius(m) 2.180 #N/A #D/A #	313.5 ables Below 891.6 203.3 6.72 JET JET Vert. Vel(m/s) 5.20 5.14 4.94 4.74 4.54 4.33 3.93 3.33 3.33 3.33 3.33 3.33 3.3	feet* 304.8 feet* feet ft/sec feet	Height above s $V = \{n(V_3)_{3,m}/4\}$ $V = V_{touch} + (V_m - V_m - V_{touch} + (V_m - V_m - V_{touch} + (V_m - V_m -$	tack where Total Merging Occurs (s ¹³ for heights above total merging e ¹ fourh)*(2-z _{louch})/(z _{hul} -z _{louch}) for heights below total mer pround (z+h _a) NS ₁₀) if z>z _{hul} / _{(ouch})*(z'-z _{hul})/(z _{hul} -z _{hul}) if z _{hub} (z _{hul})*(z'-z _{hub})/(z _{hul} -z _{hub}) if z _{hub} (z _{hub})*(z'-z _{hub})/(z _{hul} -z _{hub}) if z _{hub} z _{hub})*(z _{hub})*(z'-z _{hub})/(z _{hu} -z _{hub}) if v _{ert} z _{hub})*(z _{hub})*(z _{hub})/(z _{hub} -z _{hub}) if v _{ert} z _{hub})*(z _{hub})*(z _{hub})/(z _{hub} -z _{hub}) if v _{ert} z _{hub})*(z _{hub})*(z _{hub})/(z _{hub} -z _{hub}) (z _{hub})*(z'-z _{hub})/(z _{hub} -z _{hub})) (z _{hub})*(z'-z _{hub})/(z _{hub} -z _{hub})	levation ging elevation z <z<sub>full :al VV < Top of J >V_m</z<sub>

"Aviation Safety and Buoyant Plumes," Peter Best, et. al. "The Evaluation of Maximum Updraft Speeds for Calm Conditions at Various Heights in the Plume from a Gas-Turbine Power Station at Oakey, Queensland, Australia," Dr. K.T. Spillane Ambient Conditions: **Constants:** Assume neutral conditions (d θ /dz=0 or $\theta_a = \theta_e$) Ambient Potential Temp θ 278.15 Kelvins 41.0 °F 0.3048 meters/feet Plume Exit Conditions: 9.81 m/s² Gravity g 33.03 meters 108 4/12 feet-inches Stack Height h. 1.11 λ Individual Chiller Stack Diameter D 1.7374 meters 68.4 inches λ. ~1.0 Stack Velocity V_{exit} 13.20 m/s 43.30 ft/sec 4Vol/(60πD²) Individual Chiller Volumetric Flow 66,300 ACFM 31.29 cu.m/sec $\pi V_{exit} D^2/4$ Sect.2/¶1 Stack Potential Temp θ_s 289.26 Kelvins 61.0 °F Initial Stack Buoyancy Flux F. 3.7531 m⁴/s³ 20.0 ΔT(°F) $gV_{exit}D^{2}(1-\theta_{a}/\theta_{s})/4 = Vol.Flow(g/\pi)(1-\theta_{a}/\theta_{s})$ Sect.2/¶1 Plume Buoyancy Flux F N/A m⁴/s³ λ^2 gVa²(1- θ_a/θ_p) for a,V, θ_p at plume height (see below) Number of Chillers n 24 2.213 Multiple Stack Multiplication Factor (n^{0.25}) Conditions at End (Top) of Jet Phase: Height above Stack z_{jet} z_{iet} = 6.25D, meters*=meters above stack top 10.859 meters* 35.6 feet* Sect.3/¶1 Height above Ground z_{iet}+h_s 43.890 meters 144.0 feet $V_{iet} = 0.5V_{exit} = V_{exit}/2$ Vertical Velocity V_{jet} 6.599 m/s 21.65 ft/sec Plume Top-Hat Diameter 2a_{iet} 3.475 meters 2a_{iet} = 2D 11.4 feet Conservation of momentum Spillane Methodology - Analytical Solutions for Calm Conditions for Plume Heights above Jet Phase Single Plume-averaged Vertical Velocity V given by Analytical Solution in Paper where Product Va given by equations below: Solutions in Table Below Plume Top-Hat Radius a $0.16(z-z_v)$, or linear increase with height Sect.2/Ea.6 Virtual Source Height z., 0.211 meters* 07 feet* $6.25D[1-(\theta_e/\theta_s)^{1/2}]$, meters*=meters above stack top Sect 2/Eq.6 where $(\theta_a/\theta_s)^{1/2} = (\theta_e/\theta_s)^{1/2} = 0.9806$ Height above Ground zv+h 33 242 meters 109 1 feet Vertical Velocity V Solutions in Table Below $\{(Va)_{o}^{3} + 0.12F_{o}[(z-z_{v})^{2} - (6.25D-z_{v})^{2}]\}^{(1/3)} / a$ Sect.2.1(6) Product (Va) 11.243 m²/s $V_{exit}D/2(\theta_e/\theta_s)^{1/2}$ Single Chiller Results: 1.000.0 feet Solve for plume-averaged vertical velocity at height 304.8 meters above ground (z'+h_s) Gives the following Height above Stack z' 271.769 meters* 891.6 feet* 86.899 meters 285.1 feet 2a'=2*0.16(z'-z_v) Plume Top-Hat Diameter 2a' Sect.2/Eq.6 Vertical Velocity V 0.750 m/s 2.46 ft/sec $V=\{(Va)_{o}^{3}+0.12F_{o}[(z-z_{v})^{2}-(6.25D-z_{v})^{2}]\}^{(1/3)}/(2a'/2)$ Sect.2/Eq.6 Solve for Height of CASC critical vertical velocity $V_{\mbox{crit}}$ 5.30 m/s plume-averaged vertical velocity Critical VV > Top of Jet (Spillane) Find Height above Stack z_{crit} 13.559 meters 44.5 feet Solve for x=(z-z_v) simultaneously in both eqs. (i.e., Va and a) Height above Ground z_{crit}+h_s 46.590 meters 152.9 feet for V=V_{crit} using the cubic equation ax³+bx²+cx+d=0, where a=1, c=0, and b=-(0.12F_o)/(V_{crit}^30.16^3)= -0.73856 Interpolated Height of critical vertical velocity in Jet Phase: and $d=[0.12F_0(6.25D-z_v)^2-(Va)_0^3]/(V_{crit}^30.16^3)=$ -2246 82 Find Height above Stack z_{crit} #N/A meters #N/A feet http://www.1728.org/cubic.htm gives the real solution x = z-zv = #N/A feet Height above Ground zcrit+hs #N/A meters 13.3484 or z(m/above stack) = 13.559 z(ft/above ground) = 152.9 Table of Plume Top-Hat Diameters (2a) and Plume-Averaged Vertical Velocities starting at end of jet phase: Height (feet) (meters) Plume SingleStk Plume above ground above stack Radius(m) VertVel(m/s) Temp(K) Stack.Rel.Ht = 108.4 0.00 0.869 13.20 110.0 0.50 0.908 12 90 Jet Phase Eqs: 10 ft Intervals 11.04 120.0 3.54 1.152 Linearly interpolated from Stack Rel.Ht to Top of Jet 130.0 6.59 1.396 9.19 Spillane Equations: 140.0 9.64 1.640 7.34 $V_{nlume} = \{(Va)_{0}^{3} + 0.12F_{0}[(z-z_{0})^{2} - (6.25D-z_{0})^{2}]\}^{1/3} / a$ Top of Single jet = 144.0 10.86 1.737 6.60 $a = 0.16(z-z_v)$ 152.9 13 56 2 136 5 30 282 49 $\theta_p = \theta_s(1 + (1 - (\theta_e/\theta_s))^*(V_{exit}D^2/(4V_{plume}^*a^{2*}\lambda^2)))$ 160.0 CEC Staff Equation: 15.74 2.484 4.59 281.72 170.0 18.78 2,972 3.87 281.20 V_{mp}=n^{0.25}V_{sp} 21.83 3.460 180.0 3.37 280.67 Brigg's Equation: $V_{Brigg's}$ = (2/3) x 1.6^(3/2) x $F_{mp}^{(1/2)}$ x $u^{(-1/2)}$ x $z^{(-1/2)}$ 190.0 24 88 3.947 2.99 280.29 200.0 27.93 4.435 2.70 280.00 where $F_{mp} = nF_{sp}$ 210.0 30.98 4.923 2.47 279.78 250.0 43.17 6.873 1.89 279.59 50 ft Intervals 300.0 58 41 9 3 1 2 1.53 279 12 350.0 73.65 11.750 1.33 278.80 Max<5.3 m/s 400.0 88.89 14.189 1.20 278.62 450.0 104.13 16.627 1.11 278.51 119.37 19.065 500.0 1.04 278.43 550.0 134 61 21 504 0.99 278.38 600.0 149.85 23.942 0.94 278.34 700.0 180.33 28,819 0.87 278.31 210.81 100 ft Intervals 800.0 33.696 0.82 278.27 900.0 241 29 38 573 0 78 278 24 1000.0 271.77 43,449 0.75 278.22 1100.0 302.25 48.326 0.72 278.21 332.73 53.203 0.70 278.20 1200.0 363.21 58.080 278.19 1300.0 0.68 1400.0 393.69 62.957 0.66 278.19 424.17 67.833 1500.0 0.64 278.18 2000.0 576.57 92.217 0.58 278.18 500 ft Intervals 728.97 116.601 2500.0 0.53 278.17 3000.0 881.37 140.985 0.50 278.16 3500.0 1033.77 165.369 0.47 278.16 4000.0 1186.17 189,753 0.45 278.16 4500.0 1338.57 214.137 0.43 278.16

SINGLE/Approximated Plume Average Vertical Velocities for SVY03A Chillers using CEC Staff Methodology - Winter Min*

Winter Min = Monthly Mean of Minimum Daily Temperatures for 1971-2000 (Lowest in Dece 278.15 NOAA Sources: Climatography of the United MERGED (along width) Plume Average Vertical Velocities for SVY03A Chillers using CEC Staff Methodology - Winter Min "Aviation Safety and Buoyant Plumes," Peter Best, et. al.

	"The Evaluat			-	Calm Conditions at Various Heights in the Me	-
Ambient Conditions:		Plume	e trom Two Ga	is-Turbine	Power Station at Oakey, Queensland, Australia Constants: Assume neutral conditions (dθ/dz=0	
Ambient Conditions: Ambient Potential Temp θ	278.15	Kelvins	41.0	°F	0.3048 meters/feet	o, o _a -o _e)
Plume Exit Conditions:	210.10			•	Gravity g 9.81 m/s ²	
Stack Height h	33.03	meters	108 4/12	feet-inches	λ 1.11	
Individual Stack Diameter	1.73736	meters	68.4	inches	λ _o ~1.0	
Stack Velocity V _{ex}			43.30		4Vol/(60πD ²)	
Individual Volumetric Flow		cu.m/sec	66,300		πV _{exit} D ² /4	Sect.2/¶1
Stack Potential Temp θ	-	Kelvins	61.0			Cast 0/III
Initial Stack Buoyancy Flux F Plume Buoyancy Flux F		m ⁴ /s ³ m ⁴ /s ³	20.0	ΔT(°F)	$gV_{exit}D^2(1-\theta_a/\theta_s)/4 = Vol.Flow(g/\pi)(1-\theta_a/\theta_s)$ $\lambda^2 gVa^2(1-\theta_a/\theta_n)$ for a,V, θ_n at plume height (see b)	Sect.2/¶1
Total Number of Stacks r		m /s			A gva $(1-\sigma_{a}/\sigma_{b})$ for a, v, σ_{b} at pluttle neight (see b	elow)
Average Adjacent Stack Separation		meters	14.3	feet	Calcs based on multiple plume treatment in Peter	Best Paper:
Number of Stacks along Orientation N					plume velocities increased by N ^{0.25} at the height w	
					fully merged (interp. below ht, single merged stac	k above ht)
Conditions at End (Top) of Jet Phase:						
Height above Stack z _{je}	-	meters*	35.6		z _{jet} = 6.25D, meters*=meters above stack top	Sect.3/¶1
Height above Ground z _{jet} +h		meters	144.0		N 0.5% N 10	
Vertical Velocity V _{je}			21.65		$V_{jet} = 0.5V_{exit} = V_{exit}/2$	
Plume Top-Hat Diameter 2a _{le}	1 3.475	meters	11.4	leet	2a _{jet} = 2D Conservation of moment	um
Spillane Methodology - Analytical Solutions f	or Calm Condi	itions for Plu	umo Hoichte a	hove let a	nd Merging Phases	
Single Plume-averaged Vertical Velocity			-			
Single Plume Values: Plume Top-Hat Radius a		-	Merging Only		$a = 0.16(z-z_v)$, or linear increase with height	Sect.2/Eq.6
Virtual Source Height z		meters*	0.7	feet*	$z_v = 6.25D[1-(\theta_e/\theta_s)^{1/2}]$, meters*=meters above stack top	Sect.2/Eq.6
Height above Ground z _v +h	•	meters	109.1		where $(\theta_a/\theta_s)^{1/2} = (\theta_e/\theta_s)^{1/2}$	
Single Plume Values: Vertical Velocity \		ed in Plume	Merging Only	/	${(Va)_o^3 + 0.12F_o [(z-z_v)^2 - (6.25D-z_v)^2]}^{(1/3)} / a$	Sect.2.1(6)
Product (Va)	₀ 11.243	m²/s			$V_{exit}(D/2)(\theta_e/\theta_s)^{1/2}$	
lume Merging - Based on Single Plume Calc						Sect.3/¶3
Begin Merging Plume Top-Hat Diameter 2a _{touc}		meters	14.3		2a _{touch} =d, (or a _{touch} =d/2)	
Height above Stack z _{touc}		meters*	45.4		$z_{touch} = z_v + d/(2*0.16)$, meters*=meters above sta	ck top
Height above Ground z _{touch} +h		meters	153.8			n .
Vertical Velocity Vtouci				ft/sec	$V_{\text{touch}} = \{ (Va)_{o}^{3} + 0.12F_{o} [(z-z_{v})^{2} - (6.25D-z_{v})^{2}] \}^{(1/2)}$	
Total Merging Plume Top-Hat Diameter 2a _{fu}	-	meters	100.1		2a _{full} =2d(N-1)/2, (or a _{full} =d(N-1)/2) FOR 2 STACK	
Height above Stack Z _{fu}		meters*	313.6 422.0		$z_{full} = z_v + 2d/(2^*0.16)$, meters*=meters above stac	ж тор
Height above Ground z _{full} +h Vertical Velocity V _{fu}					$V_{\text{full}} = \{(Va)_0^3 + 0.12F_0 [(z_{\text{full}} - z_v)^2 - (6.25D - z_v)^2]\}^{(1/3)}$	3) / -
		m ⁴ /s ³	3.0	ft/sec	$v_{\text{full}} = \{(va)_0 + 0.12r_0 [(z_{\text{full}}-z_v) - (0.25D-z_v)]\}$	7 a _{full}
Product (V ³ a) _{fu} Conditions at End (Top) of Merging Phase - D	-		da, in Mercer	Plume ca	culations (based on TOTAL number of stacks):	
Merged Plume Values: Plume Diameter 2a			Table Below		$2a = 2 \times (a_m + 0.16(z-z_{full})), or linear increase with the second seco$	h height
Revised Merged Plume Radius a		meters	110.8	feet	where $a_m = n^{0.25} a_{full}$ where Total Merging Occurs	
Revised Merged Plume Velocity V				ft/sec	and $V_m = n^{0.25} V_{full}$ where Total Merging Occurs	
Revised Virtual Source Height zfu		meters*	313.6	feet*	Height above stack where Total Merging Occurs	
Revised Vertical Velocity \	/ S	olutions in [.]	Tables Below		V={n(V ³ a) _{full} /a} ^{1/3} for heights above total merging	
					V=V _{touch} +(V _m -V _{touch})*(z-z _{touch})/(z _{full} -z _{touch})	
Iultiple Plume Calculations					for heights below total me	erging elevation
Solve for plume-averaged vertical velo		200.0			meters above ground (z+h _s)	
Gives the following Height above Stack		meters*	91.6		LESS THAN TOP OF MERGING PHASE-INTER	POLATE
Plume Top-Hat Radius a Vertical Velocity V		meters	#N/A	feet ft/sec	$a=a_m+0.16(z-z_{full})$ if $z>z_{full}$	
venical velocity v	4.741	m/s	10.00	n/sec	$V=\{n(V^{3}a)_{tull}/a\}^{1/3} \text{ if } z>z_{full}$ $V'=V_{touch}+(V_m-V_{touch})^*(z'-z_{touch})/(z_{full}-z_{touch}) \text{ if } z_{touch}$	<7<7.
					V'=single plume values if z <z<sub>touch</z<sub>	
Solve for Height of CASC critical vertica	al velocity V _{crit}	5.30			5 1 10001	
Find Height above Stack z _{cr}			m/s		BEFORE TOUCHING Crit	ical VV < Top of Je
i inu neight above StaCK Z _{cr}	t JET	meters	m/s JET	feet	BEFORE TOUCHING Crit $z_{crit} = z_{full} + \{[n(V^3a)_{full}/(V_{crit})^3] - a_m\}/0.16 \text{ if } V_{crit} < V_m$	
Height above Ground z _{crit} +h		meters meters				ical VV < Top of Je
Height above Ground z _{crit} +h	s JET	meters	JET JET		$z_{crit} = z_{full} + \{[n(V^3a)_{full}/(V_{crit})^3]-a_m\}/0.16 \text{ if } V_{crit} < V_m$	ical VV < Top of Je
Height above Ground z _{crit} +h able of MERGED Plume-Averaged Vertical V	₅ JET elocities starti	meters ng at Touch	JET JET ing Height:		$\begin{split} z_{crit} &= z_{full} + \left([n(V^3a)_{hull}/(V_{crit})^3] - a_m \right) (0.16 \text{ if } V_{crit} < V_m \\ z_{crit} &= z_{fouch} + (z_{hull} - z_{fouch})^* (V_{crit} - V_{bouch}) / (V_m - V_{bouch}) \text{ if } V_c \\ \text{Single Plume Eqns (see Single Plume spreadshee} \end{split}$	ical VV < Top of Je _{rit} >V _m
Height above Ground z _{ort} +h able of MERGED Plume-Averaged Vertical V Height (feet	s JET elocities starti) (meters)	meters ng at Touch Plume	JET JET ing Height: Vert.		$\begin{split} & Z_{crit} = Z_{buil} + \{[n(V^3_a)_{buil}/(V_{crit})^3] \text{-}a_m]/0.16 \text{ if } V_{crit} < V_m \\ & Z_{crit} = Z_{bouch} + (Z_{buil} - Z_{bouch})/(V_{crit} - V_{bouch}) \text{ if } V_c \\ & Single Plume Eqns (see Single Plume spreadsher \\ & V_{plum} = [(Va)_{a}^{-3} + 0.12F_{cl}(zz.z)^2 (0.25Dz.z)^2])^{13/3} \text{ a} \end{split}$	ical VV < Top of Je _{rit} >V _m
Height above Ground z _{ent} +h able of MERGED Plume-Averaged Vertical V Height (feet above ground	s JET elocities starti) (meters) d above stack	meters ng at Touch Plume Radius(m)	JET JET ing Height: Vert. Vel(m/s)		$\begin{split} & Z_{crit} = Z_{hull} + \{[n(V^3_a)_{hull}/(V_{cril})^3] - a_m]/0.16 \text{ if } V_{crit} < V_m \\ & Z_{crit} = Z_{touch} + (Z_{tull} - Z_{touch})'(V_{crit} - V_{touch})/(V_m - V_{touch}) \text{ if } V_c \\ & Single Plume Eqns (see Single Plume spreadsher \\ & V_{plum} = (V_{olb})_{*}^{*0}.12F_{ol}(z_{*2})_{*}^{2}(6.25D \cdot z_{v})^{2}]_{1}^{10} / a \\ & a = 0.16(z \cdot z_{v}) \end{split}$	ical VV < Top of Je _{rit} >V _m
Height above Ground z _{crit} +h able of MERGED Plume-Averaged Vertical V Height (feet above ground Begin Merging (touch) = 153.8	s JET elocities starti) (meters) d above stack 13.85	meters ng at Touch Plume Radius(m) 2.180	JET JET ing Height: Vert. Vel(m/s) 5.20		$\begin{split} & Z_{crt} = Z_{bull} + \left\{ [n(V_a^{3})_{bull}/(V_{crt})^{3}]_{-am} \right\} (0.16 \text{ if } V_{crt} < V_m \\ & Z_{crt} = Z_{buuch} + (Z_{tull} - Z_{luoch})^{\prime} (V_{crt} - V_{buuch}) / (V_m - V_{louch}) \text{ if } V_c \\ & Single Plume Eqns (see Single Plume spreadsher) \\ & V_{game} = (Va)_{a}^{3-0.12F_{cl}} (z_{c2}, z_{c2})^{-2} (c_{c2}SD - z_{c2})^{2})^{1/3} / a \\ & a = 0.16 (z_{c2}, z_{c2}) \\ & \theta_{p} = \theta_{a} (1 + (1 - (\theta_{p}/\theta_{a})))^{\prime} (V_{ext} D^{2} / (4V_{plume} * a^{2} \lambda^{2}))) \end{split}$	ical VV < Top of Je _{rit} >V _m tet)
Height above Ground z _{ort} +h able of MERGED Plume-Averaged Vertical V Height (feet above grounc <u>Begin Merging (touch) = 153.6</u> 160.0	s JET elocities starti) (meters) d above stack 13.85) 15.74	meters ng at Touch Plume Radius(m) 2.180 #N/A	JET JET ing Height: Vert. Vel(m/s) 5.20 5.13		$\begin{split} & Z_{crt} = Z_{bull} + \left\{ [n(V_{crt}^3)_{hull}/(V_{crt})^3]_{-am} \} (0.16 \text{ if } V_{crt} < V_m \\ & Z_{crt} = Z_{buuch} + (Z_{tull} - Z_{louch})'(V_{crt} - V_{buuch})/(V_m - V_{bouch}) \text{ if } V_c \\ & Single Plume Eqns (see Single Plume spreadshed \\ & V_{\mu nm} = [(V_{ab})_a^3 + 0.12F_{cl} [(z.z{c})^2]_{cl}^{-2.25D \cdot z{c}}]_{cl}^{13/4} / a \\ & a = 0.16(2 \cdot z_{c}) \\ & \theta_{p} = \theta_{s}(1 + (1 - (\theta_{p}/\theta_{s}))^* (V_{ext} D^2/(4V_{plume}^* a^2 \cdot \lambda^2))) \\ & Interpolated Layer Eqns \end{split}$	ical VV < Top of Je _{rit} >V _m
Height above Ground z _{ont} +h able of MERGED Plume-Averaged Vertical V Height (feet above ground Begin Merging (touch) = 153.8 160.0 180.0	s JET elocities starti) (meters) d above stack 1 13.85) 15.74) 21.83	meters ng at Touch Plume Radius(m) 2.180 #N/A #N/A	JET JET ing Height: Vert. Vel(m/s) 5.20 5.13 4.94		$\begin{split} & Z_{crt} = Z_{bull} + \left\{ [n(V_a^{3})_{bull}/(V_{crt})^{3}]_{-am} \right\} (0.16 \text{ if } V_{crt} < V_m \\ & Z_{crt} = Z_{buuch} + (Z_{tull} - Z_{luoch})^{\prime} (V_{crt} - V_{buuch}) / (V_m - V_{louch}) \text{ if } V_c \\ & Single Plume Eqns (see Single Plume spreadsher) \\ & V_{game} = (Va)_{a}^{3-0.12F_{cl}} (z_{c2}, z_{c2})^{-2} (c_{c2}Sc_{2}, z_{c1})^{11/3} / a \\ & = 0.16 (z_{c2}, z_{c2}) \\ & \theta_{p} = \theta_{g} (1 + (1 - (\theta_{p}/\theta_{gl}))^{*} (V_{ext} D^{2} / (4V_{plume} * a^{2*}\lambda^{2}))) \end{split}$	ical VV < Top of Ja _{rit} >V _m tet)
Height above Ground z _{ent} +h able of MERGED Plume-Averaged Vertical V Height (feet above ground Begin Merging (touch) = 153.8 160.0 180.0 200.0	JET elocities starti (meters) above stack 13.85 15.74 21.83 227.93	meters ng at Touch Plume Radius(m) 2.180 #N/A #N/A #N/A	JET JET ing Height: Vert. Vel(m/s) 5.20 5.13 4.94 4.74		$\begin{split} & Z_{crt} = Z_{bull} + \left\{ [n(V_{crt}^3)_{hull}/(V_{crt})^3]_{-am} \} (0.16 \text{ if } V_{crt} < V_m \\ & Z_{crt} = Z_{buuch} + (Z_{tull} - Z_{louch})'(V_{crt} - V_{buuch})/(V_m - V_{bouch}) \text{ if } V_c \\ & Single Plume Eqns (see Single Plume spreadshed \\ & V_{\mu nm} = [(V_{ab})_a^3 + 0.12F_{cl} [(z.z{c})^2]_{cl} (2.5D \cdot z{c})^2]_{cl}^{1/3} / a \\ & a = 0.16(2 \cdot z_{c}) \\ & \theta_{p} = \theta_{s}(1 + (1 - (\theta_{p}/\theta_{s}))^* (V_{ext} D^2/(4V_{plume}^* a^2 \cdot \lambda^2))) \\ & Interpolated Layer Eqns \end{split}$	ical VV < Top of Ja _{rit} >V _m tet)
Height above Ground z _{ent} +h Table of MERGED Plume-Averaged Vertical V Height (feet above ground Begin Merging (touch) = 153.8 160.0 200.0 220.0	elocities starti) (meters) d above stack 3 13.85 0 15.74 0 21.83 0 27.93 0 34.02	meters ng at Touch Plume Radius(m) 2.180 #N/A #N/A #N/A #N/A	JET JET ing Height: Vert. Vel(m/s) 5.20 5.13 4.94 4.94 4.74 4.54		$\begin{split} & Z_{crt} = Z_{bull} + \left\{ [n(V_{crt}^3)_{hull}/(V_{crt})^3]_{-am} \} (0.16 \text{ if } V_{crt} < V_m \\ & Z_{crt} = Z_{buuch} + (Z_{tull} - Z_{louch})'(V_{crt} - V_{buuch})/(V_m - V_{bouch}) \text{ if } V_c \\ & Single Plume Eqns (see Single Plume spreadshed \\ & V_{\mu nm} = [(V_{ab})_a^3 + 0.12F_{cl} [(z.z{c})^2]_{cl} (2.5D \cdot z{c})^2]_{cl}^{1/3} / a \\ & a = 0.16(2 \cdot z_{c}) \\ & \theta_{p} = \theta_{s}(1 + (1 - (\theta_{p}/\theta_{s}))^* (V_{ext} D^2/(4V_{plume}^* a^2 \cdot \lambda^2))) \\ & Interpolated Layer Eqns \end{split}$	ical VV < Top of Ja _{rit} >V _m tet)
Height above Ground z _{orit} +h able of MERGED Plume-Averaged Vertical V Height (feet above ground Begin Merging (touch) = 153.6 160.0 180.0 220.0 240.0	B JET elocities starti) (meters) d above stack 1 3.85 1 5.74 2 1.83 0 27.93 0 34.02 0 40.12	meters ng at Touch Plume Radius(m) 2.180 #N/A #N/A #N/A #N/A	JET JET ing Height: Vert. Vel(m/s) 5.20 5.13 4.94 4.74 4.54 4.54		$\begin{split} & Z_{crt} = Z_{bull} + \left\{ [n(V_{crt}^3)_{hull}/(V_{crt})^3]_{-am} \} (0.16 \text{ if } V_{crt} < V_m \\ & Z_{crt} = Z_{buuch} + (Z_{tull} - Z_{louch})'(V_{crt} - V_{buuch})/(V_m - V_{bouch}) \text{ if } V_c \\ & Single Plume Eqns (see Single Plume spreadshed \\ & V_{\mu nm} = [(V_{ab})_a^3 + 0.12F_{cl} [(z.z{c})^2]_{cl} (2.5D \cdot z{c})^2]_{cl}^{1/3} / a \\ & a = 0.16(2 \cdot z_{c}) \\ & \theta_{p} = \theta_{s}(1 + (1 - (\theta_{p}/\theta_{s}))^* (V_{ext} D^2/(4V_{plume}^* a^2 \cdot \lambda^2))) \\ & Interpolated Layer Eqns \end{split}$	ical VV < Top of Ja _{rit} >V _m tet)
Height above Ground z _{ort} +h Table of MERGED Plume-Averaged Vertical V Height (feet above ground Begin Merging (touch) = 153.8 160.0 180.0 200.0 220.0 240.0 260.0	elocities starti) (meters) d above stack 1 3.85 1 5.74 0 21.83 0 27.93 0 34.02 0 40.12 0 46.22	meters ng at Touch Plume Radius(m) 2.180 #N/A #N/A #N/A #N/A #N/A	JET JET ing Height: Vert. Vel(m/s) 5.20 5.13 4.94 4.74 4.54 4.55 4.15		$\begin{split} & Z_{crt} = Z_{bull} + \left\{ [n(V_{crt}^3)_{hull}/(V_{crt})^3]_{-am} \} (0.16 \text{ if } V_{crt} < V_m \\ & Z_{crt} = Z_{buuch} + (Z_{tull} - Z_{louch})'(V_{crt} - V_{buuch})/(V_m - V_{bouch}) \text{ if } V_c \\ & Single Plume Eqns (see Single Plume spreadshed \\ & V_{\mu nm} = [(V_{ab})_a^3 + 0.12F_{cl} [(z.z{c})^2]_{cl} (2.5D \cdot z{c})^2]_{cl}^{1/3} / a \\ & a = 0.16(2 \cdot z_{c}) \\ & \theta_{p} = \theta_{s}(1 + (1 - (\theta_{p}/\theta_{s}))^* (V_{ext} D^2/(4V_{plume}^* a^2 \cdot \lambda^2))) \\ & Interpolated Layer Eqns \end{split}$	ical VV < Top of Je _{rit} >V _m eet) 20 ft Intervals
Height above Ground z _{ort} +h Table of MERGED Plume-Averaged Vertical V Height (feet above ground Begin Merging (touch) = 153.8 160.0 180.0 220.0 240.0	JET elocities starti) (meters) 1 above stack 1 15.74 0 15.74 0 27.93 0 27.93 0 34.02 0 40.12 0 46.22 0 52.31	meters ng at Touch Plume Radius(m) 2.180 #N/A #N/A #N/A #N/A	JET JET ing Height: Vert. Vel(m/s) 5.20 5.13 4.94 4.74 4.54 4.54		$\begin{split} & Z_{crt} = Z_{bull} + \left\{ [n(V_{crt}^3)_{hull}/(V_{crt})^3]_{-am} \} (0.16 \text{ if } V_{crt} < V_m \\ & Z_{crt} = Z_{buuch} + (Z_{tull} - Z_{louch})'(V_{crt} - V_{buuch})/(V_m - V_{bouch}) \text{ if } V_c \\ & Single Plume Eqns (see Single Plume spreadshed \\ & V_{\mu nm} = [(V_{ab})_a^3 + 0.12F_{cl} [(z.z{c})^2]_{cl} (2.5D \cdot z{c})^2]_{cl}^{1/3} / a \\ & a = 0.16(2 \cdot z_{c}) \\ & \theta_{p} = \theta_{s}(1 + (1 - (\theta_{p}/\theta_{s}))^* (V_{ext} D^2/(4V_{plume}^* a^2 \cdot \lambda^2))) \\ & Interpolated Layer Eqns \end{split}$	ical VV < Top of Ja _{rit} >V _m tet)
Height above Ground z _{ent} +h Table of MERGED Plume-Averaged Vertical V Height (feet above ground Begin Merging (touch) = 153.8 160.0 200.0 220.0 240.0 260.0 260.0 280.0	JET elocities starti) (meters) above stack 1 above stack 1 38.95 0 27.93 0 34.02 0 40.12 0 46.22 0 58.41	meters ng at Touch Plume Radius(m) 2.180 #N/A #N/A #N/A #N/A #N/A	JET JET ing Height: Vert. Vel(m/s) 5.20 5.13 4.94 4.74 4.54 4.35 4.15 3.95		$\begin{split} & Z_{crt} = Z_{bull} + \left\{ [n(V_{crt}^3)_{hull}/(V_{crt})^3]_{-am} \} (0.16 \text{ if } V_{crt} < V_m \\ & Z_{crt} = Z_{buuch} + (Z_{tull} - Z_{louch})'(V_{crt} - V_{buuch})/(V_m - V_{bouch}) \text{ if } V_c \\ & Single Plume Eqns (see Single Plume spreadshed \\ & V_{\mu nm} = [(V_{ab})_a^3 + 0.12F_{cl} [(z.z{c})^2]_{cl} (2.5D \cdot z{c})^2]_{cl}^{1/3} / a \\ & a = 0.16(2 \cdot z_{c}) \\ & \theta_{p} = \theta_{s}(1 + (1 - (\theta_{p}/\theta_{s}))^* (V_{ext} D^2/(4V_{plume}^* a^2 \cdot \lambda^2))) \\ & Interpolated Layer Eqns \end{split}$	ical VV < Top of Je _{rit} >V _m eet) 20 ft Intervals
Height above Ground z _{ent} +h Table of MERGED Plume-Averaged Vertical V Height (feet above ground Begin Merging (touch) = 153.8 160.0 280.0 240.0 240.0 280.0 280.0 300.0	JET elocities starti i above stack above stack 1 above stack 1 385 1 3.85 1 21.83 1 21.83 1 21.83 1 21.83 1 21.83 1 21.83 1 21.83 1 21.83 2 1.83 2 21.83 2 21.83 2 21.83 2 21.83 2 34.02 2 46.22 2 52.31 2 52.31 3 58.41 2 56.41 2 56.45	meters ng at Touch Plume Radius(m) 2.180 #N/A #N/A #N/A #N/A #N/A	JET JET ing Height: Vert. Vel(m/s) 5.20 5.13 4.94 4.94 4.74 4.54 4.35 4.15 3.95 3.76		$\begin{split} & Z_{crt} = Z_{bull} + \left\{ [n(V_{crt}^3)_{hull}/(V_{crt})^3]_{-am} \} (0.16 \text{ if } V_{crt} < V_m \\ & Z_{crt} = Z_{buuch} + (Z_{tull} - Z_{louch})'(V_{crt} - V_{buuch})/(V_m - V_{bouch}) \text{ if } V_c \\ & Single Plume Eqns (see Single Plume spreadshed \\ & V_{\mu nm} = [(V_{ab})_a^3 + 0.12F_{cl} [(z.z{c})^2]_{cl} (2.5D \cdot z{c})^2]_{cl}^{1/3} / a \\ & a = 0.16(2 \cdot z_{c}) \\ & \theta_{p} = \theta_{s}(1 + (1 - (\theta_{p}/\theta_{s}))^* (V_{ext} D^2/(4V_{plume}^* a^2 \cdot \lambda^2))) \\ & Interpolated Layer Eqns \end{split}$	ical VV < Top of Je _{rit} >V _m eet) 20 ft Intervals
Height above Ground z _{crit} +h Table of MERGED Plume-Averaged Vertical V Height (feet above ground Begin Merging (touch) = 153.8 160.0 180.0 220.0 240.0 240.0 260.0 300.0 300.0 320.0	JET elocities starti) (meters) d above stack 13.85 15.74 21.83 27.93 34.02 46.22 52.31 58.41 64.50 70.60	meters ng at Touch Plume Radius(m) 2.180 #N/A #N/A #N/A #N/A #N/A #N/A #N/A	JET JET ing Height: Vert. Vel(m/s) 5.20 5.13 4.94 4.74 4.54 4.54 4.55 3.95 3.76 3.56		$\begin{split} & Z_{crt} = Z_{bull} + \left\{ [n(V_{crt}^3)_{hull}/(V_{crt})^3]_{-am} \} (0.16 \text{ if } V_{crt} < V_m \\ & Z_{crt} = Z_{buuch} + (Z_{tull} - Z_{louch})'(V_{crt} - V_{buuch})/(V_m - V_{bouch}) \text{ if } V_c \\ & Single Plume Eqns (see Single Plume spreadshed \\ & V_{\mu nm} = [(V_{ab})_a^3 + 0.12F_{cl} [(z.z{c})^2]_{cl} (2.5D \cdot z{c})^2]_{cl}^{1/3} / a \\ & a = 0.16(2 \cdot z_{c}) \\ & \theta_{p} = \theta_{s}(1 + (1 - (\theta_{p}/\theta_{s}))^* (V_{ext} D^2/(4V_{plume}^* a^2 \cdot \lambda^2))) \\ & Interpolated Layer Eqns \end{split}$	ical VV < Top of Je _{rit} >V _m eet) 20 ft Intervals
Height above Ground z _{unt} +h able of MERGED Plume-Averaged Vertical V Height (feet above ground Begin Merging (touch) = 153.6 160.0 200.0 220.0 240.0 280.0 300.0 300.0 320.0 340.0 340.0	JET elocities starti) (meters) 1 above stack 1 3.85 0 15.74 0 27.93 0 34.02 0 40.12 0 46.22 0 52.31 0 64.50 0 70.60 0 70.60	meters ng at Touch Plume Radius(m) 2.180 #N/A #N/A #N/A #N/A #N/A #N/A #N/A	JET JET ing Height: Vert. Vel(m/s) 5.20 5.13 4.94 4.54 4.55 4.15 3.96 3.766 3.56 3.36		$\begin{split} & Z_{crt} = Z_{bull} + \left\{ [n(V_{crt}^3)_{hull}/(V_{crt})^3]_{-am} \} (0.16 \text{ if } V_{crt} < V_m \\ & Z_{crt} = Z_{buuch} + (Z_{tull} - Z_{louch})'(V_{crt} - V_{buuch})/(V_m - V_{bouch}) \text{ if } V_c \\ & Single Plume Eqns (see Single Plume spreadshed \\ & V_{\mu nm} = [(V_{ab})_a^3 + 0.12F_{cl} [(z.z{c})^2]_{cl} (2.5D \cdot z{c})^2]_{cl}^{1/3} / a \\ & a = 0.16(2 \cdot z_{c}) \\ & \theta_{p} = \theta_{s}(1 + (1 - (\theta_{p}/\theta_{s}))^* (V_{ext} D^2/(4V_{plume}^* a^2 \cdot \lambda^2))) \\ & Interpolated Layer Eqns \end{split}$	ical VV < Top of Je _{rit} >V _m eet) 20 ft Intervals
Height above Ground z _{ent} +h able of MERGED Plume-Averaged Vertical V Height (feet above ground Begin Merging (touch) = 153.8 160.0 2200.0 20	JET elocities starti) (meters) above stack 1 above stack 1 3.85 0 15.74 0 27.93 0 40.12 0 46.22 0 58.41 0 64.50 0 70.60 0 76.70 0 70.60 0 76.70	meters ng at Touch Plume Radius(m) 2.180 #N/A #N/A #N/A #N/A #N/A #N/A #N/A #N/A	JET JET ing Height: Vert. Vel(m/s) 5.20 5.13 4.94 4.74 4.54 4.35 5.4.15 3.95 3.76 3.56 3.36 3.36 3.36		$\begin{split} & Z_{crt} = Z_{bull} + \left\{ [n(V_{crt}^3)_{hull}/(V_{crt})^3]_{-am} \} (0.16 \text{ if } V_{crt} < V_m \\ & Z_{crt} = Z_{buuch} + (Z_{tull} - Z_{luoch})'(V_{crt} - V_{buuch})/(V_m - V_{bouch}) \text{ if } V_c \\ & Single Plume Eqns (see Single Plume spreadshed \\ & V_{\mu nm} = [(V_{ab})_a^3 + 0.12F_{cl} [(z.z{c})^2]_{cl}^{-2.25D \cdot z{c}}]_{cl}^{13/4} / a \\ & a = 0.16(2 \cdot z_{c}) \\ & \theta_{p} = \theta_{s}(1 + (1 - (\theta_{p}/\theta_{s}))^* (V_{ext} D^2/(4V_{plume}^* a^2 \cdot \lambda^2))) \\ & Interpolated Layer Eqns \end{split}$	ical VV < Top of Je _{rit} >V _m eet) 20 ft Intervals
Height above Ground z _{ent} +h able of MERGED Plume-Averaged Vertical V Height (feet above ground Begin Merging (touch) = 153.8 160.0 280.0 220.0 240.0 260.0 280.0 300.0 320.0 340.0 340.0 380.0 380.0	JET elocities starti i above stack above stack 1 above stack 1 above stack 1 385 0 15.74 0 21.83 0 27.93 0 40.12 0 46.22 0 58.41 0 64.50 0 70.60 0 82.79 8.889	meters ng at Touch Plume Radius(m) 2.180 #N/A #N/A #N/A #N/A #N/A #N/A #N/A #N/A	JET JET ing Height: Vert. Vel(m/s) 5.20 5.13 4.94 4.74 4.54 4.74 4.55 4.15 3.95 3.76 3.56 3.36 3.36 3.36 3.37		$\begin{split} & Z_{crt} = Z_{bull} + \left\{ [n(V_{crt}^3)_{hull}/(V_{crt})^3]_{-am} \} (0.16 \text{ if } V_{crt} < V_m \\ & Z_{crt} = Z_{buuch} + (Z_{tull} - Z_{luoch})'(V_{crt} - V_{buuch})/(V_m - V_{bouch}) \text{ if } V_c \\ & Single Plume Eqns (see Single Plume spreadshed \\ & V_{\mu nm} = [(V_{ab})_a^3 + 0.12F_{cl} [(z.z{c})^2]_{cl}^{-2.25D \cdot z{c}}]_{cl}^{13/4} / a \\ & a = 0.16(2 \cdot z_{c}) \\ & \theta_{p} = \theta_{s}(1 + (1 - (\theta_{p}/\theta_{s}))^* (V_{ext} D^2/(4V_{plume}^* a^2 \cdot \lambda^2))) \\ & Interpolated Layer Eqns \end{split}$	ical VV < Top of Je _{rit} >V _m eet) 20 ft Intervals
Height above Ground z _{ent} +h able of MERGED Plume-Averaged Vertical V Height (feet above ground Begin Merging (touch) = 153.8 160.0 220.0 200.0 220.0 200.0	JET elocities starti) (meters) d above stack 13.85 15.74 27.93 24.83 27.93 34.02 34.02 46.22 46.22 52.31 64.50 76.70 76.70 88.89 95.59 104.13	meters ng at Touch Plume Radius(m) 2.180 #N/A #N/A #N/A #N/A #N/A #N/A #N/A #N/A	JET JET ing Height: Vert. Vel(m/s) 5.20 5.13 4.94 4.74 4.54 4.35 6.3.36 3.56 3.36 3.36 3.36 3.36 3.36		$\begin{split} & Z_{crt} = Z_{bull} + \left\{ [n(V_{crt}^3)_{hull}/(V_{crt})^3]_{-am} \} (0.16 \text{ if } V_{crt} < V_m \\ & Z_{crt} = Z_{buuch} + (Z_{tull} - Z_{luoch})'(V_{crt} - V_{buuch})/(V_m - V_{bouch}) \text{ if } V_c \\ & Single Plume Eqns (see Single Plume spreadshed \\ & V_{\mu nm} = [(V_{ab})_a^3 + 0.12F_{cl} [(z.z{c})^2]_{cl}^{-2.25D \cdot z{c}}]_{cl}^{13/4} / a \\ & a = 0.16(2 \cdot z_{c}) \\ & \theta_{p} = \theta_{s}(1 + (1 - (\theta_{p}/\theta_{s}))^* (V_{ext} D^2/(4V_{plume}^* a^2 \cdot \lambda^2))) \\ & Interpolated Layer Eqns \end{split}$	ical VV < Top of Jo _{rit} >V _m 20 ft Intervals 50 ft Intervals
Height above Ground z _{ent} +h able of MERGED Plume-Averaged Vertical V Height (feet above ground Begin Merging (touch) = 153.8 160.0 280.0 220.0 240.0 240.0 260.0 280.0 300.0 380.0	JET elocities starti i (meters) above stack 1.3.85 1.5.74 2.183 2.21.83 2.27.93 3.4.02 3.4.02 4.4.22 5.2.31 5.4.41 6.4.50 70.61 88.89 9 9 9 10.104.13 119.37	meters ng at Touch Plume Radius(m) 2.180 #N/A #N/A #N/A #N/A #N/A #N/A #N/A #N/A	JET JET ing Height: Vert. Vel(m/s) 5.20 5.13 4.94 4.74 4.54 4.55 3.766 3.766 3.366 3.36 3.36 3.317 2.97 2.77 2.56		$\begin{split} & Z_{crt} = Z_{bull} + \left\{ [n(V_{crt}^3)_{hull}/(V_{crt})^3]_{-am} \} (0.16 \text{ if } V_{crt} < V_m \\ & Z_{crt} = Z_{buuch} + (Z_{tull} - Z_{luoch})'(V_{crt} - V_{buuch})/(V_m - V_{bouch}) \text{ if } V_c \\ & Single Plume Eqns (see Single Plume spreadshed \\ & V_{\mu nm} = [(V_{ab})_a^3 + 0.12F_{cl} [(z.z{c})^2]_{cl}^{-2.25D \cdot z{c}}]_{cl}^{13/4} / a \\ & a = 0.16(2 \cdot z_{c}) \\ & \theta_{p} = \theta_{s}(1 + (1 - (\theta_{p}/\theta_{s}))^* (V_{ext} D^2/(4V_{plume}^* a^2 \cdot \lambda^2))) \\ & Interpolated Layer Eqns \end{split}$	ical VV < Top of Jo _{rit} >V _m 20 ft Intervals 50 ft Intervals
Height above Ground z _{ortt} +h Table of MERGED Plume-Averaged Vertical V Height (feet above ground Begin Merging (touch) = 153.8 160.0 280.0 24	JET elocities starti i above stack above stack 1 above stack 1 above stack 1 3.85 0 15.74 0 27.93 0 40.12 0 46.22 0 58.41 0 64.50 0 70.60 0 76.70 0 88.89 9 55.9 0 104.13 1 19.37 1 149.85	meters ng at Touch Plume Radius(m) 2.180 #W/A #W/A #W/A #W/A #W/A #W/A #W/A #W/A	JET JET ing Height: Vert. Vel(m/s) 5.20 5.13 4.94 4.74 4.54 4.35 3.76 3.36 3.36 3.36 3.36 3.37 2.97 2.97 2.97 2.56 2.52 2.47 2.37		$\begin{split} & Z_{crt} = Z_{bull} + \left\{ [n(V_{crt}^3)_{hull}/(V_{crt})^3]_{-am} \} (0.16 \text{ if } V_{crt} < V_m \\ & Z_{crt} = Z_{buuch} + (Z_{tull} - Z_{luoch})'(V_{crt} - V_{buuch})/(V_m - V_{bouch}) \text{ if } V_c \\ & Single Plume Eqns (see Single Plume spreadshed \\ & V_{\mu nm} = [(V_{ab})_a^3 + 0.12F_{cl} [(z.z{c})^2]_{cl}^{-2.25D \cdot z{c}}]_{cl}^{13/4} / a \\ & a = 0.16(2 \cdot z_{c}) \\ & \theta_{p} = \theta_{s}(1 + (1 - (\theta_{p}/\theta_{s}))^* (V_{ext} D^2/(4V_{plume}^* a^2 \cdot \lambda^2))) \\ & Interpolated Layer Eqns \end{split}$	ical VV < Top of Je nt>Vm 20 ft Intervals 50 ft Intervals
Height above Ground z _{ent} +h able of MERGED Plume-Averaged Vertical V Height (feet above ground Begin Merging (touch) = 153.8 160.0 220.0 200.0 220.0 200.0	JET elocities starti) (meters) above stack 13.85 15.74 027.93 027.93 034.02 040.12 040.12 046.22 05.31 05.440.12 046.22 05.841 064.50 070.60 076.70 082.79 088.99 0104.13 0141.33 0141.33 0141.35 0141.33 0141.33 0141.33 0141.33 0141.33 0141.33 0141.33 0141.33 0141.33 0141.33 0141.33	meters ng at Touch Plume Radius(m) 2.180 #N/A #N/A #N/A #N/A #N/A #N/A #N/A #N/A	JET JET ing Height: Vert. Vel(m/s) 5.20 5.13 4.94 4.74 4.54 4.35 4.15 3.96 3.766 3.366 3.36 3.36 3.36 3.37 2.97 2.77 2.56 2.52 2.47 2.37 2.28		$\begin{split} & Z_{crt} = Z_{bull} + \left\{ [n(V_{crt}^3)_{hull}/(V_{crt})^3]_{-am} \} (0.16 \text{ if } V_{crt} < V_m \\ & Z_{crt} = Z_{buuch} + (Z_{tull} - Z_{luoch})'(V_{crt} - V_{buuch})/(V_m - V_{bouch}) \text{ if } V_c \\ & Single Plume Eqns (see Single Plume spreadshed \\ & V_{\mu nm} = [(V_{ab})_a^3 + 0.12F_{cl} [(z.z{c})^2]_{cl}^{-2.25D \cdot z{c}}]_{cl}^{13/4} / a \\ & a = 0.16(2 \cdot z_{c}) \\ & \theta_{p} = \theta_{s}(1 + (1 - (\theta_{p}/\theta_{s}))^* (V_{ext} D^2/(4V_{plume}^* a^2 \cdot \lambda^2))) \\ & Interpolated Layer Eqns \end{split}$	ical VV < Top of Je nt>Vm 20 ft Intervals 50 ft Intervals
Height above Ground z _{ort} +h able of MERGED Plume-Averaged Vertical V Height (feet above ground Begin Merging (touch) = 153.8 160.0 220.0 200.	JET elocities starti i above stack 13.85 15.74 27.93 24.83 27.93 34.02 34.02 40.12 46.22 52.31 64.50 76.70 88.89 95.59 104.13 119.37 104.33 21.84.33	meters ng at Touch Plume Radius(m) 2.180 #N/A #N/A #N/A #N/A #N/A #N/A #N/A #N/A	JET JET ing Height: Vert. Vel(m/s) 5.20 5.13 4.94 4.74 4.54 4.35 6.3.56 3.56 3.56 3.36 3.36 3.36 3.36		$\begin{split} & Z_{crt} = Z_{bull} + \left\{ [n(V_{crt}^3)_{hull}/(V_{crt})^3]_{-am} \} (0.16 \text{ if } V_{crt} < V_m \\ & Z_{crt} = Z_{buuch} + (Z_{tull} - Z_{luoch})'(V_{crt} - V_{buuch})/(V_m - V_{bouch}) \text{ if } V_c \\ & Single Plume Eqns (see Single Plume spreadshed \\ & V_{\mu nm} = [(V_{ab})_a^3 + 0.12F_{cl} [(z.z{c})^2]_{cl}^{-2.25D \cdot z{c}}]_{cl}^{13/4} / a \\ & a = 0.16(2 \cdot z_{c}) \\ & \theta_{p} = \theta_{s}(1 + (1 - (\theta_{p}/\theta_{s}))^* (V_{ext} D^2/(4V_{plume}^* a^2 \cdot \lambda^2))) \\ & Interpolated Layer Eqns \end{split}$	ical VV < Top of Je nt>Vm 20 ft Intervals 50 ft Intervals
Height above Ground z _{ort} +h able of MERGED Plume-Averaged Vertical V Height (feet above ground Begin Merging (touch) = 153.8 160.0 200.0 220.0 200.0	JET elocities starti i (meters) above stack 13.85 15.74 21.83 221.83 221.83 231 24.83 252.31 246.22 252.31 264.50 270,03 265.97 270,03 265.99 270,03 270,03 285.99 201,041.33 214,033 214,033 214,033 2141,29	meters ng at Touch Plume Radius(m) 2.180 #N/A #N/A #N/A #N/A #N/A #N/A #N/A #N/A #N/A #N/A #N/A 33.776 35.143 37.581 42.458 47.355 52.212 57.088	JET JET Vert. Vel(m/s) 5.20 5.13 4.94 4.74 4.54 4.74 4.55 4.15 3.95 3.76 3.56 3.36 3.36 3.36 3.36 3.377 2.97 2.77 2.52 2.52 2.47 2.52 2.52 2.47 2.52 2.52 2.52 2.52 2.52 2.52 2.53 2.53		$\begin{split} & Z_{crit} = Z_{buil} + \left\{ [n(V^3_a)_{buil}/(V_{crit})^3] - a_m]/0.16 \text{ if } V_{crit} < V_m \\ & Z_{crit} = Z_{bouch} + (Z_{buil} - Z_{bouch})/(V_{crit} - V_{bouch})/(V_m - V_{bouch}) \text{ if } V_c \\ & Single Plume Eqns (see Single Plume spreadsher \\ & V_{\mu m} = (V_{bh})^a \cdot 0.12F_{2}(z_{2,v})^2 \cdot (6.25D \cdot z_{v})^2)^{1/3} / a \\ & a = 0.16(z \cdot z_{v}) \\ & \theta_{p} = \theta_{v}(1 + (1 - (\theta_{p})\theta_{p}))^v (V_{erit}D^2/(4V_{plume} \cdot a^{2*}\lambda^2))) \\ & Interpolated Layer Eqns \\ & V^{-} = V_{bouch} + (V_m \cdot V_{bouch})^v (z' - Z_{bouch})/(Z_{bil} - Z_{bouch}) \end{split}$	ical VV < Top of Jo _{rit} >V _m 20 ft Intervals 50 ft Intervals
Height above Ground z _{ent} +h able of MERGED Plume-Averaged Vertical V Height (feet above ground Begin Merging (touch) = 153.6 160.0 200.0 220.0 240.0 220.0 240.0 280.0 300.0 280.0 300.0 300.0 300.0 280.0 300.0 300.0 300.0 280.0 300.0 280.0 300.0 300.0 300.0 280.0 300.0	JET elocities starti) (meters) d above stack 13.85 14.21.83 27.93 21.83 21.83 21.83 22.93 34.02 34.02 34.02 34.02 34.02 34.02 34.02 34.02 34.02 34.02 34.02 34.02 34.02 34.02 34.02 34.02 34.02 34.02 35.841 35.841 36.859 37.198 38.89 31.198.55 31.198.55 31.180.33 32.1081 31.218.33 32.210.81 32.210.81 32.210.81 32.210.81 32.210.81 32.210.81 32.210.81 32.210.81	meters ng at Touch Plume Radius(m) 2.180 #N/A #N/A #N/A #N/A #N/A #N/A #N/A #N/A	JET JET vert. Vel(m/s) 5.20 5.13 4.94 4.74 4.54 4.35 3.76 3.36 3.36 3.36 3.37 2.97 2.77 2.56 2.52 2.47 2.37 2.28 2.21 2.28 2.21 2.21 5.20		$\begin{split} & Z_{crit} = Z_{buil} + \left\{ [n(V_{a}^{3})_{buil}/(V_{crit}^{3})^{2}]_{-an_{i}}/0.16 \text{ if } V_{crit}$	ical VV < Top of Jo _{rit} >V _m 20 ft Intervals 50 ft Intervals
Height above Ground z _{ent} +h able of MERGED Plume-Averaged Vertical V Height (feet above ground Begin Merging (touch) = 153.8 160.0 220.0 200.	JET elocities starti (meters) above stack 13.85 15.74 27.93 241.83 27.93 34.02 40.12 46.22 52.31 56.41 64.50 70.60 76.70 88.89 95.59 149.35 149.35 149.35 210.81 2210.81 241.29 241.29 241.77 271.77	meters ng at Touch Plume Radius(m) 2.180 #N/A #N/A #N/A #N/A #N/A #N/A #N/A #N/A	JET JET Vert. Vel(m/s) 5.20 5.13 4.94 4.74 4.54 4.55 3.95 3.76 3.36 3.36 3.36 3.36 3.36 2.52 2.77 2.56 2.52 2.47 2.77 2.56 2.52 2.47 2.37 2.28 2.21 2.37 2.28 2.21 2.15 2.09 2.09		$\begin{split} & Z_{crit} = Z_{buil} + \left\{ [n(V_{a}^{3})_{buil}/(V_{crit}^{3})_{l-an}]/0.16 \text{ if } V_{crit} < V_{m} \\ & Z_{crit} = Z_{bouch} + (Z_{buil} - Z_{bouch})/(V_{crit} - V_{bouch})/(V_{m} - V_{bouch}) \text{ if } V_{crit} \\ & Single Plume Eqns (see Single Plume spreadsher) \\ & V_{pham} = (V_{abil}^{3} - 0.16 (z-z_{cr}) \\ & \theta_{p} = \theta_{a}(1+(1-(\theta_{p}/\theta_{a})))'(V_{exil}D^{2}/(4V_{plume} *a^{2} + \lambda^{2}))) \\ & Interpolated Layer Eqns \\ & V = V_{bouch} + (V_{m} - V_{bouch})'(Z^{2} - Z_{bouch})/(Z_{buil} - Z_{bouch}) \\ \end{split}$	ical VV < Top of Jo _{rit} >V _m 20 ft Intervals 50 ft Intervals
Height above Ground z _{ort} +h Table of MERGED Plume-Averaged Vertical V Height (feet above ground Begin Merging (touch) = 153.8 160.0 200.0 220.0 240	JET elocities starti i daove stack 13.85 15.74 27.93 24.83 27.93 24.02 46.22 46.22 56.41 64.50 76.70 88.89 93.559 104.133 119.37 149.85 149.85 210.81 2210.81 241.29 241.29 241.29 241.29 221.77 221.77	meters ng at Touch Plume Radius(m) 2.180 #N/A #N/A #N/A #N/A #N/A #N/A #N/A #N/A	JET JET ing Height: Vert. Vel(m/s) 5.20 5.13 4.94 4.74 4.54 4.35 6.3.56 3.366 3.366 3.366 3.366 3.366 3.366 2.52 2.47 2.37 2.37 2.277 2.277 2.56 2.52 2.47 2.37 2.37 2.28 2.28 2.21 2.15 2.09 2.09 2.04		$\begin{split} & Z_{crit} = Z_{buil} + \left\{ [n(V_{a}^{3})_{buil}/(V_{crit}^{3})^{2}]_{-an_{i}}/0.16 \text{ if } V_{crit}$	ical VV < Top of Je _{rit} >V _m eet) 20 ft Intervals
Height above Ground z _{ort} +h Table of MERGED Plume-Averaged Vertical V Height (feet above ground Begin Merging (touch) = 153.8 160.0 200.0 220.0 200	JET elocities starti) (meters) above stack 13.85 15.74 21.83 221.83 221.83 231 24.83 25.211 246.22 252.31 2645.22 2652.31 276.70 270 265.99 201413 21.83 21.83 22.25 252.31 265.99 201413 21.93 21.94 21.94 21.97 21.97 21.97 21.97 22.1177 22.271.77 23.222.25 22.42.417	meters ng at Touch Plume Radius(m) 2.180 #N/A #N/A #N/A #N/A #N/A #N/A #N/A #N/A #N/A #N/A #N/A 33.776 35.143 37.581 42.458 47.35 52.212 57.088 61.965 81.9555 81.9555 81.9555 81.95555 81.9555 81.95555 81.9555	JET JET vert. Vel(m/s) 5.20 5.13 4.94 4.74 4.54 4.35 4.15 3.95 3.76 3.56 3.36 3.36 3.37 2.97 2.77 2.56 2.52 2.52 2.52 2.47 2.37 2.28 2.21 2.21 2.29 2.29 2.29 2.29 2.29 2.21 2.15 2.09 2.09 2.09		$\begin{split} & Z_{crit} = Z_{buil} + \left\{ [n(V_{a}^{3})_{buil}/(V_{crit}^{3})_{l-an}]/0.16 \text{ if } V_{crit} < V_{m} \\ & Z_{crit} = Z_{bouch} + (Z_{buil} - Z_{bouch})/(V_{crit} - V_{bouch})/(V_{m} - V_{bouch}) \text{ if } V_{crit} \\ & Single Plume Eqns (see Single Plume spreadsher) \\ & V_{pham} = (V_{abil}^{3} - 0.16 (z-z_{cr}) \\ & \theta_{p} = \theta_{a}(1+(1-(\theta_{p}/\theta_{a})))'(V_{exil}D^{2}/(4V_{plume} *a^{2} + \lambda^{2}))) \\ & Interpolated Layer Eqns \\ & V = V_{bouch} + (V_{m} - V_{bouch})'(Z^{2} - Z_{bouch})/(Z_{buil} - Z_{bouch}) \\ \end{split}$	ical VV < Top of Je nt>Vm 20 ft Intervals 50 ft Intervals
Height above Ground z _{ent} +h able of MERGED Plume-Averaged Vertical V Height (feet above ground Begin Merging (touch) = 153.6 160.0 220.0 220.0 240.0 220.0 240.0 220.0 240.0 220.0 240.0 200.0	JET elocities starti) (meters) d above stack 13.85 14.21.83 27.93 21.83 21.83 21.83 22.93 34.02 34.02 34.02 34.02 34.02 34.02 34.02 34.02 34.02 34.02 34.02 34.02 34.02 34.02 34.02 34.02 34.02 34.02 358.41 368.89 37.08 38.89 301413 3149.55 3140.33 321.21.11 321.21.11 321.21.11 321.22.11.11 321.22.11.11 321.22.11.11 321.22.11.11 321.22.11.11 321.22.11.11 321.22.11.11 <t< td=""><td>meters ng at Touch Plume Radius(m) 2.180 #N/A #N/A #N/A #N/A #N/A #N/A #N/A #N/A</td><td>JET JET vert. Vel(m/s) 5.20 5.13 4.94 4.74 4.54 4.35 3.76 3.36 3.36 3.36 3.37 2.97 2.77 2.56 2.52 2.47 2.28 2.21 2.21 2.21 2.20 2.09 2.09 2.04 1.87 1.72</td><td></td><td>$\begin{split} & Z_{crit} = Z_{buil} + \left\{ [n(V_{a}^{3})_{buil}/(V_{crit}^{3})_{l-an}]/0.16 \text{ if } V_{crit} < V_{m} \\ & Z_{crit} = Z_{bouch} + (Z_{buil} - Z_{bouch})/(V_{crit} - V_{bouch})/(V_{m} - V_{bouch}) \text{ if } V_{crit} \\ & Single Plume Eqns (see Single Plume spreadsher) \\ & V_{pham} = (V_{abil}^{3} - 0.16 (z-z_{cr}) \\ & \theta_{p} = \theta_{a}(1+(1-(\theta_{p}/\theta_{a})))'(V_{exil}D^{2}/(4V_{plume} *a^{2} + \lambda^{2}))) \\ & Interpolated Layer Eqns \\ & V = V_{bouch} + (V_{m} - V_{bouch})'(Z^{2} - Z_{bouch})/(Z_{buil} - Z_{bouch}) \\ \end{split}$</td><td>ical VV < Top of Je rit>Vm 20 ft Intervals 50 ft Intervals 100 ft Intervals</td></t<>	meters ng at Touch Plume Radius(m) 2.180 #N/A #N/A #N/A #N/A #N/A #N/A #N/A #N/A	JET JET vert. Vel(m/s) 5.20 5.13 4.94 4.74 4.54 4.35 3.76 3.36 3.36 3.36 3.37 2.97 2.77 2.56 2.52 2.47 2.28 2.21 2.21 2.21 2.20 2.09 2.09 2.04 1.87 1.72		$\begin{split} & Z_{crit} = Z_{buil} + \left\{ [n(V_{a}^{3})_{buil}/(V_{crit}^{3})_{l-an}]/0.16 \text{ if } V_{crit} < V_{m} \\ & Z_{crit} = Z_{bouch} + (Z_{buil} - Z_{bouch})/(V_{crit} - V_{bouch})/(V_{m} - V_{bouch}) \text{ if } V_{crit} \\ & Single Plume Eqns (see Single Plume spreadsher) \\ & V_{pham} = (V_{abil}^{3} - 0.16 (z-z_{cr}) \\ & \theta_{p} = \theta_{a}(1+(1-(\theta_{p}/\theta_{a})))'(V_{exil}D^{2}/(4V_{plume} *a^{2} + \lambda^{2}))) \\ & Interpolated Layer Eqns \\ & V = V_{bouch} + (V_{m} - V_{bouch})'(Z^{2} - Z_{bouch})/(Z_{buil} - Z_{bouch}) \\ \end{split}$	ical VV < Top of Je rit>Vm 20 ft Intervals 50 ft Intervals 100 ft Intervals
Height above Ground z _{ort} +h able of MERGED Plume-Averaged Vertical V Height (feet above ground Begin Merging (touch) = 153.8 160.0 220.0 200.	JET elocities starti (meters) above stack 13.85 14.385 15.74 27.93 27.93 24.22 46.22 56.41 664.50 76.60 76.70 76.81 9.35.59 140.12 9.46.22 76.70 9.46.23 140.62 140.13 140.413 149.55 140.33 210.81 2210.81 2210.81 2210.81 2210.81 2210.81 2210.81 2210.81 2210.81 2210.81 2210.81 2210.81 2210.81 2210.81 2210.81 2210.81 2210.81 2210.81 230.225 241.29 2424.17 <td>meters ng at Touch Plume Radius(m) 2.180 #N/A #N/A #N/A #N/A #N/A #N/A #N/A #N/A</td> <td>JET JET Vert. Vel(m/s) 5.20 5.13 4.94 4.74 4.54 4.35 3.95 3.76 3.36 3.36 3.36 3.36 3.36 3.36 2.52 2.47 2.77 2.56 2.52 2.47 2.77 2.56 2.52 2.47 2.77 2.56 2.52 2.47 2.77 2.56 2.52 2.41 2.15 2.15 2.15 3.76 3.76 3.76 3.76 3.76 3.76 3.76 3.76</td> <td></td> <td>$\begin{split} & Z_{crit} = Z_{buil} + \left\{ [n(V_{a}^{3})_{buil}/(V_{crit}^{3})_{l-an}]/0.16 \text{ if } V_{crit} < V_{m} \\ & Z_{crit} = Z_{bouch} + (Z_{buil} - Z_{bouch})/(V_{crit} - V_{bouch})/(V_{m} - V_{bouch}) \text{ if } V_{crit} \\ & Single Plume Eqns (see Single Plume spreadsher) \\ & V_{pham} = (V_{abil}^{3} - 0.16 (z-z_{cr}) \\ & \theta_{p} = \theta_{a}(1+(1-(\theta_{p}/\theta_{a})))'(V_{exil}D^{2}/(4V_{plume} *a^{2} + \lambda^{2}))) \\ & Interpolated Layer Eqns \\ & V = V_{bouch} + (V_{m} - V_{bouch})'(Z^{2} - Z_{bouch})/(Z_{buil} - Z_{bouch}) \\ \end{split}$</td> <td>ical VV < Top of Je rit>Vm 20 ft Intervals 50 ft Intervals 100 ft Intervals</td>	meters ng at Touch Plume Radius(m) 2.180 #N/A #N/A #N/A #N/A #N/A #N/A #N/A #N/A	JET JET Vert. Vel(m/s) 5.20 5.13 4.94 4.74 4.54 4.35 3.95 3.76 3.36 3.36 3.36 3.36 3.36 3.36 2.52 2.47 2.77 2.56 2.52 2.47 2.77 2.56 2.52 2.47 2.77 2.56 2.52 2.47 2.77 2.56 2.52 2.41 2.15 2.15 2.15 3.76 3.76 3.76 3.76 3.76 3.76 3.76 3.76		$\begin{split} & Z_{crit} = Z_{buil} + \left\{ [n(V_{a}^{3})_{buil}/(V_{crit}^{3})_{l-an}]/0.16 \text{ if } V_{crit} < V_{m} \\ & Z_{crit} = Z_{bouch} + (Z_{buil} - Z_{bouch})/(V_{crit} - V_{bouch})/(V_{m} - V_{bouch}) \text{ if } V_{crit} \\ & Single Plume Eqns (see Single Plume spreadsher) \\ & V_{pham} = (V_{abil}^{3} - 0.16 (z-z_{cr}) \\ & \theta_{p} = \theta_{a}(1+(1-(\theta_{p}/\theta_{a})))'(V_{exil}D^{2}/(4V_{plume} *a^{2} + \lambda^{2}))) \\ & Interpolated Layer Eqns \\ & V = V_{bouch} + (V_{m} - V_{bouch})'(Z^{2} - Z_{bouch})/(Z_{buil} - Z_{bouch}) \\ \end{split}$	ical VV < Top of Je rit>Vm 20 ft Intervals 50 ft Intervals 100 ft Intervals
Height above Ground z _{ort} +h Table of MERGED Plume-Averaged Vertical V Height (feet above ground Begin Merging (touch) = 153.8 160.0 220.0 200	JET elocities starti i daove stack 13.85 15.74 27.93 24.83 27.93 24.02 440.12 440.12 46.22 52.31 64.50 76.70 76.70 88.89 95.59 144.83 149.85 149.85 210.81 2210.81 221.77 221.77 221.77 302.25 424.129 221.77 302.25 424.17 302.25 424.17 302.25 424.17 376.57 72.877 376.57	meters ng at Touch Plume Radius(m) 2.180 #N/A #N/A #N/A #N/A #N/A #N/A #N/A #N/A	JET JET ing Height: Vert. Vel(m/s) 5.20 5.13 4.94 4.74 4.54 4.35 3.95 3.76 3.56 3.36 3.36 3.36 3.36 3.36 3.36 2.52 2.47 2.57 2.57 2.52 2.47 2.37 2.28 2.21 2.15 2.09 2.04 1.87 1.72 2.09 2.04 1.87 1.72		$\begin{split} & Z_{crit} = Z_{buil} + \left\{ [n(V_{a}^{3})_{buil}/(V_{crit}^{3})_{l-an}]/0.16 \text{ if } V_{crit} < V_{m} \\ & Z_{crit} = Z_{bouch} + (Z_{buil} - Z_{bouch})/(V_{crit} - V_{bouch})/(V_{m} - V_{bouch}) \text{ if } V_{crit} \\ & Single Plume Eqns (see Single Plume spreadsher) \\ & V_{pham} = (V_{abil}^{3} - 0.16 (z-z_{cr}) \\ & \theta_{p} = \theta_{a}(1+(1-(\theta_{p}/\theta_{a})))'(V_{exil}D^{2}/(4V_{plume} *a^{2} + \lambda^{2}))) \\ & Interpolated Layer Eqns \\ & V = V_{bouch} + (V_{m} - V_{bouch})'(Z^{2} - Z_{bouch})/(Z_{buil} - Z_{bouch}) \\ \end{split}$	ical VV < Top of Je nt>Vm 20 ft Intervals 50 ft Intervals
Height above Ground z _{ort} +h able of MERGED Plume-Averaged Vertical V Height (feet above ground Begin Merging (touch) = 153.8 160.0 200.0 220.0 200.	JET elocities starti) (meters) above stack 13.85 015.74 021.83 021.81 021.81 021.81 021.81 021.81 021.81 021.81 021.81	meters ng at Touch Plume Radius(m) 2.180 #N/A #N/A #N/A #N/A #N/A #N/A #N/A #N/A #N/A #N/A #N/A #N/A 33.776 35.143 37.581 42.458 47.335 52.212 57.088 61.965 62.212 57.088 61.965 66.842 86.349 110.733 135.117 159.501 183.885	JET JET Vert. Vel(m/s) 5.20 5.13 4.94 4.74 4.54 4.35 4.15 3.95 3.76 3.36 3.36 3.36 3.36 3.36 3.37 2.97 2.77 2.56 2.52 2.47 2.37 2.56 2.52 2.47 2.37 2.28 2.21 2.21 2.29 2.09 2.09 2.09 2.09 2.09 2.09 2.09		$\begin{split} & Z_{crit} = Z_{buil} + \left\{ [n(V_{a}^{3})_{buil}/(V_{crit}^{3})_{l-an}]/0.16 \text{ if } V_{crit} < V_{m} \\ & Z_{crit} = Z_{bouch} + (Z_{buil} - Z_{bouch})/(V_{crit} - V_{bouch})/(V_{m} - V_{bouch}) \text{ if } V_{crit} \\ & Single Plume Eqns (see Single Plume spreadsher) \\ & V_{pham} = (V_{abil}^{3} - 0.16 (z-z_{cr}) \\ & \theta_{p} = \theta_{a}(1+(1-(\theta_{p}/\theta_{a})))'(V_{exil}D^{2}/(4V_{plume} *a^{2} + \lambda^{2}))) \\ & Interpolated Layer Eqns \\ & V = V_{bouch} + (V_{m} - V_{bouch})'(Z^{2} - Z_{bouch})/(Z_{buil} - Z_{bouch}) \\ \end{split}$	ical VV < Top of Je rit>Vm 20 ft Intervals 50 ft Intervals 100 ft Intervals
Height above Ground z _{unt} +h Table of MERGED Plume-Averaged Vertical V Height (feet above ground Begin Merging (touch) = 153.8 160.0 220.0 20.	JET elocities starti (meters) above stack 13.85 14.385 27.93 21.83 21.83 227.93 24.02 40.12 40.12 40.12 58.41 64.50 70.60 70.60 70.60 82.79 88.89 95.59 148.55 148.55 210.81 149.37 241.29 271.77 302.25 4241.29 271.77 302.25 424.17 576.57 728.97 881.37 81.37 1033.77 1033.77 1033.77 1033.77	meters ng at Touch Plume Radius(m) 2.180 #N/A #N	JET JET Vert. Vel(m/s) 5.20 5.13 4.94 4.74 4.54 4.35 3.76 3.36 3.36 3.36 3.36 3.36 3.37 2.97 2.77 2.56 2.52 2.47 2.77 2.28 2.21 2.15 2.29 2.09 2.09 2.04 1.87 1.72 1.61 1.52 2.59 2.09 2.04 1.87 1.72 1.61 1.52 2.61 2.13		$\begin{split} & Z_{crit} = Z_{buil} + \left\{ [n(V_{a}^{3})_{buil}/(V_{crit}^{3})_{l-an}]/0.16 \text{ if } V_{crit} < V_{m} \\ & Z_{crit} = Z_{bouch} + (Z_{buil} - Z_{bouch})/(V_{crit} - V_{bouch})/(V_{m} - V_{bouch}) \text{ if } V_{crit} \\ & Single Plume Eqns (see Single Plume spreadsher) \\ & V_{pham} = (V_{abil}^{3} - 0.16 (z-z_{cr}) \\ & \theta_{p} = \theta_{a}(1+(1-(\theta_{p}/\theta_{a})))'(V_{exil}D^{2}/(4V_{plume} *a^{2} + \lambda^{2}))) \\ & Interpolated Layer Eqns \\ & V = V_{bouch} + (V_{m} - V_{bouch})'(Z^{2} - Z_{bouch})/(Z_{buil} - Z_{bouch}) \\ \end{split}$	ical VV < Top of Je rit>Vm 20 ft Intervals 50 ft Intervals 100 ft Intervals
Height above Ground z _{unt} +h Table of MERGED Plume-Averaged Vertical V Height (feet above ground Begin Merging (touch) = 153.8 160.0 220.0 200	JET elocities starti i daove stack 13.85 015.74 027.93	meters ng at Touch Plume Radius(m) 2.180 #N/A #N/A #N/A #N/A #N/A #N/A #N/A #N/A #N/A #N/A #N/A #N/A 33.776 35.143 37.581 42.458 47.335 52.212 57.088 61.965 62.212 57.088 61.965 66.842 86.349 110.733 135.117 159.501 183.885	JET JET Vert. Vel(m/s) 5.20 5.13 4.94 4.74 4.54 4.35 4.15 3.95 3.76 3.36 3.36 3.36 3.36 3.36 3.37 2.97 2.77 2.56 2.52 2.47 2.37 2.56 2.52 2.47 2.37 2.28 2.21 2.21 2.29 2.09 2.09 2.09 2.09 2.09 2.09 2.09		$\begin{split} & Z_{crit} = Z_{buil} + \left\{ [n(V_{a}^{3})_{buil}/(V_{crit}^{3})_{l-an}]/0.16 \text{ if } V_{crit} < V_{m} \\ & Z_{crit} = Z_{bouch} + (Z_{buil} - Z_{bouch})/(V_{crit} - V_{bouch})/(V_{m} - V_{bouch}) \text{ if } V_{crit} \\ & Single Plume Eqns (see Single Plume spreadsher) \\ & V_{pham} = (V_{abil}^{3} - 0.16 (z-z_{cr}) \\ & \theta_{p} = \theta_{a}(1+(1-(\theta_{p}/\theta_{a})))'(V_{exil}D^{2}/(4V_{plume} *a^{2} + \lambda^{2}))) \\ & Interpolated Layer Eqns \\ & V = V_{bouch} + (V_{m} - V_{bouch})'(Z^{2} - Z_{bouch})/(Z_{buil} - Z_{bouch}) \\ \end{split}$	ical VV < Top of Je rit>Vm 20 ft Intervals 50 ft Intervals 100 ft Intervals

MERGED (along length) Plume Average Vertical Velocities for SVY03AChillers using CEC Staff Methodology - Winter Min*

3.75 m⁴/s³

N/A m⁴/s³

2.80 meters

24

12

Ambient Conditions:

Plume Exit Conditions:

Stack Potential Temp θ_e

Plume Buoyancy Flux F

Total Number of Stacks n

Initial Stack Buoyancy Flux Fo

Average Adjacent Stack Separation d

Number of Stacks along Orientation N

Begin Merging Plume Top-Hat Diameter 2acurb

"Aviation Safety and Buoyant Plumes," Peter Best, et. al.

"The Evaluation of Maximum Updraft Speeds for Calm Conditions at Various Heights in the Merged Plume from Two Gas-Turbine Power Station at Oakey, Queensland, Australia," Dr. K.T. Spillane **Constants:** Assume neutral conditions (d θ /dz=0 or $\theta_a = \theta_e$) Ambient Potential Temp θ₋ 278.15 Kelvins 41.0 °F 0.3048 meters/feet 9.81 m/s² Gravity g 108 4/12 feet-inches Stack Height hs 33.03 meters λ 1.11 Individual Stack Diameter D 1.73736 meters 68.4 inches λ. ~1.0 Stack Velocity V_{exit} 13 20 m/s 43.30 ft/sec 4Vol/(60πD²) 66.300 ACEM Sect 2/¶1 Individual Volumetric Flow 31.29 cu.m/sec $\pi V_{exit}D^2/4$ 289 26 Kelvins

61.0 °E 20.0 ∆T(°F) $gV_{exit}D^2(1-\theta_a/\theta_s)/4 = Vol.Flow(g/\pi)(1-\theta_a/\theta_s)$ Sect 2/¶1 $\lambda^2 g V a^2 (1 - \theta_a / \theta_p)$ for a, V, θ_p at plume height (see below)

2atouch=d. (or atouch=d/2)

Calcs based on multiple plume treatment in Peter Best Paper: plume velocities increased by N^{0.25} at the height where plumes fully merged (interp. below ht, single merged stack above ht)

			fully merged (interp. below itt, single merged stack a	bove my
Conditions at End (Top) of Jet Phase:				
Height above Stack z _{jet}	10.859 meters*	35.6 feet*	z _{jet} = 6.25D, meters*=meters above stack top	Sect.3/¶1
Height above Ground z _{jet} +h _s	43.890 meters	144.0 feet		
Vertical Velocity V _{jet}	6.599 m/s	21.65 ft/sec	V _{jet} = 0.5V _{exit} = V _{exit} /2	
Plume Top-Hat Diameter 2a _{iet}	3.475 meters	11.4 feet	2a _{jet} = 2D Conservation of momentum	ı "

9.2 feet

Spillane Methodology - Analytical Solutions for Calm Conditions for Plume Heights above Jet and Merging Phases

2.800 meters

15.74

21.83

27.93

34.02

40 12

46.22

52.31

58.41

64.50

70.60

76.70

82 79

96.45

119.37

149.85

180.33

210.81

241.29

271.77

302.25

332.73

363.21

424.17

576.57

728.97

881.37

1033.77

1186.17

1338.57

#N/A

34.086

37.751

42.628

47.505

52,382

57.258

62,135

67.012

71.889

76.766

86.519

110.903

135.287

159.671

184.055

208.439

232,823

160.0

180.0

200.0

220.0

240.0

260.0

280.0

300.0

320.0

340.0

360.0

380.0

500.0

600.0

700.0

800.0

900.0

1000.0

1100.0

1200.0

1300.0

1500.0

2000.0

2500.0

3000.0

3500.0

4000.0

4500.0

End Merging (full/mp) = 424.8

Single Plume-averaged Vertical Velocity V given by Analytical Solution in Paper where Product Va given by equations below:

Single Plume Values: Plu	me Top-Hat Radius a	Used in Plume M	lerging Only	a = 0.16(z-z _v), or linear increase with height	Sect.2/Eq.6
Vi	tual Source Height z _v	0.211 meters*	0.7 feet*	$z_v = 6.25D[1-(\theta_e/\theta_s)^{1/2}]$, meters*=meters above stack top	Sect.2/Eq.6
Heigh	t above Ground z _v +h _s	33.242 meters	109.1 feet	where $(\theta_a/\theta_s)^{1/2} = (\theta_e/\theta_s)^{1/2}$	^{//2} = 0.9806
Single Plume Values:	Vertical Velocity V	Used in Plume M	lerging Only	$\{(Va)_{o}^{3} + 0.12F_{o}[(z-z_{v})^{2} - (6.25D-z_{v})^{2}]\}^{(1/3)} / a$	Sect.2.1(6)
	Product (Va) _o	11.243 m ² /s		$V_{exit}(D/2)(\theta_e/\theta_s)^{1/2}$	
Plume Merging - Based on	Single Plume Calculatio	ons where:			Sect.3/¶3

9.2 feet

begin werging Plume Top-Hat Diameter Zatouch	2.600 meters	9.2 1001	2a _{touch} =d, (of a _{touch} =d/2)
Height above Stack z _{touch}	8.961 meters*	29.4 feet*	$z_{touch} = z_v + d/(2^*0.16)$, meters*=meters above stack top
Height above Ground ztouch+hs	41.992 meters	137.8 feet	
Vertical Velocity V _{touch}	7.999 m/s	26.2 ft/sec	$V_{\text{touch}} = \{(Va)_0^3 + 0.12F_0 [(z-z_v)^2 - (6.25D-z_v)^2]\}^{(1/3)} / a$
Total Merging Plume Top-Hat Diameter 2a _{full}	30.800 meters	101.0 feet	2a _{full} =2d(N-1)/2, (or a _{full} =d(N-1)/2) FOR 2 STACKS, 2a _{full} =2d
Height above Stack z _{full}	96.461 meters*	316.5 feet*	z _{full} = z _v +2d/(2*0.16), meters*=meters above stack top
Height above Ground z _{full} +h _s	129.492 meters	424.8 feet	
Vertical Velocity V _{full}	1.149 m/s	3.8 ft/sec	$V_{full} = {(Va)_o^3 + 0.12F_o [(z_{full}-z_v)^2 - (6.25D-z_v)^2]}^{(1/3)} / a_{full}$
Product (V ³ a) _{full}	23 m ⁴ /s ³		
Conditions at End (Top) of Merging Phase - Defi	ine new values for V_{full} a	nd a _{full} in Merged Plume cal	culations (based on TOTAL number of stacks):
Merged Plume Values: Plume Diameter 2a	Solutions	in Table Below	2a = 2 x (a _m + 0.16(z-z _{full})), or linear increase with height
Revised Merged Plume Radius am	34.086 meters	111.8 feet	where a _m = n ^{0.25} a _{full} where Total Merging Occurs
Revised Merged Plume Velocity V _m	2.544 m/s	8.34 ft/sec	and V _m = n ^{0.25} V _{full} where Total Merging Occurs
Revised Virtual Source Height z _{full}	96.461 meters*	316.5 feet*	Height above stack where Total Merging Occurs (shown above)
Revised Vertical Velocity V	Solutions i	in Tables Below	V={n(V ³ a) _{full} /a) ^{1/3} for heights above total merging elevation
			V=V _{touch} +(V _m -V _{touch})*(z-z _{touch})/(z _{full} -z _{touch})
Multiple Plume Calculations			for heights below total merging elevation
Solve for plume-averaged vertical velo	city at height 1,000	.0 feet 304	.8 meters above ground (z+h _s)
Gives the following Height above Stack z	271.769 meters*	891.6 feet*	REGULAR EQNS
Plume Top-Hat Radius a	62.135 meters	203.9 feet	a=a _m +0.16(z-z _{full}) if z>z_{full}
Vertical Velocity V	2.082 m/s	6.83 ft/sec	V={n(V ³ a) _{full} /a} ^{1/3} if z>z _{full}
			$V'=V_{touch}+(V_m-V_{touch})^*(z'-z_{touch})/(z_{full}-z_{touch}) \text{ if } z_{touch} < \!\!\! z < \!\!\! z_{full}$
			V'=single plume values if z <z<sub>touch</z<sub>
Solve for Height of CASC critical vertical	l velocity V _{crit} 5.3	80 m/s	LESS THAN TOP OF MERGING PHASE-INTERPOL
Find Height above Stack z _{crit}	52.252 meters	171.4 feet	z _{crit} = z _{full} + {[n(V ³ a) _{full} /(V _{crit}) ³]-a _m }/0.16 if V _{crit} <v<sub>m</v<sub>
Height above Ground z _{crit} +h _s	85.284 meters	279.8 feet	$z_{crit}=z_{touch}+(z_{full}-z_{touch})^{*}(V_{crit}-V_{touch})/(V_{m}-V_{touch}) \text{ if } V_{crit} > V_{m}$
Table of MERGED Plume-Averaged Vertical Velo	ocities starting at Touc	hing Height:	Single Plume Eqns (see Single Plume spreadsheet)
Height (feet)	(meters) Plum	e Vert.	$V_{plume} = \{ (Va)_o^3 + 0.12F_o[(z-z_v)^2 - (6.25D-z_v)^2] \}^{1/3} / a$
above ground	above stack Radius(n	n) Vel(m/s)	$a = 0.16(z-z_v)$
Begin Merging (touch) = 137.8	8.97 1.40	0 8.00	$\theta_p = \theta_s (1 + (1 - (\theta_e/\theta_s))^* (V_{exit} D^2 / (4 V_{plume}^* a^{2*} \lambda^2)))$
140.0	9.64 #N/	A 7.96	Interpolated Layer Eqns 20 ft Intervals

7.58

7.20

6.82

6.44

6.06

5.68

5.30

4.92

4.54

4.16

3.78

3 40

2.54

2.46

2.36

2.28

2.20

2.14

2.08

2.03

1.98

1.94

1.86

1.72

1.61

1.52

1.45

1.39

1.34

ted Laver Eans $V'=V_{touch}+(V_m-V_{touch})^*(z'-z_{touch})/(z_{full}-z_{touch})$

Merged Plume Eqns $V{=}\{n(V^{3}a)_{full}/a\}^{1/3}$ a=a_m+0.16(z-z_{full})

20 ft Intervals

100 ft Intervals

500 ft Intervals

Ambient Potential Temp θ _a 302.21 Kelvins 84.3 °F 0. Plume Exit Conditions: Gravity g Stack Height h _a 10.83 meters 35 6/12 feet-inches λ Individual Chiller Stack Diameter D 2.0404 meters 80.3 inches λ_{o} Stack Velocity V _{ext} 9.96 m/s 32.67 ft/sec 4Vol/(60mD ²) Individual Chiller Volumetric Flow 32.56 cu.m/sec 69,000 ACFM $m_{exgD}^2/4$ Stack Potential Temp θ _a 322.21 Kelvins 120.3 °F initial Stack Diavancy Flux F N/A m ⁴ /s ³ 36.0 $\Delta T(^{+}F)$ $gV_{exgD}^2(1-9_g/\theta_b) fo$ Number of Chillers n 9 1.732 Multiple Stack Mu Conditions at End (Top) of Jet Phase: 77.4 feet 1.732 Multiple Stack Mu Vertical Velocity V _{fet} 4.980 m/s 16.34 ft/sec V _{fet} = 0.5V _{ext} = V _a Plume Top-Hat Diameter 2a _{jet} 4.081 meters 13.4 feet 2a _{jet} = 2D Spillane Methodology - Analytical Solutions for Calm Conditions for Plume Heights above Jet Phase Single Plume-averaged Vertical Velocity V Solutions in Table Below 0.16(z-z_i), or lineat Virtual Source Height za 0.402 meters* 13.5 feft 6.25D[1-(-0/g,0] ^{1/2}] <th>sland, Australia, "Dr. K.T. Spillane Ime neutral conditions (d0/dz=0 or $\theta_a = \theta_e$) .3048 meters/feet 9.81 m/s² 1.11 ~1.0 Sect.2/¶1 4 = Vol.Flow(g/m)(1-θ_a/θ_e) Sect.2/¶1 4 = Vol.Flow(g/m)(1-θ_a/θ_e) Sect.2/¶1 to ra,V,θ_e at plume height (see below) lutiplication Factor (n^{0.25}) ers*=meters above stack top Sect.3/¶1 " "evel/2 " Conservation of momentum " quations below: par increase with height Sect.2/Eq.6 where (θ_a/θ_e)^{1/2} = (θ_a/θ_e)^{1/2} = 0.9685 [(z-z_v)² - (6.25D-z_v)²])^(1/3)/a Sect.2.1(6) ound (z'+h_e)</th>	sland, Australia, "Dr. K.T. Spillane Ime neutral conditions (d0/dz=0 or $\theta_a = \theta_e$) .3048 meters/feet 9.81 m/s ² 1.11 ~1.0 Sect.2/¶1 4 = Vol.Flow(g/m)(1- θ_a/θ_e) Sect.2/¶1 4 = Vol.Flow(g/m)(1- θ_a/θ_e) Sect.2/¶1 to ra,V, θ_e at plume height (see below) lutiplication Factor (n ^{0.25}) ers*=meters above stack top Sect.3/¶1 " "evel/2 " Conservation of momentum " quations below: par increase with height Sect.2/Eq.6 where (θ_a/θ_e) ^{1/2} = (θ_a/θ_e) ^{1/2} = 0.9685 [(z-z _v) ² - (6.25D-z _v) ²]) ^(1/3) /a Sect.2.1(6) ound (z'+h _e)
In the conditions:Constants: Assumption of the condition o	Imme neutral conditions (d0/dz=0 or $\theta_a=\theta_a$)).3048 meters/feet 9.81 m/s ² 1.11 ~1.0 Sect.2/¶1 4 = Vol.Flow(g/m)(1- θ_a/θ_a) Sect.2/¶1 for a,V, θ_a at plume height (see below) lutiplication Factor (n ^{0.25}) ers*=meters above stack top Sect.3/¶1 " "eat/2 " Conservation of momentum " quations below: aar increase with height Sect.2/Eq.6 where (θ_a/θ_a) ^{1/2} = (θ_a/θ_a) ^{1/2} = 0.9685 [(z-z _v) ² - (6.25D-z _v) ²]) ^{1/13} /(2a ^{1/2}) Sect.2/Eq.6 iscuerce (z, z) ² - (6.25D-z _v) ²]) ^{1/13} /(2a ^{1/2}) Sect.2/Eq.6 Critical VV < Top of) simultaneously in both eqs. (i.e., Va and a) the cubic equation ax ³ +bx ² +cx+d=0, where 1, c=0, and b=-(0.12F ₀)/(V _{ent} ³ 0.16 ³)= -1.2 12F ₀ (6.25D-z _v) ² (V _{ent} ³ 0.16 ³)= -1.2 12F ₀ (6.25D-z _v) ² (V _{ent} ³ 0.16 ³)= -1.2 12F ₀ (6.25D-z _v) ² (V _{ent} ³ 0.16 ³)= -1.2 12F ₀ (6.25D-z _v) ² (V _{ent} ³ 0.16 ³)= -1.2 12F ₀ (6.25D-z _v) ² (V _{ent} ³ 0.16 ³)= -1.2 12F ₀ (6.25D-z _v) ² (V _{ent} ³ 0.16 ³)= -1.2 12F ₀ (6.25D-z _v) ² (V _{ent} ³ 0.16 ³)= -1.2 12F ₀ (6.25D-z _v) ² (V _{ent} ³ 0.16 ³)= -1.2 12F ₀ (6.25D-z _v) ² (V _{ent} ³ 0.16 ³)= -1.2 12F ₀ (6.25D-z _v) ² (V _{ent} ³ 0.16 ³)= -1.2 12F ₀ (6.25D-z _v) ² (V _{ent} ³ 0.16 ³)= -1.2 12F ₀ (6.25D-z _v) ² (V _{ent} ³ 0.16 ³)= -1.2 12F ₀ (6.25D-z _v) ² (V _{ent} ³ 0.16 ³)= -1.2 12F ₀ (0.25D-z _v) ² (V _{ent} ³ 0.16 ³)= -1.2 12F ₀ (0.25D-z _v) ² (V _{ent} ³ 0.16 ³)= -1.2 12F ₀ (0.25D-z _v) ² (V _{ent} ³ 0.16 ³)= -1.2 12F ₀ (0.25D-z _v) ² (V _{ent} ³ 0.16 ³)= -1.2 12F ₀ (0.25D-z _v) ² (V _{ent} ³ 0.16 ³)= -1.2 12F ₀ (0.25D-z _v) ² (V _{ent} ³ 0.16 ³)= -1.2 12F ₀ (0.25D-z _v) ² (V _{ent} ³ 0.16 ³)= -1.2 12F ₀ (0.25D-z _v) ² (V _{ent} ³ 0.16 ³)= -1.2 12F ₀ (0.25D-z _v) ² (V _{ent} ³ 0.16 ³)= -1.2 12F ₀ (0.25D-z _v) ² (V _{ent} ³ 0.16 ³)= -1.2 12F ₀ (0.25D-z _v) ² (V _{ent} ³ 0.16 ³)= -1.2 12F ₀ (0.25D-z _v) ² (V _{ent} ³ 0.16 ³)= -1.2 12F ₀ (0.25D-z _v) ² (V _{ent} ³ 0.16 ³)= -1.2 12F ₀ (0.25D-z _v) ² (V _{ent} ³ 0.16 ³)= -1.2 12F ₀ (0.25D-z _v) ² (V _{ent} ³ 0.16 ³)= -1.2 12F ₀ (0.25D-z _v) ² (V
Ambient Potential Temp 9, lume Exit Conditions:302.21 Kelvins84.3 STECravity g Gravity g Stack Height h, 10.83 meters0.03 inches 80.3 inches 80.0 $\Delta T(F)$ 80.0	0.3048 meters/feet 9.81 m/s ² 1.11 -1.0 Sect.2/¶1 4 = Vol.Flow(g/m)(1- θ_a/θ_a) Sect.2/¶1 4 = Vol.Flow(g/m)(1- θ_a/θ_a) Sect.2/¶1 4 = Vol.Flow(g/m)(1- θ_a/θ_a) Sect.2/¶1 4 = Vol.Flow(g/m)(1- θ_a/θ_a) Sect.3/¶1 ers*=meters above stack top Sect.3/¶1 " ers*=meters above stack top Sect.3/¶1 " ers*=meters above stack top Sect.2/Eq.6 where (θ_a/θ_a) ^{1/2} = (θ_a/θ_a) ^{1/2} = 0.9685 [(z-z _x) ² - (6.25D-z _x) ²]) ^(1/3) /(a Sect.2/Eq.6 where (θ_a/θ_a) ^{1/2} = (θ_a/θ_a) ^{1/2} = 0.9685 [(z-z _x) ² - (6.25D-z _x) ²]) ^(1/3) /(a Sect.2/Eq.6 Critical VV < Top c (z-z _x) ² -(6.25D-z _x) ²]) ^(1/3) /(2a'/2) Sect.2/Eq.6 (z-z _x) ² -(6.25D-z _x) ²]) ^(1/3) /(2a'/2) Sect.2/Eq.6 Critical VV < Top c 1, c=0, and b=-(0.12F ₀)/(V _{ent} ³ 0.16 ³)= -1.2 12F ₀ (6.25D-z _x) ² (Va) ₀ ³]/(V _{ent} ³ 0.16 ³)= -1.2 12F ₀ (6.25D-z _x) ² (Va) ₀ ³]/(V _{ent} ³ 0.16 ³)= -1.2 12F ₀ (6.25D-z _x) ² (Va) ₀ ³]/(V _{ent} ³ 0.16 ³)= -1.2 12F ₀ (6.25D-z _x) ² (Va) ₀ ³]/(V _{ent} ³ 0.16 ³)= -1.2 12F ₀ (6.25D-z _x) ² (Va) ₀ ³]/(V _{ent} ³ 0.16 ³)= -1.2 12F ₀ (0.25D-z _x) ² (Va) ₀ ³]/(V _{ent} ³ 0.16 ³)= -1.2 12F ₀ (0.25D-z _x) ² (Va) _x ³ 0.16 ³)= -1.2 12F ₀ (0.25D-z _x) ² (Va) _x ³ 0.16 ³)= -1.2 11. or z(m/above stack) = 11
tume Exit Conditions:Gravity gStack Height h, Individual Chiller Stack Diameter D2.0404 meters35 6/12 feet-inchesAIndividual Chiller Stack Diameter D2.0404 meters9.96 m/s32.67 ft/sec400/((00nC))Individual Chiller Volumetric Flow32.56 cum/sec69,000 ACFM TV_{sec}/P^2 400/((00nC))Individual Chiller Volumetric Flow32.22 t Kelvins120.3 TTStack Velochill Temp 0, Stack Netoential Temp 0, Number of Chillers n936.0 $\Delta T(T)$ $Q_{sup}/2^{1.6}, 0, 1/4$ Individual Chiller Stack Buoyancy Flux F, Number of Chillers n931.732 Multiple Stack Nu Λ^2 yba ² (1.6, 0, 0)Individual Chiller Stack Z _{pin} 12.752 meters'41.8 feet' $z_{pin} = 0.5V_{eat} = V_{eat}$ Height above Ground z_{pin} Th, Vertical Velocity V4.980 m/s16.34 ft/sec $V_{pin} = 0.5V_{eat} = V_{eat}$ Plume Top-Hat Radius aSolutions for Plume Heights above Jet PhaseSolutions in Table Below $0.16(z-z_{a}), or linetSingle Plume-averaged Vertical Velocity VVertical Velocity V9.840 m2/s0.16(z-z_{a}), or linetV_{eat}D.2(e_0/e_0)^{1/2}Height above Stack ZPlume Top-Hat Radius aSolutions in Table Below0.16(z-z_{a}), or linetV_{eat}D.2(e_0/e_0)^{1/2}Witrual Source Height Z,Vertical Velocity V9.840 m2/s0.16 (z-z_{a}), or linet0.16(z-z_{a}), or linetSolve for plume-averaged vertical velocity VSolutions in Table Below0.16(z-z_{a}), or linet0.16(z-z_{a}), or linetSolve for height 1 doves Stack Z,Height above $	9.81 m/s ² 1.11 ~1.0 Sect.2/[1 4 = Vol.Flow(g/ π)(1- θ_g/θ_g) Sect.2/[1 for a,V, θ_p at plume height (see below) lultiplication Factor (n ^{0.25}) ers*=meters above stack top Sect.3/[1 " " " " " " " " " " " " "
Stack Height h, Individual Chiller Stack Diameter D Stack Velocity W, Stack Velocity W, Stack Advelocity W, Stack Rotenial Temp 6, Stack Advelocity W, Stack Rotenial Temp 6, Stack Rotenial	1.11 ~1.0 Sect.2/[1 4 = Vol.Flow(g/m)(1- $\theta_{z}/\theta_{z})$ Sect.2/[1 for a,V, θ_{p} at plume height (see below) lultiplication Factor (n ^{0.25}) ers*=meters above stack top Sect.3/[1] " dwt/2 " Conservation of momentum " quations below: ear increase with height Sect.2/Eq.6 %here (θ_{z}/θ_{z}) ^{1/2} = (θ_{z}/θ_{z}) ^{1/2} = 0.9685 [($z-z_{x})^{2}$ -($6.25D-z_{x}$) ²]) ^(1/3) /(a Sect.2/Eq.6 cound (z'+h _s) Sect.2/Eq.6 Critical VV < Top co) simultaneously in both eqs. (i.e., Va and a) the cubic equation ax ³ +bx ² +cx+d=0, where 1, c=0, and b=-(0.12F ₀)/(V _{ent} ³ 0.16 ³)= -1.2 12F ₀ (6.25D-z_{y}) ² (Va) ₀ ³)/(V _{ent} ³ 0.16 ³)= -1.2 12F ₀ (6.25D-z_{y}) ² (Va) ₀ ³)/(V _{ent} ³ 0.16 ³)= -1.2 12F ₀ (6.25D-z_{y}) ² (Va) ₀ ³)/(V _{ent} ³ 0.16 ³)= -1.2 12F ₀ (6.25D-z_{y}) ² (Va) ₀ ³)/(V _{ent} ³ 0.16 ³)= -1.2 12F ₀ (6.25D-z_{y}) ² (Va) ₀ ³)/(V _{ent} ³ 0.16 ³)= -1.2 12F ₀ (6.25D-z_{y}) ² (Va) ₀ ³)/(V _{ent} ³ 0.16 ³)= -1.2 12F ₀ (0.25D-z_{y}) ² (Va) ₀ ³)/(V _{ent} ³ 0.16 ³)= -1.2 12F ₀ (0.25D-z_{y}) ² (Va) ₀ ³)/(V _{ent} ³ 0.16 ³)= -1.2 12F ₀ (0.25D-z_{y}) ² (Va) ₀ ³)/(V _{ent} ³ 0.16 ³)= -1.2 12F ₀ (0.25D-z_{y}) ² (Va) ₀ ³)/(V _{ent} ³ 0.16 ³)= -1.2 12F ₀ (0.25D-z_{y}) ² (Va) ₀ ³)/(V _{ent} ³ 0.16 ³)= -1.2 11. or z(m/above stack) = 11
Individual Chiller Stack Diameter D2.0404 meters80.3 inches λ_{o} Stack Velocity V _{min} 9.96 m's32.627 ft/sec4/ol((60mD)Individual Chiller Volumetric Flow32.56 currivec69.000ACF mt V _{mp} D ² /4Stack Potential Temp 9,322.21 Kelvins120.3 °FIntial Stack Buoyancy Flux F,6.3105 m'/s ³ 36.0 Δ T(F)g/mp ² /4(-49,0) ft/4(-49,0)	~1.0 Sect.2/¶1 4 = Vol.Flow(g/m)(1- θ_a/θ_a) Sect.2/¶1 or a,V, θ_a at plume height (see below) lultiplication Factor (n ^{0.25}) ers*=meters above stack top Sect.3/¶1 " "ead/2 " Conservation of momentum " quations below: arr increase with height Sect.2/Eq.6 2], meters*=meters above stack top Sect.2/Eq.6 where (θ_a/θ_a) ^{1/2} = (θ_a/θ_a) ^{1/2} = 0.9685 [(z-z,y ² - (6.25D-z,y ²)] ^{1/13} / a Sect.2.1(6) cound (z'+h _a) ((z-z,y ² -(6.25D-z,y ²)] ^{1/13} / (2a/2) Sect.2/Eq.6 Critical VV < Top co .) simultaneously in both eqs. (i.e., Va and a) the cubic equation ax ³ +bx ² +cx+d=0, where 1, c=0, and b=-(0.12F ₀)/(V _{ent} ³ 0.16 ³)= -1.2 12F ₀ (6.25D-z,y ² -(V _{ent} ³ 0.16 ³)= -1.2 12F ₀ (6.25D-z,y ² -(V _{ent} ³ 0.16 ³)= -1.2 12F ₀ (6.25D-z,y ² -(V _{ent} ³ 0.16 ³)= -1.2 12F ₀ (6.25D-z,y ² -(V _{ent} ³ 0.16 ³)= -1.2 12F ₀ (6.25D-z,y ² -(V _{ent} ³ 0.16 ³)= -1.2 12F ₀ (6.25D-z,y ² -(V _{ent} ³ 0.16 ³)= -1.2 12F ₀ (6.25D-z,y ² -(V _{ent} ³ 0.16 ³)= -1.2 12F ₀ (0.25D-z,y ² -(V _{ent} ³ 0.16 ³)= -1.2
Stack Velocity V _{ext} 9.96 m/s 32.56 curvisee32.67 ft/sec 9.000 ACFM $M_{cm}D^2/4$ M_{c	Sect.2/¶1 4 = Vol.Flow(g/m)(1- θ_g/θ_g) Sect.2/¶1 for a,V, θ_g at plume height (see below) ultiplication Factor (n ^{0.25}) ers*=meters above stack top Sect.3/¶1 " "est/2 " Conservation of momentum " quations below: aar increase with height Sect.2/Eq.6 where (θ_g/θ_g) ^{1/2} = (θ_g/θ_g) ^{1/2} = 0.9685 [(z-z_v) ² - (6.25D-z_v) ²]) ^{1/13} / a Sect.2.7(6) ound (z'+h _s) $\int_{c} ((z-z_v)^2 - (6.25D-z_v)^2))^{1/13} / (2a/2)$ Sect.2/Eq.6 Critical VV < Top of $c_g(z-z_v)^2 - (6.25D-z_v)^2)^{1/13} / (2a/2)$ Sect.2/Eq.6 (z-z_v) ² - (6.25D-z_v)^2))^{1/13} / (2a/2) Sect.2/Eq.6 Critical VV < Top of $c_g(z-z_v)^2 - (6.25D-z_v)^2)^{1/13} / (2a/2)$ Sect.2/Eq.6 (z-z_v) ² - (6.25D-z_v)^2)^{1/13} / (2a/2) Sect.2/Eq.6 (z-z_v)^2 - (6.25D-z_v)^2)^{1/13} / (2a/2) Sect.2/Eq.6 (z-z_v)^2 - (2.25D-z_v)^2)^{1/13} / (2a/2) Sect.2/Eq.6 (z-z_v)^2 - (2.25D-z_v)^2)^{1/13} / (2a/2) Sect.2/Eq.6 (z-z_v) ² - (6.25D-z_v)^2)^{1/13} / (2a/2) Sect.2/Eq.6 (z-z_v)^2 - (6.25D-z_v)^2)^{1/13} / (2a/2) Sect.2/Eq.6 (z-z_v) - (z-z_v)^2 - (z-z_v)^2)^{1/13} / (2a/2) Sect.2/Eq.6 (z-z_v)^2 - (2.25D-z_v)^2)^{1/13} / (2a/2) Sect.2/Eq.6 (z-z_v) ² - (6.25D-z_v)^2)^{1/13} / (2a/2) Sect.2/Eq.6 (z-z_v)^2 - (2.25D-z_v)^2)^{1/13} / (2a/2) Sect.2/Eq.6 (z-z_v) ² - (6.25D-z_v)^2)^{1/13} / (2a/2) Sect.2/Eq.6 (z-z_v) ² - (2.25D-z_v)^2)^{1/13} / (2a/2) Sect.2/Eq.6 (z-z_v) ² - (2.25D-z_v)^2 - (2a/3) / (2a/3) Sect.2/Eq.6 (z-z_v) ² - (2a/3) / (z-z_v)^2 - (2a/3) / (z-z_
Individual Chiller Volumetric Flow32.56cu.m/sec69.000ACFM $mV_{ex}D^{3/4}$ Stack Potential Temp θ_{a} 32.21Kelvins120.3"FInitial Stack Buoyancy Flux FN/A36.0 $\Delta T(F)$ $yV_{ex}D^{2}(1-\theta_{a}/\theta_{a})/a$ Number of Chillers n91.732Multiple Stack Muonditions at End (Top) of Jet Phase:11.732multiple Stack MuHeight above Stack z_{m} 12.752meters*11.8Height above Stack z_{m} 12.752meters*16.34file over Ground z_{m} 4.081meters13.4Plume Top-Hat Diameter $2a_{m}$ 4.081meters13.4field tabove Ground z_{m} 30.0010m in Table Bolow0.16(2-2, c), or linetVertical Velocity Vgiound z, ha11.235meters1.3Single Plume-averaged Vertical Velocity VSolutions in Table Bolow0.16(2-2, c), or linetVirtual Source Height z,0.402meters1.3feetVertical Velocity Vgiound z, ha11.235meters36.9Solve for plume-averaged vertical velocity at height500.0feet152.4Wertical Velocity V1.114m/s3.65ff/sec $a=2^{20} \cdot 16(2-z_{c})$ Vertical Velocity V1.114m/s3.65ff/sec $a=2^{20} \cdot 16(2-z_{c})$ Virtual Source Height above Stack z_{m} 11.14m/s3.65ff/sec $a=2^{20} \cdot 16(2-z_{c})$ Vertical Velocity V1.114m/s3.65ff/sec $a=2^{20} \cdot 1$	$4 = Vol.Flow(g/\pi)(1-\theta_a/\theta_a) Sect.2/[1]$ for a, V, θ_a at plume height (see below) luttiplication Factor (n ^{0.25}) ers*=meters above stack top Sect.3/[1] "est/2" Conservation of momentum " quations below: aar increase with height Sect.2/Eq.6 2], meters*=meters above stack top Sect.2/Eq.6 where (θ_a/θ_a) ^{1/2} = (θ_a/θ_a) ^{1/2} = 0.9685 [($z-z_v$) ² - ($6.25D-z_v$) ²]) ^(1/3) /(a Sect.2/Eq.6) ound ($z'+h_a$) $\int_{a}^{b} (z_v - z_v)^2 - (6.25D-z_v)^2]$) ^(1/3) /(2a'/2) Sect.2/Eq.6 Critical VV < Top co) simultaneously in both eqs. (i.e., Va and a) the cubic equation ax ³ +bx ² +cx+d=0, where 1, c=0, and b=-(0.12F_o)/(V _{ent} ³ 0.16 ³)= -1.2; 12F _a (6.25D-z_v) ² (Va) ₀ ³)(V _{ent} ³ 0.16 ³)= -1.3; http://www.1728.org/cubic gives the real solution x = z-zv = 11. or z(m/above stack) = 11
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	tor a,V,θ _p at plume height (see below) lultiplication Factor (n ^{0.25}) ers*=meters above stack top Sect.3/¶1 " duat/2 " Conservation of momentum " quations below: ear increase with height Sect.2/Eq.6 2], meters*=meters above stack top Sect.2/Eq.6 where (θ_{a}/θ_{a}) ^{1/2} = (θ_{a}/θ_{a}) ^{1/2} = 0.9685 [($z-z_{a}$) ² - ($6.25D-z_{a}$) ²]) ^(1/3) / a Sect.2/Eq.6 cound ($z'+h_{\pi}$) Sect.2/Eq.6 Critical VV < Top of) simultaneously in both eqs. (i.e., Va and a) the cubic equation ax ³ +bx ² +cx+d=0, where 1, c=0, and b=-(0.12F _o)/(V _{ent} ³ 0.16 ³)= -1.2 12F _o (6.25D-z _a) ² -(10^{-1}) ² = (10^{-1}) ² http://www.1728.org/cubic gives the real solution x = z-zv = 11. or z(m/above stack) = 11
Plume Buoyancy Flux FN/AM/A M^2_3 $X^2_3 Q_3^2 (1-a_0/a_0)$ foNumber of Chillers n91.732Multiple Stack Multiple Multiple Multiple Multiple Multiple	tor a,V,θ _p at plume height (see below) lultiplication Factor (n ^{0.25}) ers*=meters above stack top Sect.3/¶1 " duat/2 " Conservation of momentum " quations below: ear increase with height Sect.2/Eq.6 2], meters*=meters above stack top Sect.2/Eq.6 where (θ_{a}/θ_{a}) ^{1/2} = (θ_{a}/θ_{a}) ^{1/2} = 0.9685 [($z-z_{a}$) ² - ($6.25D-z_{a}$) ²]) ^(1/3) / a Sect.2/Eq.6 cound ($z'+h_{\pi}$) Sect.2/Eq.6 Critical VV < Top of) simultaneously in both eqs. (i.e., Va and a) the cubic equation ax ³ +bx ² +cx+d=0, where 1, c=0, and b=-(0.12F _o)/(V _{ent} ³ 0.16 ³)= -1.2 12F _o (6.25D-z _a) ² -(10^{-1}) ² = (10^{-1}) ² http://www.1728.org/cubic gives the real solution x = z-zv = 11. or z(m/above stack) = 11
Number of Chillers n 9 1.732 Multiple Stack Mu onditions at End (Top) of Jet Phase: 77.4 feat Height above Stack zga 12.752 meters* 41.8 feet* zga = 6.250, meters Vertical Velocity Vga 4.980 m/s 16.34 ft/sec Vga = 0.5Voat Vga	lultiplication Factor ($n^{0.25}$) ers*=meters above stack top Sect.3/[1] " erg/2 " Conservation of momentum " quations below: aar increase with height Sect.2/Eq.6 2], meters*=meters above stack top Sect.2/Eq.6 where (θ_g/θ_g) ^{1/2} = (θ_g/θ_g) ^{1/2} = 0.9685 [($z-z_y$) ² - ($6.25D-z_y$) ²]) ^(1/3) / a Sect.2.1(6) ound (z' +h _s) Sect.2/Eq.6 Critical VV < Top of) simultaneously in both eqs. (i.e., Va and a) the cubic equation ax ³ +bx ² +cx+d=0, where 1, c=0, and b=-(0.12F ₀)/(V _{ent} ³ 0.16 ³)= -1.2 12F ₀ (6.25D-z_y) ² (V_{ont} ³ 0.16 ³)= -1.2 12F ₀ (6.25D-z_y) ² (V_{ont} ³ 0.16 ³)= -1.37 http://www.1728.org/cubic gives the real solution x = z-zv = 11. or z(m/above stack) = 11
onditions at End (Top) of Jet Phase: Height above Ground z_{at} th, 23.585 meters 77.4 feet Vertical Velocity V _µ , 4.980 m/s f6.34 ft/sec V _µ = 0.5V _{mat} = V _a Plume Top-Hat Diameter $2a_{pt}$, 4.081 meters 13.4 feet $2a_{µt} = 2.5$ pillane Methodology - Analytical Solutions for Calm Conditions for Plume Heights above Jet Phase Single Plume -averaged Vertical Velocity V given by Analytical Solution in Paper where Product V given by equ Plume Top-Hat Zaladius a Solutions in Table Below 0.16(z_{c2} , or line Virtual Source Height z, 0.402 meters 1.3 feet 6.25D[1-($Q_{r}Q_{0}$)] ^{1/2} Height above Ground z_{r} th, 11.235 meters 36.9 feet Vertical Velocity V Solutions in Table Below ($(Va)_{0}^{3} + 0.12F_{0}$ [Product (Va)_0 9.840 m ² /s V _{emc} D/2($Q_{r}Q_{0}$)] ^{1/2} ingle Chiller Results: Solve for plume-averaged vertical velocity at height 500.0 feet 152.4 meters above gro Gives the following Height above Stack z' 141.567 meters' 464.5 feet" Plume Top-Hat Diameter 2a' 45.173 meters 148.2 feet $2a^{1}=2^{10.16(Z-z_{c})}$ Vertical Velocity V 1.114 m/s 3.65 ft/sec V = ($(Va)_{0}^{3}+0.12F_{0}$ [Find Height above Stack z_{crit} #W/A meters #W/A feet Solve for $x=(z-z_{c})$ Height above Ground z_{crit} the W/A meters #W/A feet for V= v_{crit} using the application of z_{crit} the application z_{c	ers*=meters above stack top Sect.3/¶1 "" Conservation of momentum " quations below: aar increase with height Sect.2/Eq.6 2], meters*=meters above stack top Sect.2/Eq.6 where $(\theta_a/\theta_a)^{1/2} = (\theta_a/\theta_a)^{1/2} = 0.9685$ [$(z-z_v)^2 - (6.25D-z_v)^2$]) ^(1/3) / $(a$ Sect.2.1(6) ound $(z'+h_a)$ $\int_{a}^{b} ((z-z_v)^2 - (6.25D-z_v)^2)$] ^(1/3) / $((2a'/2)$ Sect.2/Eq.6 Critical VV < Top of $\int_{a}^{b} ((z-z_v)^2 - (6.25D-z_v)^2)$] ^(1/3) / $((2a'/2)$ Sect.2/Eq.6 Critical VV < Top of $\int_{a}^{b} ((z-z_v)^2 - (6.25D-z_v)^2)$] ^(1/3) / $((2a'/2)$ Sect.2/Eq.6 1, $(z=0, and b=-(0.12F_a)/(V_{ent}^30, 16^3) = -1.2$ $12F_a(6.25D-z_v)^2 - (V_{a})^3 - 1(2T_{a})^3 - 1(2T_{a})^3$
Height above Stack z_{pet} 12.752meters*41.8feet z_{pet} = 6.25D, meteHeight above Ground z_{pe} +h Vertical Velocity V_{pet} 4.980m/s16.34ft/sec V_{pet} = 0.5 V_{ext} = V_{ext} Plume Top-Hat Diameter $2a_{pet}$ 4.081meters13.4feet $2a_{pet}$ = 2Dsingle Plume-averaged Vertical Velocity V given by Analytical Solutions in Paper where Product Va given by equPlume Top-Hat Addus aSolutions in Table Below0.16(z-z.), or linesVirtual Source Height z, Vertical Velocity V0.402meters*1.3feet6.25D[1-(θ_{r}/θ_{0}]) ^{1/2} Height above Ground z,+h Vertical Velocity V0.402meters*36.9feetVertical Velocity VSolutions in Table Below0.16(z-z.)or motor ($(Va)_{o}^{-1} + 0.12F_{o}$ [Wertical Velocity V0.402meters*36.9feetVertical Velocity VSolutions in Table Below($(Va)_{o}^{-1} + 0.12F_{o}$ [Wertical Velocity V9.840m ² /sV _{exit} D/2(θ_{o}^{-1}/s^{-1} Solve for plume-averaged vertical velocity at height500.0feet152.4Plume Top-Hat Diameter 2a'141.567meters446.5Plume Top-Hat Diameter 2a'45.173meters#IA.2Solve for Height of CASC critical vertical velocity V ent6.30m/s plume-averaged vertical velocityFind Height above Ground z_{ent} +h#N/Ameters39.1Height above Ground z_{ent} +h22.765meters39.1Find Height above Ground z_{en	$\int_{ext}^{ext}/2 = \int_{ext}^{a} \int_{ext}^{a}/2 = \int_{ext}^{a}/2 $
Height above Stack z _{jet} 12.752 meters* 41.8 feet* z _{jet} = 6.25D, mete Height above Ground z _m +h 23.585 meters 77.4 feet 12.752 meters* 16.34 ft/sec V _{jet} = 0.5V _{ext} = V _m Plume Top-Hat Diameter 2a _{jet} 4.081 meters 13.4 feet 2a _{jet} = 2D single Plume-averaged Vertical Velocity V give by Analytical Solutions for Calm Conditions for Plume Heights above Jet Phase Single Plume-averaged Vertical Velocity V give by Analytical Solutions in Table Below 0.16(z-z.), or lines Virtual Source Height z, 0.402 meters* 1.3 feet* 6.25D[1-(θ ₂ /θ ₄) ^{1/2}] Height above Ground z,+h, 11.235 meters 36.9 feet (I(Va) ₀ ³ + 0.12F ₀] Vertical Velocity V Solutions in Table Below (I(Va) ₀ ³ + 0.12F ₀] meters above ground z,+h, Yertical Velocity V Solutions in Table Below (I(Va) ₀ ³ + 0.12F ₀] V _{exit} D/2(θ ₀ /0 ^{1/2}) Ingle Chiller Results: Solutions for future, averaged vertical velocity at height 500.0 feet 152.4 meters above ground z(Va) ₀ Solve for Height of CASC critical vertical velocity V 1.114 m/s 3.65 ft/sec V=((Va) ₀ ³ +0.12F ₀] Solve for Height of CASC critical vertical velocity V 1.114 m/s 3.85 ft/sec V=(Va) ₀ ³ 0.12F ₀] <td>$\int_{ext}^{ext}/2 = \int_{ext}^{a} \int_{ext}^{a}/2 = \int_{ext}^{a}/2$</td>	$\int_{ext}^{ext}/2 = \int_{ext}^{a} \int_{ext}^{a}/2 = \int_{ext}^{a}/2 $
Height above Ground $z_{jet}+h_s$ 23.585 meters77.4 feetVertical Velocity V_{jet} 4.980 m/s16.34 ft/sec $V_{jet} = 0.5V_{oot} = V_{oot}$ Plume Top-Hat Diameter $2a_{jet}$ 4.081 meters13.4 feet $2a_{jet} = 2D$ sollane Methodology - Analytical Solutions for Calm Conditions for Plume Heights above Jet PhaseSingle Plume-averaged Vertical Velocity V given by Analytical Solution in Paper where Product Va given by equPlume Top-Hat Radius aSolutions in Table Below $0.16(z-z_0)$, or line:Virtual Source Height z_v 0.402 meters*1.3 feet* $6.25D[1-(\theta_v/B_0)^{1/2}$ Height above Ground z_v+h_s 11.235 meters36.9 feet $((Va)_o^3 + 0.12F_o[$ Vertical Velocity VSolutions in Table Below $((Va)_o^3 + 0.12F_o[$ $V_{out}D/2(\theta_v/B_0)^{1/2}$ region Chiller Results:Solve for plume-averaged vertical velocity at height\$00.0feet152.4 meters above groundGives the following Height above Stack z' 141.567 meters*464.5 feet* $2a^i=2^{o.0.16(z-z_v)}$ Vertical Velocity V1.114 m/s3.65 ft/sec $v=((Va)_o^3+0.12F_o[$ Solve for Height of CASC critical vertical velocity v_{ent} 5.30 m/s plume-averaged vertical velocity $a=1,$ Interpolated Height above Stack z_{out} #N/A meters#N/A feetSolve for V= v_{out} using thand d=[0.1]Find Height above Ground $z_{out}+h_s$ 22.765 meters39.1 feetHeight above Ground $z_{out}+h_s$ 22.765 meters39.1 feet $a=1,$ Interpolated Height above Ground $z_{out}+h_s$ 22.765 meters </td <td>$\int_{ext}^{ext}/2 = \int_{ext}^{a} \int_{ext}^{a}/2 = \int_{ext}^{a}/2$</td>	$\int_{ext}^{ext}/2 = \int_{ext}^{a} \int_{ext}^{a}/2 = \int_{ext}^{a}/2 $
Vertical Velocity V _{jet} 4.980 m/s16.34 ft/sec $V_{jet} = 0.5V_{ext} = V_{ext}$ Plume Top-Hat Diameter 2a _{jet} 4.081 meters13.4 feet $2a_{jet} = 2D$ Single Plume-averaged Vertical Solutions for Calm Conditions for Plume Heights above Jet PhaseSingle Plume-averaged Vertical Velocity V given by Analytical Solutions in Table Below0.16(z-z.), or lineVertical Velocity V given by Analytical Solutions in Table Below0.16(z-z.), or lineVertical Velocity V0.402 meters*1.3 feet*6.25D(1+(0,/0_a)^{1/2})Height above Ground z, +ha11.235 meters36.9 feetVertical Velocity VSolutions in Table Below $((Va)_o^3 + 0.12F_o)$ Vertical Velocity VSolutions in Table Below(Value) 2a' 2a' 20.16(z'-z.)Torduct (Va)_o9.840 m²/sVertical Velocity 4Solutions in Table Below(Value), a' + 0.22F_oVertical Velocity at height500.0feet152.4meters above groupGives the following Height above Stack z'141.567Plume Top-Hat Diameter 2a'45.173meters464.5feetPlume Top-Hat Diameter 2a'45.173meters#0.42feet2a'=2'0.16(z'-z.)Vertical Velocity V1.14metersSolve for X=(cra, Hh/A)Meters </td <td>Conservation of momentum " quations below: Sect.2/Eq.6 2], meters*=meters above stack top Sect.2/Eq.6 where $(\theta_a/\theta_a)^{1/2} = (\theta_a/\theta_a)^{1/2} = 0.9685$ $(z-z_a)^2 - (6.25D-z_a)^2)^{1/(3)}/a$ Sect.2/Eq.6 Sect.2/Eq.6 ound (z^2+h_a) Sect.2/Eq.6 $\zeta_a((z-z_a)^2 - (6.25D-z_a)^2))^{1/(3)}/(2a/2)$ Sect.2/Eq.6 Simultaneously in both eqs. (i.e., Va and a) Sect.2/Eq.6 $\zeta_a((z-z_a))^2 - (6.25D-z_a)^2))^{1/(3)}/(2a/2)$ Sect.2/Eq.6 Simultaneously in both eqs. (i.e., Va and a) Sect.2/Eq.6 $\zeta_a((z-z_a))^2 - (6.25D-z_a)^2)^{1/(3)}/(2a/2)$ Sect.2/Eq.6 Simultaneously in both eqs. (i.e., Va and a) Sect.2/Eq.6 $\zeta_a((z-z_a))^2 - (6.25D-z_a)^2)^{1/(3)}/(2a/2)$ Sect.2/Eq.6 Simultaneously in both eqs. (i.e., Va and a) Sect.2/Eq.6 $\zeta_a((z-z_a))^2 - (0.3)^2 - (0$</td>	Conservation of momentum " quations below: Sect.2/Eq.6 2], meters*=meters above stack top Sect.2/Eq.6 where $(\theta_a/\theta_a)^{1/2} = (\theta_a/\theta_a)^{1/2} = 0.9685$ $(z-z_a)^2 - (6.25D-z_a)^2)^{1/(3)}/a$ Sect.2/Eq.6 Sect.2/Eq.6 ound (z^2+h_a) Sect.2/Eq.6 $\zeta_a((z-z_a)^2 - (6.25D-z_a)^2))^{1/(3)}/(2a/2)$ Sect.2/Eq.6 Simultaneously in both eqs. (i.e., Va and a) Sect.2/Eq.6 $\zeta_a((z-z_a))^2 - (6.25D-z_a)^2))^{1/(3)}/(2a/2)$ Sect.2/Eq.6 Simultaneously in both eqs. (i.e., Va and a) Sect.2/Eq.6 $\zeta_a((z-z_a))^2 - (6.25D-z_a)^2)^{1/(3)}/(2a/2)$ Sect.2/Eq.6 Simultaneously in both eqs. (i.e., Va and a) Sect.2/Eq.6 $\zeta_a((z-z_a))^2 - (6.25D-z_a)^2)^{1/(3)}/(2a/2)$ Sect.2/Eq.6 Simultaneously in both eqs. (i.e., Va and a) Sect.2/Eq.6 $\zeta_a((z-z_a))^2 - (0.3)^2 - (0$
Plume Top-Hat Diameter $2a_{jut}$ 4.081 meters13.4 feet $2a_{jut} = 2D$ billane Methodology - Analytical Solutions for Calm Conditions for Plume Heights above Jet PhaseSingle Plume-averaged Vertical Velocity V given by Analytical Solution in Paper where Product V a given by equPlume Top-Hat Radius aSolutions in Table Below $0.16(z-z_i)$, or lineaVirtual Source Height z_i 0.402 meters^* 1.3 feet* $6.25D[1-(\theta_i/\theta_i)^{1/2}]$ Height above Ground z_i h_s 11.235 meters 36.9 feet $((Va)_o^3 + 0.12F_o)$ Vertical Velocity VSolutions in Table Below $((Va)_o^3 + 0.12F_o)$ $V_{ext}D/2(\theta_i/\theta_i)^{1/2}$ Product (Va) $9.840 \text{ m}^2/s$ $V_{ext}D/2(\theta_i/\theta_i)^{1/2}$ Solve for plume-averaged vertical velocity at height 500.0 feet 152.4 meters above grouGives the following Height above Stack z' 141.567 meters^* 464.5 feet* $2a^2-2^{\circ}.016(z^2-z_i)$ Vertical Velocity V 1.114 m/s 3.65 fivec $V=((Va)_o^3+0.12F_o)$ Vertical Velocity V 1.114 m/s 3.65 fivec $V=((Va)_o^3+0.12F_o)$ Solve for Height of CASC critical velocity V_{ert} 5.30 m/s plume-averaged vertical velocityFind Height above Stack z_{ent} $\#N/A \text{ meters}$ $\#N/A \text{ feet}$ Solve for $V=_{ent}$ using the approxe Ground $z_{ent} + h_s$ $\#N/A \text{ meters}$ 39.1 feet Height ffeet)(meters)PlumeSingleStPlume<	Conservation of momentum " quations below: Sect.2/Eq.6 2], meters*=meters above stack top Sect.2/Eq.6 where $(\theta_a/\theta_a)^{1/2} = (\theta_a/\theta_a)^{1/2} = 0.9685$ $(z-z_a)^2 - (6.25D-z_a)^2)^{1/(3)}/a$ Sect.2/Eq.6 Sect.2/Eq.6 ound (z^2+h_a) Sect.2/Eq.6 $\zeta_a((z-z_a)^2 - (6.25D-z_a)^2))^{1/(3)}/(2a/2)$ Sect.2/Eq.6 Simultaneously in both eqs. (i.e., Va and a) Sect.2/Eq.6 $\zeta_a((z-z_a))^2 - (6.25D-z_a)^2))^{1/(3)}/(2a/2)$ Sect.2/Eq.6 Simultaneously in both eqs. (i.e., Va and a) Sect.2/Eq.6 $\zeta_a((z-z_a))^2 - (6.25D-z_a)^2)^{1/(3)}/(2a/2)$ Sect.2/Eq.6 Simultaneously in both eqs. (i.e., Va and a) Sect.2/Eq.6 $\zeta_a((z-z_a))^2 - (6.25D-z_a)^2)^{1/(3)}/(2a/2)$ Sect.2/Eq.6 Simultaneously in both eqs. (i.e., Va and a) Sect.2/Eq.6 $\zeta_a((z-z_a))^2 - (0.3)^2 - (0$
billane Methodology - Analytical Solutions for Calm Conditions for Plume Heights above Jet Phase Single Plume-averaged Vertical Velocity V given by Analytical Solution in Paper where Product Va given by equ Plume Top-Hat Radius a Virtual Source Height z, 0.402 meters* 1.3 feet* 6.25D[1-(θ_{i}/θ_{i}] ^{1/2}] Height above Ground z,+h _s 11.235 meters 36.9 feet Vertical Velocity V Product (Va) _o 9.840 m ² /s V _{ent} D/2(θ_{i}/θ_{i}] ^{1/2} ngle Chiller Results: Solve for plume-averaged vertical velocity at height Solve for plume-averaged vertical velocity at height Plume Top-Hat Diameter 2a' 45.173 meters* 464.5 feet* Plume Top-Hat Diameter 2a' 45.173 meters 148.2 feet 2a'=2'0.16(z'-z_i) Vertical Velocity V Find Height above Stack z' 141.567 meters* 464.5 feet* Plume Top-Hat Diameter 2a' 45.173 meters Solve for Height of CASC critical vertical velocity v 1.114 m/s 3.65 ft/sec V=((Va) ₀ ³⁺ 0.12F _o] Find Height above Stack z _{mit} #N/A meters Height of CASC critical vertical velocity in Jet Phase: Find Height above Ground z _m +h _s #N/A meters Find Height above Stack z _{mit} 11.932 meters 39.1 feet Height above Ground z _m +h _s 22.765 meters 74.7 feet abble of Plume Top-Hat Diameters (2a) and Plume-Averaged Vertical Velocities starting at end of jet phase: Height (feet) (meters) Plume SingleSt Plume above ground above stack Radius(m) Vertivel(m/s) Temp(K) Stack.Rel.HT = 35.5 0.00 1.020 9.96 40.0 1.36 1.122 9.43 50.0 4.41 1.351 8.24 60.0 7.46 1.579 7.05 70.0 10.50 1.807 5.86 Single Jet 5.3 m/s Height = 74.7 11.93 1.915 5.30	quations below: par increase with height Sect.2/Eq.6 2], meters*=meters above stack top Sect.2/Eq.6 where $(\theta_y \theta_y)^{1/2} = (\theta_y \theta_y)^{1/2} = 0.9685$ $(z-z_v)^2 - (6.25D-z_v)^2)^{1/13}/(a$ sound (z'+h _s) Sect.2/Eq.6 $c_s((z-z_v)^2 - (6.25D-z_v)^2)^{1/13}/((2a'/2))$ Sect.2/Eq.6 Critical VV < Top of the section of
Single Plume -averaged Vertical Velocity V given by Analytical Solutions in Table Below0.16(z - z_v), or linesPlume Top-Hat Radius aSolutions in Table Below0.16(z - z_v), or linesVirtual Source Height z_v 0.402 meters*1.3 feet*6.25D[1-(θ_v / θ_v) ^{1/2}]Height above Ground z_v + h_a 11.235 meters36.9 feet(Va) $_o^3$ + 0.12 F_o [Vertical Velocity VSolutions in Table Below{ $(Va$) $_o^3$ + 0.12 F_o [V _{win} D/2($\theta_v \theta_v$) ^{1/2} ngle Chiller Results:Solve for plume-averaged vertical velocity at height500.0feet152.4 meters above groupGives the following Height above Stack z141.567 meters*464.5 feet*2a ⁺ =2 ² 0.16(z^+ - z_v)Plume Top-Hat Diameter 2a'45.173 meters148.2 feet2a ⁺ =2 ² 0.16(z^+ - z_v)Vertical Velocity V1.114 m/s3.65 ft/secV={ $(Va$) $_o^3$ +0.12 F_o [Solve for Height of CASC critical vertical velocity V _{orti} 5.30m/s plume-averaged vertical velocityFind Height above Stack z_{ort} #N/A meters#N/A feetSolve for x =(z - z_v)Height above Ground z_{ont} + h_a #N/A meters39.1 feetand d=[0.1Interpolated Height of critical vertical velocity in Jet Phase:39.1 feetand d=[0.1Find Height above Stack z_{ort} 11.932 meters39.1 feetHeight above Ground z_{ont} + h_a 22.765 meters74.7 feetable of Plume Top-Hat Diameters (2a) and Plume-Averaged Vertical Velocities starting at end of jet phase:Height (feet)meters)Height (feet)	Sect.2/Eq.6 2], meters*=meters above stack top Sect.2/Eq.6 where $(\theta_{a}/\theta_{a})^{1/2} = (\theta_{a}/\theta_{a})^{1/2} = 0.9685$ 0.9685 [(z-z_{v})^{2} - (6.25D-z_{v})^{2}]^{(1/3)} / a Sect.2/Eq.6 ound (z*+h _s) Sect.2/Eq.6 $\delta_{a}(z-z_{v})^{2}$ -(6.25D- $z_{v}/^{2}]^{(1/3)}/(2a^{1/2}) Sect.2/Eq.6 Sect.2/Eq.6 Critical VV < Top of the cubic equation ax^{3}+bx^{2}+cx4d=0, where$
Plume Top-Hat Radius a Virtual Source Height z, Virtual Source Height z, Vertical Velocity V Height above Ground z,+ha Product (Va)o Product (Va)o 9.840 m²/sSolutions in Table Below Solutions in Table Below Vertical Velocity V Solutions in Table Below Vertical Velocity V Product (Va)o 9.840 m²/s $(Va)o^3 + 0.12F_o [Va)o^3 + 0.12F_o [Va]o^3 + 0.12F_o [Va]o^$	Sect.2/Eq.6 2], meters*=meters above stack top Sect.2/Eq.6 where $(\theta_{a}/\theta_{a})^{1/2} = (\theta_{a}/\theta_{a})^{1/2} = 0.9685$ 0.9685 [(z-z_{v})^{2} - (6.25D-z_{v})^{2}]^{(1/3)} / a Sect.2/Eq.6 ound (z*+h _s) Sect.2/Eq.6 $\delta_{a}(z-z_{v})^{2}$ -(6.25D- $z_{v}/^{2}]^{(1/3)}/(2a^{1/2}) Sect.2/Eq.6 Sect.2/Eq.6 Critical VV < Top of the cubic equation ax^{3}+bx^{2}+cx4d=0, where$
Virtual Source Height z, Height above Ground z,+hs 0.402 meters^* 1.3 feet^* $6.25D[1-(\theta_i/\theta_i)^{1/2}]$ Height above Ground z,+hs 11.235 meters 36.9 feet $((Va)_o^3 + 0.12F_o[$ $VextD/2(\theta_i/\theta_i)^{1/2}]$ Product (Va)_o $9.840 \text{ m}^2/\text{s}$ $V_{extD/2(\theta_i/\theta_i)^{1/2}]$ ngle Chiller Results:Solve for plume-averaged vertical velocity at height 500.0 feet 152.4 meters above groupGives the following Height above Stack z' 141.567 meters^* 464.5 feet^* $2a^2 = 2^* 0.16(z^2 - z_i)$ Pume Top-Hat Diameter 2a' 45.173 meters 148.2 feet $2a^2 = 2^* 0.16(z^2 - z_i)$ Vertical Velocity V 1.114 m/s 3.65 ft/sec $V = ((Va)_o^3 + 0.12F_o]$ Solve for Height of CASC critical vertical velocity V erit $5.30 \text{ m/s plume-averaged vertical velocity}$ $a=1, and d=[0.1]$ Find Height above Stack z_{crit} $\#N/A \text{ meters}$ $\#N/A \text{ feet}$ Solve for $V = V_{crit}$ using the $a=1, and d=[0.1]$ Find Height above Ground z_{crit} hs 22.765 meters 74.7 feet bile of Plume Top-Hat Diameters (2a) and Plume-Averaged Vertical Velocities starting at end of jet phase: Height above Ground z_{crit} hs 22.765 meters 74.7 feet above ground above stack z_{crit} 11.322 meters 39.1 feet 10.02 meters $above ground above dround z_{crit} has22.765 \text{ meters}74.7 \text{ feet}above Ground z_{crit} has1.122 \text{ meters}9.46 \text{ meters}above Ground z_{crit} has1.122 m$	2], meters'=meters above stack top Sect.2/Eq.6 where $(\theta_a/\theta_a)^{1/2} = (\theta_a/\theta_a)^{1/2} = 0.9685$ [$(z-z_v)^2 - (6.25D-z_v)^2$]) ^(1/3) / a Sect.2.1(6) ound $(z'+h_a)$ $(z'+h_a)$ $(z'-z_v)^2-(6.25D-z_v)^2$]) ^(1/3) /(2a/2) Sect.2/Eq.6 Critical VV < Top of (z'-z_v)^2-(6.25D-z_v)^2]) ^(1/3) /(2a/2) Sect.2/Eq.6 Critical VV < Top of (z'-z_v)^2-(6.25D-z_v)^2]) ^(1/3) /(2a/2) Sect.2/Eq.6 (z'-z_v)^2-(6.25D-z_v)^2]) ^(1/3) /(2a/2) Sect.2/Eq.6 (z'-z_v)^2-(0.25D-z_v)^2]) ^(1/3) /(2a/2) Sect.2/Eq.6 (z'-z_v)^2-(0.25D-z_v)^2]) ^(1/3) /(2a/2) Sect.2/Eq.6 (z'-z_v) (z'-q)) ^(1/3) /(2a/2)
Height above Ground z,+hs 11.235 meters 36.9 feet Vertical Velocity V Solutions in Table Below {{\lambda Value}_0}^3 + 0.12F_o [Product {Va}_o 9.840 m²/s V _{out} D/2(0,0s) ^{1/2} ngle Chiller Results: Solve for plume-averaged vertical velocity at height 500.0 feet 152.4 meters above group Gives the following Height above Stack z' 141.567 meters* 464.5 feet* 2a'=2*0.16(z'-z_o) Plume Top-Hat Diameter 2a' 45.173 meters 148.2 feet 2a'=2*0.16(z'-z_o) Vertical Velocity V 1.114 m/s 3.65 ft/sec V=((Va)_o^3+0.12F_o) Solve for Height of CASC critical vertical velocity V 1.114 m/s 3.65 ft/sec V=((Va)_o^3+0.12F_o) Find Height above Stack z _{orit} #N/A meters #N/A feet Solve for V=V _{cini} using t Height above Ground z _{orit} +hs #N/A meters #N/A feet for V=V _{cini} using t Interpolated Height of critical vertical velocity in Jet P+se: and d=[0.1 a=1, and d=[0.1 Find Height above Ground z _{cini} +hs 22.765 meters 74.7 feet a=4 bible of Plume Top-Hat Diameters (2a) and Plume-Averaged Vertical Velocities starting at end of jet phase: Height feet) meters 39.1 feet </td <td>$\begin{aligned} & \text{where } (\theta_a/\theta_a)^{1/2} = (\theta_a/\theta_a)^{1/2} = 0.9685 \\ [(z-z_v)^2 - (6.25D-z_v)^2]]^{(1/3)} / a & \text{Sect.2.1(6)} \end{aligned}$</td>	$\begin{aligned} & \text{where } (\theta_a/\theta_a)^{1/2} = (\theta_a/\theta_a)^{1/2} = 0.9685 \\ [(z-z_v)^2 - (6.25D-z_v)^2]]^{(1/3)} / a & \text{Sect.2.1(6)} \end{aligned}$
Vertical Velocity V Solutions in Table Below {(Va) ₀ ³ + 0.12F ₀ [Product (Va) ₀ 9.840 m ² /s V _{ext} D/2(0,y0,y ^{1/2}) ngle Chiller Results: Solve for plume-averaged vertical velocity at height 500.0 feet 152.4 meters above gro Gives the following Height above Stack z' 141.567 meters* 464.5 feet 2a'=2*0.16(z'-z,) Vertical Velocity V 1.114 m/s 3.65 fi/sec V=((Va) ₀ ³ +0.12F ₀] Solve for Height of CASC critical vertical velocity V 1.114 m/s 3.65 fi/sec V=((Va) ₀ ³ +0.12F ₀] Find Height above Stack z _{ent} #N/A meters #N/A feet Solve for x=(z-z,) Height above Ground z _{ent} +h _s #N/A meters #N/A feet solve for x=(z-z,) Height above Ground z _{ent} +h _s 22.765 meters 39.1 feet Height above Ground z _{ent} +h _s 22.765 meters 39.1 feet Height above Ground z _{ent} +h _s 22.765 meters 39.1 feet ble of Plume Top-Hat Diameters (2a) and Plume-Averaged Plume SingleSitk Plume <	$[(z-z_{v})^{2} - (6.25D-z_{v})^{2}]]^{(1/3)} / a \qquad \text{Sect.2.1(6)}$ ound $(z'+h_{s})$ $\sum_{i=1}^{3} (z-z_{v})^{2} - (6.25D-z_{v})^{2}]]^{(1/3)} / (2a'/2) \qquad \text{Sect.2/Eq.6}$ $Critical VV < Top of the cubic equation ax^{3}+bx^{2}+cx+d=0, where$ 1, c=0, and b=-(0.12F_{o})/(V_{crit}^{3}0.16^{3})= -1.2 12F _o (6.25D-z_{v})^{2} (Va)^{3} / (V_{crit}^{3}0.16^{3})= -1.3i http://www.1728.org/cubic http://www.1728.o
Product (Va), 9.840 m²/s Veril D/2(θ,g/θ,g) ^{1/2} ngle Chiller Results: Solve for plume-averaged vertical velocity at height 500.0 feet 152.4 meters above group Gives the following Height above Stack z' 141.567 meters' 464.5 feet 2a'=2*0.16(2'-z,) Plume Top-Hat Diameter 2a' 45.173 meters' 148.2 feet 2a'=2*0.16(2'-z,) Vertical Velocity V 1.114 m/s 3.65 ft/sec V={(Va),3}+0.12F_{ol} Solve for Height of CASC critical vertical velocity V 1.114 m/s 3.65 ft/sec V={(Va),3}+0.12F_{ol} Find Height above Stack z _{erit} #N/A meters #N/A feet Solve for x=(z-z,) Height above Ground z _{erit} +hs WN/A meters #N/A feet for V=V _{erit} using tt Find Height above Ground z _{erit} +hs 22.765 meters 39.1 feet Height above Ground z _{erit} +hs 22.765 meters 39.1 feet Height above Ground z _{erit} +hs 22.765 meters 39.1 feet	ound (z'+h _s) $Sect.2/Eq.6$ $Sect.2/Eq.6$ $Sect.2/Eq.6$ $Critical VV < Top of the equation ax^3+bx^2+cx+d=0, where$ 1, c=0, and b=-(0.12F_o)/(V_{crit}^30.16^3)= -1.2 $12F_o(6.25D-z_v)^2 - (Va)_o^3/(V_{crit}^30.16^3)= -1.37$ $http://www.1728.org/cubic htere and the results of the results$
Solve for plume-averaged vertical velocity at height 500.0 feet 152.4 meters above gro Gives the following Height above Stack z' 141.567 meters* 464.5 feet* 2a'=2*0.16(z'-z,) Plume Top-Hat Diameter 2a' 45.173 meters 148.2 feet 2a'=2*0.16(z'-z,) Vertical Velocity V 1.114 m/s 3.65 ft/sec V={(Va) ₀ ³ +0.12F ₀ } Solve for Height of CASC critical vertical velocity V _{crit} 5.30 m/s plume-averaged vertical velocity Find Height above Stack z _{crit} #N/A meters #N/A feet Solve for X=(2-z_v) Height above Ground z _{crit} +hs #N/A meters #N/A feet Solve for X=(2-z_v) Height above Ground z _{crit} +hs 22.765 meters 39.1 feet and d=[0.1 Interpolated Height dove Ground z _{crit} +hs 22.765 meters 74.7 feet and d=[0.1 bible of Plume Top-Hat Diameters (2a) and Plume-Averaged Vertical Velocities starting at end of jet phase: Height (feet) meters 91.02 above ground above stack Radius(m) VertVel(m/s) Temp(K) 5.0.0 1.020 9.96 40.0 1.36 1.122 9.43 5.0.0 1.020 9.96 60.0 7.46 1.579 7	$\begin{array}{llllllllllllllllllllllllllllllllllll$
Solve for plume-averaged vertical velocity at height 500.0 feet 152.4 meters above group Gives the following Height above Stack z' 141.567 meters* 464.5 feet* Plume Top-Hat Diameter 2a' 45.173 meters 148.2 feet 2a'=2'0.16(z'-z,) Vertical Velocity V 1.114 m/s 3.65 ft/sec V={(Va)_o}^3+0.12F_o} Solve for Height of CASC critical vertical velocity V 1.114 m/s 3.65 ft/sec V={(Va)_o}^3+0.12F_o} Solve for Height of CASC critical vertical velocity V 1.114 m/s 3.65 ft/sec V={(Va)_o}^3+0.12F_o} Solve for Height of CASC critical vertical velocity V ft/sec 5.30 m/s plume-averaged vertical velocity Find Height above Ground z _{ent} +hs #N/A meters #N/A feet Solve for V=v _{ent} using the a=1, and d=[0.1 Interpolated Height above Ground z _{ent} +hs 22.765 meters 39.1 feet Height above Ground z _{ent} +hs 22.765 meters 74.7 feet abble of Plume Top-Hat Diameters (2a) and Plume-Averaged Vertical Velocities starting at end of jet phase: Height (feet) meters Plume SingleSik	$\begin{array}{llllllllllllllllllllllllllllllllllll$
Gives the following Height above Stack z' 141.567 meters* 464.5 feet* Plume Top-Hat Diameter 2a' 45.173 meters 148.2 feet 2a'=2*0.16(z'-z_v) Vertical Velocity V 1.114 m/s 3.65 ft/sec V={(Va)_3^+0.12F_0} Solve for Height of CASC critical vertical velocity V _{crit} 5.30 m/s plume-averaged vertical velocity Find Height above Stack z _{crit} #N/A meters #N/A feet Solve for x=(z-z_v) Height above Ground z _{crit} +h _s #N/A meters #N/A feet for V=V _{crit} using the a=1, Interpolated Height of critical vertical velocity in Jet Phase: Find Height above Stack z _{crit} 11.932 meters 39.1 feet Height above Ground z _{crit} +h _s 22.765 meters 74.7 feet above ground above stack Radius(m) VertVel(m/s) Stack.Rel.Ht = 35.5 0.00 1.020 9.96 40.0 1.36 1.122 9.43 50.0 4.41 1.351 8.24 60.0 7.46 1.579 7.05 70.0 10.50 1.807 5.86 Single Jet 5.3 m/s Height = 74.7 11.93 1.915 5.30	$\begin{array}{llllllllllllllllllllllllllllllllllll$
Plume Top-Hat Diameter 2a' 45.173 meters 148.2 feet 2a'=2*0.16(z'-z_i) Vertical Velocity V 1.114 m/s 3.65 ft/sec V=((Va)_0^3+0.12F_0) Solve for Height of CASC critical vertical velocity V 1.114 m/s 3.65 ft/sec V=((Va)_0^3+0.12F_0) Find Height above Stack z _{orit} #N/A meters #N/A feet Solve for V=V _{cini} using tr Height above Ground z _{orit} +hs #N/A meters #N/A feet for V=V _{cini} using tr Interpolated Height of critical vertical velocity in Jet Phase: a=1, and d=[0.1 and d=[0.1 Find Height above Ground z _{orit} +hs 22.765 meters 39.1 feet Height above Ground z _{orit} +hs 22.765 meters 39.1 feet Abbe of Plume Top-Hat Diameters (2a) and Plume-Averaged Vertical Velocities starting at end of jet phase: Height (feet) meters Plume SingleStk Plume above ground above stack z _{oit} 1.132 9.43 5.00 1.020 9.96 40.0 1.36 1.122 9.43 5.00 1.020 9.96 7.05 50.0 7.40	
Vertical Velocity V 1.114 m/s 3.65 ft/sec V={(Va)_0^3+0.12F_0^3} Solve for Height of CASC critical vertical velocity V _{ertit} 5.30 m/s plume-averaged vertical velocity Find Height above Stack Z _{ertit} #N/A meters #N/A feet Solve for X=(2z,2v) Height above Ground Z _{ertit} +hs #N/A meters #N/A feet for V=V _{erti} using tt Interpolated Height of critical vertical velocity in Jet Phase: 39.1 feet a=1, and d=[0.1 Find Height above Ground Z _{ertit} +hs 22.765 meters 39.1 feet and d=[0.1 Height above Ground Z _{ertit} +hs 22.765 meters 39.1 feet and d=[0.1 Height above Ground Z _{ertit} +hs 22.765 meters 74.7 feet and d=[0.1 above ground above stack Z _{ertit} 11.932 Plume SingleStk Plume above ground above stack Radius(m) VertVel(m/s) Temp(K) Temp(K) Stack.Rel.Ht = 35.5 0.00 1.020 9.96 40.0 1.36 1.122 9.43 50.0 70.0 1.050 5.30 5.30 Multi feet 1.600 7.46 1.579	
Solve for Height of CASC critical vertical velocity V _{erti} 5.30 m/s plume-averaged vertical velocity Find Height above Stack z _{ert} #N/A meters #N/A feet Solve for x=(z-z_v) Height above Ground z _{erti} +h _s #N/A meters #N/A feet Solve for x=(z-z_v) Height above Ground z _{erti} +h _s #N/A meters #N/A feet for V=V _{erti} using t Interpolated Height of critical vertical velocity in Jet Phase: aand d=[0.1 a=1, and d=[0.1 Find Height above Ground z _{erti} +h _s 22.765 meters 39.1 feet Height above Ground z _{erti} +h _s 22.765 meters 74.7 feet bible of Plume Top-Hat Diameters (2a) and Plume-Averaged Vertical Velocities starting at end of jet phase: Height (feet) (meters) Plume SingleSitk Plume above ground above stack Radius(m) VertVel(m/s) Temp(K) Temp(K) Stack.Rel.Ht = 35.5 0.00 1.020 9.96 40.0 1.36 1.122 9.43 50.0 74.6 1.579 7.05 70.0 1.050 1.807 5.86 60.0 7.46 1.579 7.05 70.0 5.30 5.30<	Critical VV < Top of Critica
Find Height above Stack Z _{crit} #N/A meters #N/A feet Solve for x=(z-z_v) Height above Ground Z _{crit} +hs #N/A meters #N/A feet for V=V _{crit} using tr Interpolated Height of critical vertical velocity in Jet Phase: 39.1 feet and d=[0.1 Find Height above Stack Z _{crit} 11.932 meters 39.1 feet Height above Ground Z _{crit} +hs 22.765 meters 74.7 feet bble of Plume Top-Hat Diameters (2a) and Plume-Averaged Vertical Velocities starting at end of jet phase: Height (feet) (meters) Plume SingleStk Plume above ground above stack Radius(m) VertVel(m/s) Temp(K) Temp(K) Stack.Rel.Ht = 35.5 0.00 1.020 9.96 40.0 1.36 1.122 9.43 50.0 4.41 1.351 8.24 60.0 7.46 1.579 7.05 70.0 10.50 1.807 5.86 5.30 5.30 5.30) simultaneously in both eqs. (i.e., Va and a) the cubic equation $ax^3+bx^2+cx+d=0$, where 1, c=0, and b=-(0.12F_{o})(V_{cnt}^30.16^3)= -1.2 12F_{o}(6.25D-z_{v})^2-(Va)_{o}^3]/(V_{cnt}^30.16^3)= -1.37 http://www.1728.org/cubic gives the real solution x = z-zv = 11. or z(m/above stack) = 11
Height above Ground z _{ent} +h _s #N/A meters #N/A feet for V=V _{ent} using tr Interpolated Height of critical vertical velocity in Jet Phase: and d=[0.1] Find Height above Stack z _{ent} 11.932 meters 39.1 feet Height above Ground z _{ent} +h _s 22.765 meters 39.1 feet Height above Ground z _{ent} +h _s 22.765 meters 74.7 feet Ibbe of Plume Top-Hat Diameters (2a) and Plume-Averaged Vertical Velocities starting at end of jet phase: Height (feet) (meters) Plume SingleStk Plume above ground above stack Radius(m) VertVel(m/s) Temp(K) Stack.Rel.Ht = 35.5 0.00 1.020 9.96 40.0 1.36 1.122 9.43 50.0 4.41 1.351 8.24 60.0 7.46 1.579 7.05 70.0 10.50 1.807 5.86 Single Jet 5.3 m/s Height = 74.7 11.93 1.915 5.30	the cubic equation $ax^3+bx^2+cx+d=0$, where 1, c=0, and b=-(0.12F _o)/(V _{crit} ³ 0.16 ³)= -1.2 $12F_o(6.25D-z_v)^2-(Va)_o^3]/(V_{crit}^30.16^3)= -137$ <u>http://www.1728.org/cubic</u> gives the real solution x = z-zv = 11. or z(m/above stack) = 11
a=1, and d=[0.1] Find Height above Stack Z _{ort} 11.932 meters 39.1 feet Height above Ground z _{ort} +h _s 22.765 meters 74.7 feet ble of Plume Top-Hat Diameters (2a) and Plume-Averaged Vertical Velocities starting at end of jet phase: Height (feet) (meters) Plume SingleStk Plume above ground above stack Radius(m) VertVel(m/s) Temp(K) Stack.Rel.Ht = 35.5 0.00 1.020 9.96 40.0 1.36 1.122 9.43 50.0 4.41 1.351 8.24 60.0 7.46 1.579 7.05 70.0 10.50 1.807 5.86 Single Jet 5.3 m/s Height = 74.7 11.93 1.915 5.30	$\begin{array}{llllllllllllllllllllllllllllllllllll$
Interpolated Height of critical vertical velocity in Jet Pise: and d=[0.1] Find Height above Stack z _{crit} 11.932 meters 39.1 feet Height above Ground z _{crit} +hs 22.765 meters 39.1 feet bible of Plume Top-Hat Diameters (2a) and Plume-Averaged Vertical Velocities starting at end of jet phase: nd d=[0.1] Height (feet) (meters) Plume SingleStk Plume above ground above stack Radius(m) VertVel(m/s) Temp(K) Stack.Rel.Ht = 35.5 0.00 1.020 9.96 40.0 1.36 1.122 9.43 50.0 7.0 1.357 7.05 70.0 10.50 1.807 5.86 Single Jet 5.3 m/s Height = 74.7 11.93 1.915 5.30	$\begin{split} & 12F_o(6.25D-z_v)^2 - (Va)_o^3]/(V_{ortit}^30.16^3) = & -137 \\ & \underline{http://www.1728.org/cubic} \\ & gives the real solution x = z-zv = & & 11. \\ & or z(m/above stack) = & & 112 \\ \end{split}$
Find Height above Stack z _{crit} 11.932 meters 39.1 feet Height above Ground z _{crit} +hs 22.765 meters 74.7 feet ble of Plume Top-Hat Diameters (2a) and Plume VertVelorStack starting at end of jet phase: Plume Babove ground above stack Radius(m) VertVel(m/s) Plume Stack. Rel. Ht = 35.5 0.00 1.020 9.96 40.0 1.36 1.122 9.43 50.0 4.41 1.351 8.24 60.0 7.4.6 1.579 7.05 70.0 10.50 1.807 5.86 Single Jet 5.3 m/s Height = 74.7 11.93 1.915 5.30	http://www.1728.org/cubic gives the real solution x = z-zv = 11. or z(m/above stack) = 11
Height above Ground z _{cnt} +hs 22.765 meters 74.7 feet able of Plume Top-Hat Diameters (2a) and Plume-Averaged Vertical Velocities starting at end of jet phase: Height (feet) (meters) Plume SingleStk Plume above ground above stack Radius(m) VertVel(m/s) Temp(K) Stack.Rel.Ht = 35.5 0.00 1.020 9.96 40.0 1.36 1.122 9.43 50.0 4.41 1.351 8.24 60.0 7.46 1.579 7.05 70.0 10.50 1.807 5.86 Single Jet 5.3 m/s Height = 74.7 11.93 1.915 5.30	gives the real solution x = z-zv = 11. or z(m/above stack) = 11
able of Plume Top-Hat Diameters (2a) and Plume-Averaged Vertical Velocities starting at end of jet phase:Height (feet)(meters)PlumeSingleStkPlumeabove groundabove stackRadius(m) VertVel(m/s)Temp(K)Stack.Rel.Ht = 35.50.001.0209.9640.01.361.1229.4350.04.411.5518.2460.07.461.5797.0570.010.501.8075.86Single Jet 5.3 m/s Height = 74.7	or z(m/above stack) = 11
Height (feet)(meters)PlumeSingleStkPlumeabove groundabove stackRadius(m) VertVel(ms)Temp(K)Stack.Rel.Ht = 35.50.001.0209.9640.01.361.1229.4350.04.411.3518.2460.07.461.5797.0570.010.501.8075.86Single Jet 5.3 m/s Height = 74.711.931.9155.30	· · · · ·
Height (feet)(meters)PlumeSingleSktPlumeabove groundabove stackRadius(m) VertVel(ms)Temp(K)Stack.Rel.Ht = 35.50.001.0209.9640.01.361.1229.4350.004.411.3518.2460.07.461.5797.0570.010.501.8075.86Single Jet 5.3 m/s Height = 74.711.931.9155.30	z(ft/above ground) =
Height (feet) (meters) Plume SingleStk Plume above ground above stack Radius(m) VertVel(ms) Temp(K) Stack.Rel.Ht = 35.5 0.00 1.020 9.96 Above ground 1.361 1.122 9.43 Above dtabble 4.41 1.351 8.24 Above dtable 0.746 1.579 7.05 Above dtable 1.807 5.86 5.30	
above ground above stack Radius(m) VertVel(m/s) Temp(K) Stack.Rel.Ht = 35.5 0.00 1.020 9.96 40.0 1.36 1.122 9.43 50.00 4.41 1.351 8.24 60.0 7.46 1.579 7.05 70.0 10.50 1.807 5.86 Single Jet 5.3 m/s Height = 74.7 11.93 1.915 5.30	
Stack.Rel.Ht = 35.5 0.00 1.020 9.96 40.0 1.36 1.122 9.43 50.0 4.41 1.351 8.24 60.0 7.46 1.579 7.05 70.0 10.50 1.807 5.86 Single Jet 5.3 m/s Height = 74.7 11.93 1.915 5.30	
50.0 4.41 1.351 8.24 60.0 7.46 1.579 7.05 70.0 10.50 1.807 5.86 Single Jet 5.3 m/s Height = 74.7 11.93 1.915 5.30	
60.0 7.46 1.579 7.05 70.0 10.50 1.807 5.86 Single Jet 5.3 m/s Height = 74.7 11.93 1.915 5.30	Jet Phase Eqs: 10 ft Interv
70.0 10.50 1.807 5.86 Single Jet 5.3 m/s Height = 74.7 11.93 1.915 5.30	Linearly interpolated from Stack Rel.Ht to Top of Je
Single Jet 5.3 m/s Height = 74.7 11.93 1.915 5.30	Spillane Equations:
	$V_{plume} = \{(Va)_o^3 + 0.12F_o[(z-z_v)^2 - (6.25D-z_v)^2]\}^{1/3} / a$
Top of Single jet = 77.4 12.75 1.076 4.09 210.22	$a = 0.16(z-z_v)$
	$\theta_p = \theta_s (1 + (1 - (\theta_e/\theta_s))^* (V_{exit} D^2/(4V_{plume}^* a^{2*} \lambda^2)$
80.0 13.55 2.104 4.70 310.32	CEC Staff Equation:
90.0 16.60 2.592 3.90 309.79	$V_{mp} = n^{0.25} V_{sp}$
100.0 19.65 3.079 3.37 308.23 110.0 23.70 3.567 3.00 207.15	Brigg's Equation: $V_{1} = -\frac{(2/2)}{(2/2)} + \frac{(3/2)}{(2/2)} + \frac{(1/2)}{(2/2)} + $
110.0 22.70 3.567 2.99 307.15 120.0 25.74 4.055 2.71 306.36	$V_{Brigg's} = (2/3) \times 1.6^{(3/2)} \times F_{mp}^{(1/2)} \times u^{(-1/2)} \times z^{(-1/2)}$ where $F_{mp} = nF_{sp}$
120.0 25.74 4.055 2.71 306.36 130.0 28.79 4.542 2.49 305.75	where r mp = III sp
150.0 26.79 4.942 2.49 505.75 150.0 34.89 5.518 2.18 305.28	
200.0 50.13 7.956 1.75 304.59	
250.0 65.37 10.394 1.53 303.63	50 ft Interv
300.0 80.61 12.833 1.39 303.16	50 ft Interv Max<5.3 m/s
350.0 95.85 15.271 1.30 302.90	50 ft Interv Max<5.3 m/s
400.0 111.09 17.710 1.22 302.73	
450.0 126.33 20.148 1.16 302.62	
500.0 141.57 22.586 1.11 302.54	
600.0 172.05 27.463 1.04 302.49	
700.0 202.53 32.340 0.98 302.41	
800.0 233.01 37.217 0.93 302.36	Max<5.3 m/s
900.0 <u>263.49 42.094 0.89 302.33</u>	Max<5.3 m/s
900.0 263.49 42.094 0.89 302.33 1000.0 293.97 46.970 0.86 302.31	Max<5.3 m/s
900.0263.4942.0940.89302.331000.0293.9746.9700.86302.311100.0324.4551.8470.83302.29	Max<5.3 m/s
900.0263.4942.0940.89302.331000.0293.9746.9700.86302.311100.0324.4551.8470.83302.291200.0354.9356.7240.81302.28	Max<5.3 m/s
900.0263.4942.0940.89302.331000.0293.9746.9700.86302.311100.0324.4551.8470.83302.291200.0354.9356.7240.81302.281300.0385.4161.6010.79302.27	Max<5.3 m/s
900.0263.4942.0940.89302.331000.0293.9746.9700.86302.311100.0324.4551.8470.83302.291200.0354.9356.7240.81302.281300.0385.4161.6010.79302.271500.0446.3771.3540.75302.26	Max<5.3 m/s
900.0263.4942.0940.89302.331000.0293.9746.9700.86302.311100.0324.4551.8470.83302.291200.0354.9356.7240.81302.281300.0385.4161.6010.79302.271500.0446.3771.3540.75302.262000.0598.7795.7380.68302.25	Max<5.3 m/s
900.0263.4942.0940.89302.331000.0293.9746.9700.86302.311100.0324.4551.8470.83302.291200.0354.9356.7240.81302.281300.0385.4161.6010.79302.271500.0446.3771.3540.75302.262000.0598.7795.7380.68302.252500.0751.17120.1220.63302.24	Max<5.3 m/s
900.0263.4942.0940.89302.331000.0293.9746.9700.86302.311100.0324.4551.8470.83302.291200.0354.9356.7240.81302.281300.0365.4161.6010.79302.271500.0446.3771.3540.75302.262000.0598.7795.7380.68302.252500.0751.17120.1220.63302.243000.0903.57144.5060.59302.23	Max<5.3 m/s
900.0263.4942.0940.89302.331000.0293.9746.9700.86302.311100.0324.4551.8470.83302.291200.0354.9356.7240.81302.281300.0385.4161.6010.79302.271500.0446.3771.3540.75302.262000.0598.7795.7380.68302.252500.0751.17120.1220.63302.24	Max<5.3 m/s

*Winter Min = Monthly Mean of Minimum Daily Temperatures for 1971-2000 (Lowest in Dece 302.22 NOAA Sources: Climatography of the United

MERGED (along length) Plume Average Vertical Velocities for SVY03A CRACs using CEC Staff Methodology - Winter Min*

"Aviation Safety and Buoyant Plumes," Peter Best, et. al.

	"The Evaluat	ion of Maxir	num Updraft S	peeds for (Calm Conditior	is at Various Heights in the Merged	
						n at Oakey, Queensland, Australia,	
Ambient Conditions:					Constants: As	ssume neutral conditions (d0/dz=0 or	$\theta_a = \theta_e$)
Ambient Potential Temp θ_a	302.21	Kelvins	84.3	°F	Crewitzer	0.3048 meters/feet	
Plume Exit Conditions: Stack Height h _s	10.92	meters	25 6/12	feet-inches	Gravity g λ	9.81 m/s ² 1.11	
Individual Stack Diameter D	2.040382			inches	λ.	~1.0	
Stack Velocity Vevit	9.96			ft/sec	4Vol/(60πD ²)	1.0	
Individual Volumetric Flow		cu.m/sec		ACFM	$\pi V_{exit} D^2/4$		Sect.2/¶1
Stack Potential Temp θ _s		Kelvins	120.3		BAIL -		
Initial Stack Buoyancy Flux Fo	6.31	m ⁴ /s ³	36.0	ΔT(°F)	$gV_{exit}D^2(1-\theta_a/\theta$	$_{\rm s})/4 = {\rm Vol.Flow}(g/\pi)(1-\theta_{\rm a}/\theta_{\rm s})$	Sect.2/¶1
Plume Buoyancy Flux F		m ⁴ /s ³			$\lambda^2 g V a^2 (1 - \theta_a / \theta_f)$) for a, V, θ_p at plume height (see below	w)
Total Number of Stacks n							
Average Adjacent Stack Separation d		meters	7.0	feet		n multiple plume treatment in Peter Be	
Number of Stacks along Orientation N	9					es increased by N ^{0.25} at the height whe nterp. below ht, single merged stack a	
Conditions at End (Top) of Jet Phase:					fully merged (i	nterp. below ht, single merged stack a	bove nt)
Height above Stack z _{iet}	12 752	meters*	41.8	feet*	z⊶ = 6.25D m	eters*=meters above stack top	Sect.3/¶1
Height above Ground z _{iet} +h _s		meters		feet	Zjet - 0.200, 11		"
Vertical Velocity Viet				ft/sec	V _{jet} = 0.5V _{exit} =	V _{exit} /2	
Plume Top-Hat Diameter 2a _{jet}		meters	13.4	feet	2a _{jet} = 2D	Conservation of momentum	
Spillane Methodology - Analytical Solutions for	Calm Conditi	ons for Plu	ne Heights ab	ove Jet and	d Merging Phas	es	
Single Plume-averaged Vertical Velocity V		-			ct Va given by	equations below:	
Single Plume Values: Plume Top-Hat Radius a		sed in Plum	e Merging Only	/	$a = 0.16(z-z_v),$	or linear increase with height	Sect.2/Eq.6
Virtual Source Height z _v		meters*		feet*	z _v = 6.25D[1-($(\theta_e/\theta_s)^{1/2}]$, meters*=meters above stack top	Sect.2/Eq.6
Height above Ground z _v +h _s		meters		feet		where $(\theta_a/\theta_s)^{1/2} = (\theta_e/\theta_s)^{1/2}$	
Single Plume Values: Vertical Velocity V			e Merging Only	/		= ₀ [(z-z _v) ² - (6.25D-z _v) ²]} ^(1/3) / a	Sect.2.1(6)
Product (Va) _o	9.840	m²/s			$V_{exit}(D/2)(\theta_e/\theta_s)$) ^{1/2}	
Plume Merging - Based on Single Plume Calcu					_		Sect.3/¶3
Begin Merging Plume Top-Hat Diameter 2atouch		meters		feet	2a _{touch} =d, (or a		
Height above Stack z _{touch}		meters*		feet*	$z_{touch} = z_v + d/(2$	*0.16), meters*=meters above stack t	юр
Height above Ground z _{touch} +h _s		meters		feet			
Vertical Velocity Vtouch				ft/sec		$(1.12F_{o} [(z-z_{v})^{2} - (6.25D-z_{v})^{2}])^{(1/3)} / a$	
Total Merging Plume Top-Hat Diameter 2a _{full}		meters		feet		2, (or a _{full} =d(N-1)/2) FOR 2 STACKS,	
Height above Stack z _{full}		meters*	176.0		$z_{full} = z_v + 2d/(2)$	*0.16), meters*=meters above stack to	ор
Height above Ground z _{full} +h _s		meters	211.6			2	
Vertical Velocity V _{full}	1.690		5.5	ft/sec	$V_{full} = \{(Va)_o^3 +$	$-0.12F_{o} [(z_{full}-z_{v})^{2} - (6.25D-z_{v})^{2}]\}^{(1/3)} / a$	a _{full}
Product (V ³ a) _{full}		m ⁴ /s ³	. In Manual	Diama and			
Conditions at End (Top) of Merging Phase - Det			a _{full} in Merged	Plume calc			
Merged Plume Values: Plume Diameter 2a				faat		0.16(z-z _{full})), or linear increase with h	eignt
Revised Merged Plume Radius a _m Revised Merged Plume Velocity V _m		meters		feet ft/sec		²⁵ a _{full} where Total Merging Occurs	
Revised Virtual Source Height z _{full}			9.00	IU SEC	and $v_m = n^2$	²⁵ V _{full} where Total Merging Occurs	
Revised virtual Source Height Zfull			170.0	60.04*		staali udaana Tatal Mansing Ossuna (sh	
Boyland Vartical Valanty V		meters*	176.0 Tables Below	feet*	Height above	stack where Total Merging Occurs (sh	
Revised Vertical Velocity V			176.0 Tables Below	feet*	Height above V={n(V ³ a) _{full} /a]	^{1/3} for heights above total merging ele	
				feet*	Height above V={n(V ³ a) _{full} /a]	$v_{touch}^{1/3}$ for heights above total merging electron $v_{touch}^{1/3}$ (z-z _{touch})/(z _{full} -z _{touch})	evation
Multiple Plume Calculations	s	Solutions in	Tables Below		Height above V={n(V ³ a) _{full} /aj V=V _{touch} +(V _m -Y	^{1/3} for heights above total merging ele / _{touch})*(z-z _{touch})/(z _{full} -z _{touch}) for heights below total merg	evation
Multiple Plume Calculations Solve for plume-averaged vertical velo	s ocity at height	Solutions in 500.0	Tables Below feet	152.4	Height above V={n(V ³ a) _{full} /aj V=V _{touch} +(V _m -) H meters above	^{1/3} for heights above total merging ele V _{touch})*(z-z _{touch})/(z _{tall} -z _{touch}) for heights below total merg ground (z+h _s)	evation
Multiple Plume Calculations Solve for plume-averaged vertical velo Gives the following Height above Stack z	s ocity at height 141.567	Solutions in 500.0 meters*	Tables Below feet 464.5	152.4 feet*	Height above V={n(V ³ a) _{full} /aj V=V _{touch} +(V _m - meters above REGULAR EC	^{1/3} for heights above total merging ele V _{touch})*(z-z _{touch})/(z _{tulr} -z _{touch}) for heights below total merg ground (z+h _s) NS	evation
Multiple Plume Calculations Solve for plume-averaged vertical velo Gives the following Height above Stack z Plume Top-Hat Radius a	s city at height 141.567 28.824	500.0 meters* meters	Tables Below feet 464.5 94.6	152.4 feet* feet	Height above $V=\{n(V^3a)_{full}/a\}$ $V=V_{touch}+(V_m^{-1})^2$ Henters above REGULAR EC $a=a_m+0.16(z-z)^2$	^{1/3} for heights above total merging electropy of the state of the	evation
Multiple Plume Calculations Solve for plume-averaged vertical velo Gives the following Height above Stack z	s ocity at height 141.567	500.0 meters* meters	Tables Below feet 464.5 94.6	152.4 feet*	Height above $V=\{n(V^3a)_{full}/a\}$ $V=V_{touch}+(V_m^{-1})^{-1}$ Henters above REGULAR EC $a=a_m+0.16(Z-Z)^{-1}$ $V=\{n(V^3a)_{full}/a\}$	^{1/3} for heights above total merging electrony ^{1/3} for heights above total merging electrony ^{1/3} (z-z _{touch}) [*] (z-z _{touch})(z _{ful} -z _{touch}) for heights below total merging ground (z+h _s) NS full if z>z _{full} ^{1/3} if z>z _{full}	evation
Multiple Plume Calculations Solve for plume-averaged vertical velo Gives the following Height above Stack z Plume Top-Hat Radius a	s city at height 141.567 28.824	500.0 meters* meters	Tables Below feet 464.5 94.6	152.4 feet* feet	Height above $V=\{n(V^3a)_{tull}/a, V=V_{touch}+(V_m)^2$ Here the two provided in tw	^{1/3} for heights above total merging electrony ^{1/3} for heights above total merging electrony ^{1/3} (z-t _{iouch}) [*] (z-z _{touch})(z _{full} -z _{touch}) for heights below total merging ground (z+h ₀) NS full if z>z _{full} ^{1/3} if z>z _{full} V _{touch}) [*] (z'-z _{touch})/(z _{kull} -z _{touch}) if z _{touch} <z< p=""></z<>	evation
Multiple Plume Calculations Solve for plume-averaged vertical velo Gives the following Height above Stack z Plume Top-Hat Radius a Vertical Velocity V	s city at height 141.567 28.824 2.342	500.0 500.0 meters* meters m/s	Tables Below feet 464.5 94.6 7.68	152.4 feet* feet	Height above $\begin{array}{l} V=\{n(V^3a)_{ull}/a\\ V=V_{buch}+(V_m^{-1})\\ V=V_{buch}+(V_m^{-1})\\ V=V_{buch}+(V_m^{-1})\\ V=G(UAR EC)\\ a=a_m+0.16(z-z)\\ V=\{n(V^3a)_{ull}/a]\\ V=V_{buch}+(V_m^{-1})\\ V=single plum \end{array}$	¹¹³ for heights above total merging ele V _{touch})*(z-z _{touch})/(Z _{tull} -Z _{touch}) for heights below total merg ground (z+h _s) NS v _{tull}) if z>z _{full} ¹¹³ if z>z _{full} V _{touch})*(z'-z _{touch})(Z _{tull} -Z _{touch}) if z _{touch} <z< p=""></z<>	evation ing elevation S _{full}
Multiple Plume Calculations Solve for plume-averaged vertical velo Gives the following Height above Stack z Plume Top-Hat Radius a Vertical Velocity V Solve for Height of CASC critical vertica	s bocity at height 141.567 28.824 2.342 al velocity V _{crit}	500.0 500.0 meters* meters m/s 5.30	Tables Below feet 464.5 94.6 7.68 m/s	152.4 feet* feet ft/sec	Height above $\begin{array}{l} V=\{n(V^3a)_{ull}/a]\\ V=V_{louch}+(V_m^{-1})\\ V=V_{louch}+(V_m^{-1})\\ REGULAR EC\\ a=a_m+0.16(z-z\\ V=\{n(V^3a)_{ull}/a]\\ V'=V_{louch}+(V_m^{-1})\\ V'=single plun\\ LESS THAN T$	 ^{1/3} for heights above total merging electrony (2-ztouch)/(Ztult-Ztouch)) for heights below total merging ground (z+h₃) for beights below total merging for the state st	evation ing elevation S _{full}
Multiple Plume Calculations Solve for plume-averaged vertical veloc Gives the following Height above Stack z Plume Top-Hat Radius a Vertical Velocity V Solve for Height of CASC critical vertica Find Height above Stack z _{ort}	s botity at height 141.567 28.824 2.342 2.342 al velocity V _{orit} 35.345	500.0 meters* meters m/s 5.30 meters	Tables Below feet 464.5 94.6 7.68 m/s 116.0	152.4 feet* feet ft/sec feet	$\begin{array}{l} \mbox{Height above}\\ V=\{n(V^3a)_{tul}/a]\\ V=V_{touch}+(V_m^{-1})\\ \mbox{meters above}\\ REGULAR EC\\ a=a_m+0.16(z-z\\ V=(n(V^3a)_{tul}/a]\\ V=V_{touch}+(V_m^{-1})\\ V=single plum\\ U=SS THAN T\\ z_{cnt}=z_{tul}+\{[n]$	^{1/3} for heights above total merging electropy of the second	evation ing elevation z _{full}
Multiple Plume Calculations Solve for plume-averaged vertical velo Gives the following Height above Stack z Plume Top-Hat Radius a Vertical Velocity V Solve for Height of CASC critical vertica	s botity at height 141.567 28.824 2.342 2.342 al velocity V _{orit} 35.345	500.0 500.0 meters* meters m/s 5.30	Tables Below feet 464.5 94.6 7.68 m/s	152.4 feet* feet ft/sec feet	$\begin{array}{l} \mbox{Height above}\\ V=\{n(V^3a)_{tul}/a]\\ V=V_{touch}+(V_m^{-1})\\ \mbox{meters above}\\ REGULAR EC\\ a=a_m+0.16(z-z\\ V=(n(V^3a)_{tul}/a]\\ V=V_{touch}+(V_m^{-1})\\ V=single plum\\ U=SS THAN T\\ z_{cnt}=z_{tul}+\{[n]$	 ^{1/3} for heights above total merging electrony (2-ztouch)/(Ztult-Ztouch)) for heights below total merging ground (z+h₃) for beights below total merging for the state st	evation ing elevation z _{full}
Multiple Plume Calculations Solve for plume-averaged vertical veluc Gives the following Height above Stack z Plume Top-Hat Radius a Vertical Velocity V Solve for Height of CASC critical vertica Find Height above Stack z _{ert} Height above Ground z _{ent} +h _a	s bocity at height 141.567 28.824 2.342 al velocity V _{ort} 35.345 46.177	500.0 meters* meters m/s 5.30 meters meters	Tables Below feet 464.5 94.6 7.68 m/s 116.0 151.5	152.4 feet* feet ft/sec feet	Height above $\forall = \{n(\sqrt{a})_{hull} a \}$ $\forall = \sqrt{a}, \ \sqrt{a} \}$ $\forall = \sqrt{buch} + (\sqrt{m^2})$ Henters above REGULAR EC $a=a_m + 0.16(z-z)$ $\forall = \{n(\sqrt{a})_{hull} a \}$ $\forall = \sqrt{buch} + (\sqrt{m^2})$ $\forall = \sqrt{buch} + (\sqrt{m^2})$ $\forall = \sqrt{buch} + (\sqrt{m^2})$ $\forall = \sqrt{buch} + (2f_{HI})$ $z_{crit} = z_{hull} + [(n z_{crit} = z_{huch}) + (2f_{HI})]$	^{1/3} for heights above total merging electropy of the second	evation ing elevation z _{full} vL V _m
Multiple Plume Calculations Solve for plume-averaged vertical veluc Gives the following Height above Stack z Plume Top-Hat Radius a Vertical Velocity V Solve for Height of CASC critical vertica Find Height above Stack z _{ert} Height above Ground z _{ent} +h _a	s bocity at height 141.567 28.824 2.342 al velocity V _{ort} 35.345 46.177	500.0 meters* meters m/s 5.30 meters meters	Tables Below feet 464.5 94.6 7.68 m/s 116.0 151.5	152.4 feet* feet ft/sec feet	$\begin{array}{l} \mbox{Height above}\\ V=\{n(V^3a)_{hull}/a)\\ V=V_{buch}+(V_m^{-1})\\ \mbox{Height above}\\ REGULAR EC\\ a=a_m+0.16(z-z)\\ V=\{n(V^3a)_{hull}/a)\\ V=\{n(V^3a)_{hull}/a)\\ V=V_{buch}+(V_m^{-1})\\ V=V_{buch}+(V_m^$	^{1/3} for heights above total merging electrony (z-t _{iouch})*(z-z _{touch})(z _{tul} -z _{touch}) for heights below total merging ground (z+h _a) (NS (z _{tul} -z _{tul})) (z _{tul} -z _{tul}) (z-z _{tul}) (z-z _{tul}) (z _{tul} -z _{tul}) (z-z _{tul}) (z-z _{tul}) (z _{tul} -z _{tul}) (z-z _{tul}) (z-z _{tul}) (z _{tul} -z _{tul}) (z-z _{tul}) (z-z _{tul}) (z _{tul} -z _{tul}) (z-z _{tul}) (z _{tul} -z _{tul}) (z-z _{tu}) (z-z _{tul}) (z-z _{tul}) (z-z _{tul}) (z-z	evation ing elevation z _{full} vL V _m
Multiple Plume Calculations Solve for plume-averaged vertical velu Gives the following Height above Stack z Plume Top-Hat Radius a Vertical Velocity V Solve for Height of CASC critical vertica Find Height above Stack z _{crit} Height above Ground z _{crit} +h _s Table of MERGED Plume-Averaged Vertical Velocity	5 cotty at height 141.567 28.824 2.342 al velocity V _{orit} 35.345 46.177 locities startin (meters)	Solutions in 500.0 meters* meters m/s 5.30 meters meters g at Touchi Plume	Tables Below feet 464.5 94.6 7.68 m/s 116.0 151.5 ng Height:	152.4 feet* feet ft/sec feet	$\begin{array}{l} \mbox{Height above}\\ V=\{n(V^3a)_{hull}/a)\\ V=V_{buch}+(V_m^{-1})\\ \mbox{Height above}\\ REGULAR EC\\ a=a_m+0.16(z-z)\\ V=\{n(V^3a)_{hull}/a)\\ V=\{n(V^3a)_{hull}/a)\\ V=V_{buch}+(V_m^{-1})\\ V=V_{buch}+(V_m^$	^{1/3} for heights above total merging electrony (2-ztouch)/(Ztult-Ztouch)) for heights below total merging ground (z+h ₂) (NS full) if z>z _{full} ^{1/3} if z>z _{full} ^{1/3} if z>z _{full} ^{1/3} trzztull Vtouch)*(Z-ztouch)/(Ztult-Ztouch) if ztouch <z< p=""> e values if z<ztouch 'OP OF MERGING PHASE-INTERPO (V³a)_{bull}/(V_{ctll}*)_{am})/0.16 if V_{ctll}</ztouch </z<>	evation ing elevation z _{full} vL V _m
Multiple Plume Calculations Solve for plume-averaged vertical veloc Gives the following Height above Stack z Plume Top-Hat Radius a Vertical Velocity V Solve for Height of CASC critical vertical Find Height above Stack z _{ent} Height above Ground z _{ent} +h _s Table of MERGED Plume-Averaged Vertical Velocity V	5 cotty at height 141.567 28.824 2.342 al velocity V _{orit} 35.345 46.177 locities startin (meters)	Solutions in 500.0 meters* meters m/s 5.30 meters meters g at Touchi Plume	Tables Below feet 464.5 94.6 7.68 m/s 116.0 151.5 ng Height: Vert.	152.4 feet* feet ft/sec feet	Height above $\begin{array}{l} \forall = (n(\sqrt{3}a)_{hull}/a) \\ \forall = \sqrt{n}(\sqrt{3}a)_{hull}/a) \\ \forall = \sqrt{n}(\sqrt{n}(\sqrt{3}a)_{hull}/a) \\ \forall = \sqrt{n}(\sqrt{n}(\sqrt{n}(\sqrt{3}a)) \\ \forall = \sqrt{n}(\sqrt{n}(\sqrt{n}(\sqrt{n}a)) \\ \forall = \sqrt{n}(\sqrt{n}(\sqrt{n}(\sqrt{n}(\sqrt{n}a))) \\ \forall = \sqrt{n}(\sqrt{n}(\sqrt{n}(\sqrt{n}a)) \\ \forall = \sqrt{n}(\sqrt{n}(\sqrt{n}(\sqrt{n}a)$	^{1/3} for heights above total merging electrony (2-ztouch)/(Ztult-Ztouch)) for heights below total merging ground (z+h ₂) (NS full) if z>z _{full} ^{1/3} if z>z _{full} ^{1/3} if z>z _{full} ^{1/3} trzztull Vtouch)*(Z-ztouch)/(Ztult-Ztouch) if ztouch <z< p=""> e values if z<ztouch 'OP OF MERGING PHASE-INTERPO (V³a)_{bull}/(V_{ctll}*)_{am})/0.16 if V_{ctll}</ztouch </z<>	evation ing elevation z _{full} vL V _m
Multiple Plume Calculations Solve for plume-averaged vertical veluc Gives the following Height above Stack z Plume Top-Hat Radius a Vertical Velocity V Solve for Height of CASC critical vertical Find Height above Stack z _{crit} Height above Ground z _{crit} +h _s Fable of MERGED Plume-Averaged Vertical Vel Height (feet) above ground	s botty at height 141.567 28.824 2.342 al velocity V _{orit} 35.345 46.177 locities startin (meters) above stack 7.06	Solutions in 500.0 meters* meters m/s 5.30 meters meters g at Touchi Plume Radius(m)	Tables Below feet 464.5 94.6 7.68 m/s 116.0 151.5 ng Height: Vert. Vel(m/s)	152.4 feet* feet ft/sec feet feet	Height above $\begin{array}{l} \forall = (n(\sqrt{3}a)_{hull}/a) \\ \forall = \sqrt{n}(\sqrt{3}a)_{hull}/a) \\ \forall = \sqrt{n}(\sqrt{n}(\sqrt{3}a)_{hull}/a) \\ \forall = \sqrt{n}(\sqrt{n}(\sqrt{n}(\sqrt{3}a)) \\ \forall = \sqrt{n}(\sqrt{n}(\sqrt{n}(\sqrt{n}a)) \\ \forall = \sqrt{n}(\sqrt{n}(\sqrt{n}(\sqrt{n}(\sqrt{n}a))) \\ \forall = \sqrt{n}(\sqrt{n}(\sqrt{n}(\sqrt{n}a)) \\ \forall = \sqrt{n}(\sqrt{n}(\sqrt{n}(\sqrt{n}a)$	$\label{eq:constraints} \begin{split} & {}^{1/3} \mbox{ for heights above total merging elec} \\ & {}^{I_{couch}}(z_{-z_{louch}})(z_{full-z_{louch}}) \\ & \mbox{ for heights below total merg} \\ & \mbox{ ground } (z_{+h_0}) \\ & \mbox{ NS} \\ & \mbox{ full } \mbox{ if } z_{-z_{louch}})(z_{hll}-z_{louch}) \mbox{ if } z_{-z_{louch}}) \\ & \mbox{ figure } z_{-z_{louch}})(z_{-z_{louch}})(z_{hll}-z_{louch}) \mbox{ if } z_{-z_{louch}}) \\ & \mbox{ figure } z_{-z_{louch}})(z_{-z_{louch}})(z_{hll}-z_{louch}) \mbox{ if } z_{-z_{louch}}) \\ & \mbox{ (V_{crit}V_{-z_{louch}})}(z_{-z_{louch})(z_{hll}-z_{louch}) \mbox{ if } v_{-rit} < v_m \\ & \mbox{ couch } z_{-z_{louch}})(v_{-rit}V_{-z_{louch}})(v_{-rit}-v_{-z_{louch}}) \mbox{ if } v_{-rit} < z_{-z_{louch}}) \\ & \mbox{ Eqns (see Single Plume spreadsheet, } \\ & \mbox{ 2F}_{nl}(z_{-z_{1}}^{-2}(-6.25D-z_{1})^{2})^{1/2} / a \\ & \mbox{ (} \theta_{-y})^{*}(V_{-rit}U^{2}(4V_{clum}+a^{-2}\lambda^{2}))) \\ & \end{tabular}$	vation ing elevation Z _{full})L Vm
Multiple Plume Calculations Solve for plume-averaged vertical velo Gives the following Height above Stack z Plume Top-Hat Radius a Vertical Velocity V Solve for Height of CASC critical vertical Find Height above Stack z _{ert} Height above Ground z _{ert} +h _s Fable of MERGED Plume-Averaged Vertical Vel Height (feet) above ground Begin Merging (touch) = 58.7	s city at height 141.567 28.824 2.342 al velocity V _{orit} 35.345 46.177 locities startin (meters) above stack 7.06 7.46	Solutions in 500.0 meters' meters m/s 5.30 meters meters eg at Touchi Plume Radius(m) 1.065	Tables Below feet 464.5 94.6 7.68 116.0 151.5 ng Height: Vert. Vert. Vel(m/s) 8.97	152.4 feet* feet ft/sec feet feet	$\begin{array}{l} \mbox{Height above} \\ \mbox{V=}\{n(V^3a)_{hull} a] \\ \mbox{V=V_{buch}+(V_m^2)} \\ \mbox{Height above} \\ \mbox{Regular Bove} \\ \mbox{Regular Bove} \\ \mbox{Regular Bove} \\ \mbox{Regular Bove} \\ \mbox{V=}\{n(V^3a)_{hull} a] \\ \mbox{V=}\{n(V^3a)_{$	$\label{eq:constraints} \begin{split} & {}^{1/3} \mbox{ for heights above total merging elec} \\ & {}^{I_{couch}}(z_{-z_{louch}})(z_{full-z_{louch}}) \\ & \mbox{ for heights below total merg} \\ & \mbox{ ground } (z_{+h_0}) \\ & \mbox{ NS} \\ & \mbox{ full } \mbox{ if } z_{-z_{louch}})(z_{hll}-z_{louch}) \mbox{ if } z_{-z_{louch}}) \\ & \mbox{ figure } z_{-z_{louch}})(z_{-z_{louch}})(z_{hll}-z_{louch}) \mbox{ if } z_{-z_{louch}}) \\ & \mbox{ figure } z_{-z_{louch}})(z_{-z_{louch}})(z_{hll}-z_{louch}) \mbox{ if } z_{-z_{louch}}) \\ & \mbox{ (V_{crit}V_{-z_{louch}})}(z_{-z_{louch})(z_{hll}-z_{louch}) \mbox{ if } v_{-rit} < v_m \\ & \mbox{ couch } z_{-z_{louch}})(v_{-rit}V_{-z_{louch}})(v_{-rit}-v_{-z_{louch}}) \mbox{ if } v_{-rit} < z_{-z_{louch}}) \\ & \mbox{ Eqns (see Single Plume spreadsheet, } \\ & \mbox{ 2F}_{nl}(z_{-z_{1}}^{-2}(-6.25D-z_{1})^{2})^{1/2} / a \\ & \mbox{ (} \theta_{-y})^{*}(V_{-rit}U^{2}(4V_{clum}+a^{-2}\lambda^{2}))) \\ & \end{tabular}$	avation ing elevation Z _{full})L V _m)
Multiple Plume Calculations Solve for plume-averaged vertical veluc Gives the following Height above Stack z Plume Top-Hat Radius a Vertical Velocity V Solve for Height of CASC critical vertica Find Height above Stack z _{crit} Height above Ground z _{crit} +h _s fable of MERGED Plume-Averaged Vertical Vel Height (feet) above ground Begin Merging (touch) = 58.7 60.0	s city at height 141.567 28.824 2.342 al velocity V _{orti} 35.345 46.177 locities startin (meters) above stack 7.46 7.46 13.55	Solutions in 500.0 meters* m/s 5.30 meters meters ag at Touchi Plume Radius(m) 1.065 #N/A #N/A	Tables Below feet 464.5 94.6 7.68 m/s 116.0 151.5 ng Height: Vert. Vert. Vel(m/s) 8.97 8.92	152.4 feet* feet ft/sec feet feet	$\begin{array}{l} \mbox{Height above} \\ \mbox{V=}\{n(V^3a)_{hull} a] \\ \mbox{V=V_{buch}+(V_m^2)} \\ \mbox{Height above} \\ \mbox{Regular Bove} \\ \mbox{Regular Bove} \\ \mbox{Regular Bove} \\ \mbox{Regular Bove} \\ \mbox{V=}\{n(V^3a)_{hull} a] \\ \mbox{V=}\{n(V^3a)_{$	$\label{eq:constraints} \begin{split} & ^{1/3} \mbox{ for heights above total merging elec} \\ & V_{touch})^*(2\text{-}Z_{touch})/(Z_{tull}\text{-}Z_{touch}) \\ & \mbox{ for heights below total merg} \\ & \mbox{ ground} (z+h_a) \\ & \mbox{NS} \\ & \mbox{ support} \\ & \mbox{ for z-z_{tull}} \\ & \mbox{ Value} \\ & \mbox{ for z-z_{tull}} \\ & \mbox{ Value} \\ & \mbox{ for z-z_{tull}} \\ & \mbox{ Value} \\ & \mbox{ for z-z_{tull}} \\ & \mbox{ Constraints} \\ & \mbox{ for z-z_{tull}} \\ & \mbox{ Nouch})'(Z_{tull}\text{-}Z_{touch}) \mbox{ if z-z_{touch}} \\ & \mbox{ or points} \\ & \mbox{ For z-z_{tull}} \\ & \mbox{ OP OF MERGING PHASE-INTERPO} \\ & \mbox{ (V^3a)}_{h_{HI}}/(V_{cull})^3]\mbox{ -}a_{HI} \\ & \mbox{ for z-z_{tull}} \\ & $	avation ing elevation Z _{full})L V _m)
Aultiple Plume Calculations Solve for plume-averaged vertical veloc Gives the following Height above Stack z Plume Top-Hat Radius a Vertical Velocity V Solve for Height of CASC critical vertica Find Height above Stack z _{ent} Height above Ground z _{ent} +h _s Table of MERGED Plume-Averaged Vertical Vel Height (feet) above ground Begin Merging (touch) = 58.7 60.0 80.0	s city at height 141.567 28.824 2.342 at velocity V _{crit} 35.345 46.177 locities startin (meters) above stack 7.06 7.46 13.55 19.65	Solutions in 500.0 meters* m/s 5.30 meters meters eters g at Touchi Plume Radius(m) 1.065 #N/A #N/A	Tables Below feet 464.5 94.6 7.68 m/s 116.0 151.5 ng Height: Vert. Vel(m/s) 8.92 8.92 8.12	152.4 feet fu/sec feet feet	$\begin{array}{l} \mbox{Height above} \\ \mbox{V=}\{n(V^3a)_{hull} a] \\ \mbox{V=V_{buch}+(V_m^2)} \\ \mbox{Height above} \\ \mbox{Regular Bove} \\ \mbox{Regular Bove} \\ \mbox{Regular Bove} \\ \mbox{Regular Bove} \\ \mbox{V=}\{n(V^3a)_{hull} a] \\ \mbox{V=}\{n(V^3a)_{$	$\label{eq:constraints} \begin{split} & ^{1/3} \mbox{ for heights above total merging elec} \\ & V_{touch})^*(2\text{-}Z_{touch})/(Z_{tull}\text{-}Z_{touch}) \\ & \mbox{ for heights below total merg} \\ & \mbox{ ground} (z+h_a) \\ & \mbox{NS} \\ & \mbox{ support} \\ & \mbox{ for z-z_{tull}} \\ & \mbox{ Value} \\ & \mbox{ for z-z_{tull}} \\ & \mbox{ Value} \\ & \mbox{ for z-z_{tull}} \\ & \mbox{ Value} \\ & \mbox{ for z-z_{tull}} \\ & \mbox{ Constraints} \\ & \mbox{ for z-z_{tull}} \\ & \mbox{ Nouch})'(Z_{tull}\text{-}Z_{touch}) \mbox{ if z-z_{touch}} \\ & \mbox{ or points} \\ & \mbox{ For z-z_{tull}} \\ & \mbox{ OP OF MERGING PHASE-INTERPO} \\ & \mbox{ (V^3a)}_{h_{HI}}/(V_{cull})^3]\mbox{ -}a_{HI} \\ & \mbox{ for z-z_{tull}} \\ & $	avation ing elevation Z _{full})L V _m)
Multiple Plume Calculations Solve for plume-averaged vertical veloc Gives the following Height above Stack z Plume Top-Hat Radius a Vertical Velocity V Solve for Height of CASC critical vertical Find Height above Stack z _{crit} Height above Ground z _{crit} +h _s Table of MERGED Plume-Averaged Vertical Velocity Height (feet) above ground Begin Merging (touch) = \$8.7 60.0 80.0 100.0	s city at height 141.567 28.824 2.342 al velocity V _{ortt} 35.345 46.177 locities startin (meters) above stack 7.06 7.46 13.55 19.65 25.74	Solutions in 500.0 meters* mys 5.30 meters meters g at Touchi Plume Radius(m) 1.065 #N/A #N/A #N/A	Tables Below feet 464.5 94.6 7.68 m/s 116.0 151.5 ng Height: Vert. Vel(m/s) 8.97 8.92 8.12 7.33	152.4 feet* feet ft/sec feet feet	$\begin{array}{l} \mbox{Height above} \\ \mbox{V=}\{n(V^3a)_{hull} a] \\ \mbox{V=V_{buch}+(V_m^2)} \\ \mbox{Height above} \\ \mbox{Regular Bove} \\ \mbox{Regular Bove} \\ \mbox{Regular Bove} \\ \mbox{Regular Bove} \\ \mbox{V=}\{n(V^3a)_{hull} a] \\ \mbox{V=}\{n(V^3a)_{$	$\label{eq:constraints} \begin{split} & ^{1/3} \mbox{ for heights above total merging elec} \\ & V_{touch})^*(2\text{-}Z_{touch})/(Z_{tull}\text{-}Z_{touch}) \\ & \mbox{ for heights below total merg} \\ & \mbox{ ground} (z+h_a) \\ & \mbox{NS} \\ & \mbox{ support} \\ & \mbox{ for z-z_{tull}} \\ & \mbox{ Value} \\ & \mbox{ for z-z_{tull}} \\ & \mbox{ Value} \\ & \mbox{ for z-z_{tull}} \\ & \mbox{ Value} \\ & \mbox{ for z-z_{tull}} \\ & \mbox{ Constraints} \\ & \mbox{ for z-z_{tull}} \\ & \mbox{ Nouch})'(Z_{tull}\text{-}Z_{touch}) \mbox{ if z-z_{touch}} \\ & \mbox{ or points} \\ & \mbox{ For z-z_{tull}} \\ & \mbox{ OP OF MERGING PHASE-INTERPO} \\ & \mbox{ (V^3a)}_{h_{HI}}/(V_{cull})^3]\mbox{ -}a_{HI} \\ & \mbox{ for z-z_{tull}} \\ & $	avation ing elevation Z _{full})L V _m)
Multiple Plume Calculations Solve for plume-averaged vertical veluc Gives the following Height above Stack z Plume Top-Hat Radius a Vertical Velocity V Solve for Height of CASC critical vertica Find Height above Stack z _{crit} Height above Ground z _{crit} +h _s Fable of MERGED Plume-Averaged Vertical Vel Height (feet) above ground Begin Merging (touch) = 58.7 60.0 80.0 100.0	s city at height 141.567 28.824 2.342 al velocity V _{crit} 35.345 46.177 locities startin (meters) above stack 7.06 7.46 13.55 19.65 25.74 31.84	Solutions in 500.0 meters* m/s 5.30 meters meters g at Touchi Plume Radius(m) 1.065 #N/A #N/A #N/A #N/A	Tables Below feet 464.5 94.6 7.68 116.0 151.5 ng Height: Vert. Vel(m/s) 8.97 8.92 8.12 7.33 6.54	152.4 feet* feet ft/sec feet feet	$\begin{array}{l} \mbox{Height above} \\ \mbox{V=}\{n(V^3a)_{hull} a] \\ \mbox{V=V_{buch}+(V_m^2)} \\ \mbox{Height above} \\ \mbox{Regular Bove} \\ \mbox{Regular Bove} \\ \mbox{Regular Bove} \\ \mbox{Regular Bove} \\ \mbox{V=}\{n(V^3a)_{hull} a] \\ \mbox{V=}\{n(V^3a)_{$	$\label{eq:constraints} \begin{split} & ^{1/3} \mbox{ for heights above total merging elec} \\ & V_{touch})^*(2\text{-}Z_{touch})/(Z_{tull}\text{-}Z_{touch}) \\ & \mbox{ for heights below total merg} \\ & \mbox{ ground} (z+h_a) \\ & \mbox{NS} \\ & \mbox{ support} \\ & \mbox{ for z-z_{tull}} \\ & \mbox{ Value} \\ & \mbox{ for z-z_{tull}} \\ & \mbox{ Value} \\ & \mbox{ for z-z_{tull}} \\ & \mbox{ Value} \\ & \mbox{ for z-z_{tull}} \\ & \mbox{ Constraints} \\ & \mbox{ for z-z_{tull}} \\ & \mbox{ Nouch})'(Z_{tull}\text{-}Z_{touch}) \mbox{ if z-z_{touch}} \\ & \mbox{ or points} \\ & \mbox{ For z-z_{tull}} \\ & \mbox{ OP OF MERGING PHASE-INTERPO} \\ & \mbox{ (V^3a)}_{h_{HI}}/(V_{cull})^3]\mbox{ -}a_{HI} \\ & \mbox{ for z-z_{tull}} \\ & $	avation ing elevation Z _{full})L V _m)
Multiple Plume Calculations Solve for plume-averaged vertical velo Gives the following Height above Stack z Plume Top-Hat Radius a Vertical Velocity V Solve for Height of CASC critical vertical Find Height above Stack z _{ert} Height above Ground z _{ert} +h _s Table of MERGED Plume-Averaged Vertical Vel Height (feet) above ground Begin Merging (touch) = 58.7 60.0 80.0 100.0 120.0	city at height 141.567 28.824 2.342 1 velocity V _{ortt} 35.345 46.177 bocities startin (meters) above stack 7.06 7.46 13.55 19.65 25.74 31.84 31.84	Solutions in 500.0 meters* m/s 5.30 meters meters meters g at Touchi Plume Radius(m) 1.065 #N/A #N/A #N/A #N/A #N/A	Tables Below feet 464.5 94.6 7.68 m/s 116.0 151.5 ng Height: Vert. Vert. Vert. Vert. 12(m/s) 8.97 8.92 8.12 7.33 6.54 5.75	152.4 feet* feet ft/sec feet feet	$\begin{array}{l} \mbox{Height above} \\ \mbox{V=}\{n(V^3a)_{hull} a] \\ \mbox{V=V_{buch}+(V_m^2)} \\ \mbox{Height above} \\ \mbox{Regular Bove} \\ \mbox{Regular Bove} \\ \mbox{Regular Bove} \\ \mbox{Regular Bove} \\ \mbox{V=}\{n(V^3a)_{hull} a] \\ \mbox{V=}\{n(V^3a)_{$	$\label{eq:constraints} \begin{split} & ^{1/3} \mbox{ for heights above total merging elec} \\ & V_{touch})^*(2\text{-}Z_{touch})/(Z_{tull}\text{-}Z_{touch}) \\ & \mbox{ for heights below total merg} \\ & \mbox{ ground} (z+h_a) \\ & \mbox{NS} \\ & \mbox{ support} \\ & \mbox{ for z-z_{tull}} \\ & \mbox{ Value} \\ & \mbox{ for z-z_{tull}} \\ & \mbox{ Value} \\ & \mbox{ for z-z_{tull}} \\ & \mbox{ Value} \\ & \mbox{ for z-z_{tull}} \\ & \mbox{ Constraints} \\ & \mbox{ for z-z_{tull}} \\ & \mbox{ Nouch})'(Z_{tull}\text{-}Z_{touch}) \mbox{ if z-z_{touch}} \\ & \mbox{ or points} \\ & \mbox{ For z-z_{tull}} \\ & \mbox{ OP OF MERGING PHASE-INTERPO} \\ & \mbox{ (V^3a)}_{h_{HI}}/(V_{cull})^3]\mbox{ -}a_{HI} \\ & \mbox{ for z-z_{tull}} \\ & $	avation ing elevation Z _{full})L V _m)
Aultiple Plume Calculations Solve for plume-averaged vertical veloc Gives the following Height above Stack z Plume Top-Hat Radius a Vertical Velocity V Solve for Height of CASC critical vertica Find Height above Stack z _{crit} Height above Ground z _{crit} +h _s Table of MERGED Plume-Averaged Vertical Velocity Begin Merging (touch) = 58.7 60.0 80.0 100.0 120.0 140.0	s city at height 141.567 28.824 2.342 al velocity V _{orit} 35.345 46.177 cities startin (meters) above stack 7.46 13.55 19.65 25.74 31.84 37.94 44.03	Solutions in 500.0 meters* m/s 5.30 meters meters g at Touchi Plume Radius(m) 1.065 #N/A #N/A #N/A #N/A #N/A #N/A	Tables Below feet 464.5 94.6 7.68 m/s 116.0 151.5 Ng Height: Vert. Vert. Vel(m/s) 8.92 8.92 8.12 7.33 6.54 5.75 4.96	152.4 feet* feet ft/sec feet feet	$\begin{array}{l} \mbox{Height above} \\ \mbox{V=}\{n(V^3a)_{hull} a] \\ \mbox{V=V_{buch}+(V_m^2)} \\ \mbox{Height above} \\ \mbox{Regular Bove} \\ \mbox{Regular Bove} \\ \mbox{Regular Bove} \\ \mbox{Regular Bove} \\ \mbox{V=}\{n(V^3a)_{hull} a] \\ \mbox{V=}\{n(V^3a)_{$	$\label{eq:constraints} \begin{split} & ^{1/3} \mbox{ for heights above total merging elec} \\ & V_{touch})^*(2\text{-}Z_{touch})/(Z_{tull}\text{-}Z_{touch}) \\ & \mbox{ for heights below total merg} \\ & \mbox{ ground} (z+h_a) \\ & \mbox{NS} \\ & \mbox{ support} \\ & \mbox{ for z-z_{tull}} \\ & \mbox{ Value} \\ & \mbox{ for z-z_{tull}} \\ & \mbox{ Value} \\ & \mbox{ for z-z_{tull}} \\ & \mbox{ Value} \\ & \mbox{ for z-z_{tull}} \\ & \mbox{ Constraints} \\ & \mbox{ for z-z_{tull}} \\ & \mbox{ Nouch})'(Z_{tull}\text{-}Z_{touch}) \mbox{ if z-z_{touch}} \\ & \mbox{ or points} \\ & \mbox{ For z-z_{tull}} \\ & \mbox{ OP OF MERGING PHASE-INTERPO} \\ & \mbox{ (V^3a)}_{h_{HI}}/(V_{cull})^3]\mbox{ -}a_{HI} \\ & \mbox{ for z-z_{tull}} \\ & $	evation ing elevation Z _{full})L V _m
Multiple Plume Calculations Solve for plume-averaged vertical veluc Gives the following Height above Stack z Plume Top-Hat Radius a Vertical Velocity V Solve for Height of CASC critical vertica Find Height above Stack z _{crit} Height above Ground z _{crit} +h _s Table of MERGED Plume-Averaged Vertical Vel Height (feet) above ground Begin Merging (touch) = 58.7 60.0 100.0 120.0 140.0 180.0	s city at height 141.567 28.824 2.342 al velocity V _{orit} 35.345 46.177 cities startin (meters) above stack 7.46 13.55 19.65 25.74 31.84 37.94 44.03	Solutions in 500.0 meters* m/s 5.30 meters meters g at Touchi Plume Radius(m) 1.065 #N/A #N/A #N/A #N/A #N/A #N/A	Tables Below feet 464.5 94.6 7.68 m/s 116.0 151.5 ng Height: Vert. Vel(m/s) 8.97 8.92 8.92 8.12 7.33 6.54 5.75 4.96 4.17	152.4 feet* feet ft/sec feet feet	$\begin{array}{l} \mbox{Height above} \\ \mbox{V=}\{n(V^3a)_{hull} a] \\ \mbox{V=V_{buch}+(V_m^2)} \\ \mbox{Height above} \\ \mbox{Regular Bove} \\ \mbox{Regular Bove} \\ \mbox{Regular Bove} \\ \mbox{Regular Bove} \\ \mbox{V=}\{n(V^3a)_{hull} a] \\ \mbox{V=}\{n(V^3a)_{$	$\label{eq:constraints} \begin{array}{l} ^{1/3} \mbox{ for heights above total merging electropy} \\ \end{tabular} \label{eq:constraints} \\ \end{tabular} \begin{tabular}{lllllllllllllllllllllllllllllllllll$	avation ing elevation Z _{full})L V _m)
Multiple Plume Calculations Solve for plume-averaged vertical veluc Gives the following Height above Stack z Plume Top-Hat Radius a Vertical Velocity V Solve for Height of CASC critical vertica Find Height above Stack z _{crit} Height above Ground z _{crit} +h _s Fable of MERGED Plume-Averaged Vertical Vel Height (feet) above ground Begin Merging (touch) = 58.7 60.0 80.0 100.0 120.0 140.0 160.0 180.0 200.0	scity at height 141.567 28.824 2.342 al velocity V _{crit} 35.345 46.177 locities startin (meters) above stack 7.46 13.55 19.65 25.74 31.84 37.94 44.03 50.13 50.13	Solutions in 500.0 meters* m/s 5.30 meters meters eters g at Touchi Plume Radius(m) 1.065 #N/A #N/A #N/A #N/A #N/A #N/A	Tables Below feet 464.5 94.6 7.68 m/s 116.0 151.5 ng Height: Vert. Vel(m/s) 8.97 8.92 8.12 7.33 6.54 5.75 4.96 4.17 3.38	152.4 feet* feet ft/sec feet feet	Height above $\begin{array}{l} \forall = \{n(\sqrt{3}a)_{hull}/a\} \\ \forall = \sqrt{n}(\sqrt{3}a)_{hull}/a\} \\ \forall = \sqrt{n}\sqrt{3}a_{hull}/a\} \\ \forall = \sqrt{n}\sqrt{3}a_{hull}/a} \\ \forall = \sqrt{n}\sqrt{3}a_{hull}/a \\ \forall = \sqrt{n}\sqrt{3}a_{hu$	^{1/3} for heights above total merging electrons, $(z_{z_{1},z_{2},z_{1},z_{2}$	evation ing elevation sz _{full} yL Vm 20 ft Interval
Multiple Plume Calculations Solve for plume-averaged vertical veluc Gives the following Height above Stack z Plume Top-Hat Radius a Vertical Velocity V Solve for Height of CASC critical vertical Find Height above Stack z _{crit} Height above Ground z _{crit} +h _s Table of MERGED Plume-Averaged Vertical Vel Height (feet) above ground Begin Merging (touch) = 58.7 60.0 100.0 120.0 140.0 180.0 200.0 End Merging (full/mp) = 211.6	s city at height 141.567 28.824 2.342 at velocity V _{erit} 35.345 46.177 tocities startin (meters) above stack 7.46 13.55 19.65 25.74 31.84 37.94 44.03 50.13 53.66 80.61	Solutions in 500.0 meters* m/s 5.30 meters meters g at Touchi Plume Radius(m) 1.065 #N/A #N/A #N/A #N/A #N/A #N/A #N/A #N/A	Tables Below feet 464.5 94.6 7.68 m/s 116.0 151.5 ng Height: Vert. Vert. Vel(m/s) 8.97 8.92 8.12 7.33 6.54 5.75 4.96 4.17 3.38 2.93	152.4 feet* feet ft/sec feet feet	Height above $\forall = \{n(\sqrt{3})_{hull}/a\}$ $\forall = \{n(\sqrt{3})_{hull}/a\}$ $\forall = \forall_{buch} + (V_m^{-1})$ Henders above REGULAR EC $a=a_m+0.16(z-z)$ $\forall = \{n(\sqrt{3})_{hull}/a\}$ $\forall = V_{buch} + (V_m^{-1})$ $\forall = v_{buch} + (Z_{full})$ $Z_{crit} = Z_{hull} + \{n(z_{full})_{hurm} = (V_{hurm})^{3} + 0.1$ $a = 0.16(z-z_v)$ $\theta_p = \theta_n(1+(1-\theta_q)_{hurm}) + 0.1$ $A = 0.16(z-z_v)$ $\theta_p = \theta_n(1+(1-\theta_q)_{hurm}) + 0.1$ $V = V_{buch} + (V_m^{-1}) + 0.1$	$\label{eq:constraints} \begin{array}{l} ^{1/3} \mbox{ for heights above total merging elet} \\ \ell_{touch} * (z-z_{touch}) / (z_{tult}-z_{touch}) \\ \mbox{ for heights below total merg} \\ \mbox{ for heights below total merg} \\ \mbox{ ground} (z+h_a) \\ \mbox{ NS} \\ \mbox{ support of heights below total merg} \\ \mbox{ for heights below total merg} \\ \mbox{ support of heights below total merg} \\ \mbox{ for heights below total merg} \\ for heights below t$	evation ing elevation sz _{full} yL Vm 20 ft Interva
Aultiple Plume Calculations Solve for plume-averaged vertical veloc Gives the following Height above Stack z Plume Top-Hat Radius a Vertical Velocity V Solve for Height of CASC critical vertica Find Height above Stack z _{crit} Height above Ground z _{crit} +h _s Table of MERGED Plume-Averaged Vertical Velocity Begin Merging (touch) = 58.7 60.0 80.0 100.0 100.0 120.0 140.0 180.0 1	s city at height 141.567 28.824 2.342 al velocity V _{orit} 35.345 46.177 cities startin (meters) above stack 7.46 7.47 7	Solutions in 500.0 meters* m/s 5.30 meters meters meters g at Touchi Plume Radius(m) 1.065 #N/A #N/A #N/A #N/A #N/A #N/A #N/A #N/A	Tables Below feet 464.5 94.6 7.68 m/s 116.0 151.5 Ng Height: Vert. Ver(m/s) 8.97 8.92 8.12 7.33 6.54 5.75 4.96 4.17 3.38 2.93 2.69	152.4 feet fu/sec feet feet	$\begin{array}{l} \mbox{Height above} \\ \mbox{V=}\{n(V^3a)_{hull}(a) \\ \mbox{V=V_{buch}}+(V_m^2) \\ \mbox{Height above} \\ \mbox{Regular EC} \\ \mbox{Regular EC} \\ \mbox{V=}_{buch}+(0,a) \\ \mbox{V=}_{buch}+(V_m^2) \\ \mbox{V=}_{buch}+(V_m^2) \\ \mbox{V=}_{buch}+(V_m^2) \\ \mbox{V=}_{buch}+(V_m^2) \\ \mbox{V=}_{buch}+(V_m^2) \\ \mbox{Single Plume} \\ \mbox{V=}_{buch}+(V_m^2) \\ \mbox{Single Plume} \\ \mbox{V=}_{buch}+(V_m^2) \\ \mbox{V=}_{buch}+(V$	$\label{eq:constraints} \begin{array}{l} ^{1/3} \mbox{ for heights above total merging elet} \\ \ell_{touch} * (z-z_{touch}) / (z_{tult}-z_{touch}) \\ \mbox{ for heights below total merg} \\ \mbox{ for heights below total merg} \\ \mbox{ ground} (z+h_a) \\ \mbox{ NS} \\ \mbox{ support of heights below total merg} \\ \mbox{ for heights below total merg} \\ \mbox{ support of heights below total merg} \\ \mbox{ for heights below total merg} \\ for heights below t$	evation ing elevation sz _{full} yL Vm 20 ft Interva
Aultiple Plume Calculations Solve for plume-averaged vertical veluc Gives the following Height above Stack z Plume Top-Hat Radius a Vertical Velocity V Solve for Height of CASC critical vertica Find Height above Stack z _{crit} Height above Ground z _{crit} +h _s Table of MERGED Plume-Averaged Vertical Vel Height (feet) above ground Begin Merging (touch) = 58.7 60.0 80.0 100.0 120.0 140.0 180.0 200.0 End Merging (full/mp) = 211.6 300.0 400.0	s city at height 141.567 28.824 2.342 1 velocity V _{crit} 35.345 46.177 cocities startin (meters) above stack 7.06 7.46 7.46 7.46 7.46 7.46 7.46 7.46 7.46 7.46 7.46 7.46 7.40 7.40 7.41 7.41 7.45 19.65 25.74 31.84 37.94 44.03 50.13 53.66 80.61 111.09 141.57	500.00 meters* meters m/s 5.30 meters meters meters g at Touchi Plume Radius(m) 1.065 #N/A #N/A #N/A #N/A #N/A #N/A #N/A #N/A	Tables Below feet 464.5 94.6 7.68 m/s 116.0 151.5 ng Height: Vert. Vel(m/s) 8.92 8.12 7.33 6.54 5.75 4.96 4.17 3.38 2.99 2.49	152.4 feet fl/sec feet feet	$\begin{array}{l} \mbox{Height above} \\ \mbox{V=}\{n(V^3a)_{hull}(a) \\ \mbox{V=V_{buch}}+(V_m^2) \\ \mbox{Height above} \\ \mbox{Regular EC} \\ \mbox{Regular EC} \\ \mbox{V=}_{buch}+(0,a) \\ \mbox{V=}_{buch}+(V_m^2) \\ \mbox{V=}_{buch}+(V_m^2) \\ \mbox{V=}_{buch}+(V_m^2) \\ \mbox{V=}_{buch}+(V_m^2) \\ \mbox{V=}_{buch}+(V_m^2) \\ \mbox{Single Plume} \\ \mbox{V=}_{buch}+(V_m^2) \\ \mbox{Single Plume} \\ \mbox{V=}_{buch}+(V_m^2) \\ \mbox{V=}_{buch}+(V$	$\label{eq:constraints} \begin{array}{l} ^{1/3} \mbox{ for heights above total merging elet} \\ \ell_{touch} * (z-z_{touch}) / (z_{tult}-z_{touch}) \\ \mbox{ for heights below total merg} \\ \mbox{ for heights below total merg} \\ \mbox{ ground} (z+h_a) \\ \mbox{ NS} \\ \mbox{ support of heights below total merg} \\ \mbox{ for heights below total merg} \\ \mbox{ support of heights below total merg} \\ \mbox{ for heights below total merg} \\ for heights below t$	evation ing elevation sz _{full} yL Vm 20 ft Interva
Multiple Plume Calculations Solve for plume-averaged vertical veloc Gives the following Height above Stack z Plume Top-Hat Radius a Vertical Velocity V Solve for Height of CASC critical vertica Find Height above Stack z _{ort} Height above Ground z _{ort} +h _s Table of MERGED Plume-Averaged Vertical Velocity Begin Merging (touch) = 58.7 60.0 100.0 120.0 140.0 160.0 180.0 200.0 End Merging (full/mp) = 211.6 300.0 500.0	socity at height 141.567 28.824 2.342 al velocity V _{erit} 35.345 46.177 locities startir (meters) above stack 7.46 13.55 19.65 25.74 31.84 37.94 44.03 50.13 53.66 80.61 111.09 141.57 172.05	500.00 meters* meters m/s 5.30 meters meters meters g at Touchi Plume Radius(m) 1.065 #N/A #N/A #N/A #N/A #N/A #N/A #N/A #N/A	Tables Below feet 464.5 94.6 7.68 m/s 116.0 151.5 ng Height: Vert. Vel(m/s) 8.97 8.92 8.12 7.33 6.54 5.75 4.96 4.96 4.97 3.38 2.93 2.69 2.49 2.34	152.4 feet feet fl/sec feet feet	$\begin{array}{l} \mbox{Height above} \\ \mbox{V=}\{n(V^3a)_{hull}(a) \\ \mbox{V=V_{buch}}+(V_m^2) \\ \mbox{Height above} \\ \mbox{Regular EC} \\ \mbox{Regular EC} \\ \mbox{V=}_{buch}+(0,a) \\ \mbox{V=}_{buch}+(V_m^2) \\ \mbox{V=}_{buch}+(V_m^2) \\ \mbox{V=}_{buch}+(V_m^2) \\ \mbox{V=}_{buch}+(V_m^2) \\ \mbox{V=}_{buch}+(V_m^2) \\ \mbox{Single Plume} \\ \mbox{V=}_{buch}+(V_m^2) \\ \mbox{Single Plume} \\ \mbox{V=}_{buch}+(V_m^2) \\ \mbox{V=}_{buch}+(V$	$\label{eq:constraints} \begin{array}{l} ^{1/3} \mbox{ for heights above total merging elet} \\ \ell_{touch} * (z-z_{touch}) / (z_{tult}-z_{touch}) \\ \mbox{ for heights below total merg} \\ \mbox{ for heights below total merg} \\ \mbox{ ground} (z+h_a) \\ \mbox{ NS} \\ \mbox{ support of heights below total merg} \\ \mbox{ for heights below total merg} \\ \mbox{ support of heights below total merg} \\ \mbox{ for heights below total merg} \\ for heights below t$	evation ing elevation sz _{full} yL Vm 20 ft Interva
Aultiple Plume Calculations Solve for plume-averaged vertical veluc Gives the following Height above Stack z Plume Top-Hat Radius a Vertical Velocity V Solve for Height of CASC critical vertica Find Height above Stack z _{crit} Height above Ground z _{crit} +h _s Table of MERGED Plume-Averaged Vertical Velo Height (feet) above ground Begin Merging (touch) = 58.7 60.0 100.0 120.0 140.0 160.0 180.0 200.0 End Merging (full/mp) = 211.6 300.0 600.0 600.0	s city at height 141.567 28.824 2.342 at velocity V _{orit} 35.345 46.177 locities startin (meters) above stack 7.46 7.46 13.55 19.65 25.74 31.84 37.94 44.03 50.13 53.66 80.61 111.09 141.57 172.05 202.53	50000 meters* meters m/s 5.30 meters meters g at Touchi Plume Radius(m) 1.065 #N/A #N/A #N/A #N/A #N/A #N/A #N/A #N/A	Tables Below feet 464.5 94.6 7.68 m/s 116.0 151.5 ng Height: Vert. Vel(m/s) 8.97 8.92 8.12 7.33 6.54 5.75 4.96 4.17 3.38 2.93 2.69 2.49 2.34 2.22	152.4 feet feet fl/sec feet feet	$\begin{array}{l} \mbox{Height above} \\ \mbox{V=}\{n(V^3a)_{hull}(a) \\ \mbox{V=V_{buch}}+(V_m^2) \\ \mbox{Height above} \\ \mbox{Regular EC} \\ \mbox{Regular EC} \\ \mbox{V=}_{buch}+(0,a) \\ \mbox{V=}_{buch}+(V_m^2) \\ \mbox{V=}_{buch}+(V_m^2) \\ \mbox{V=}_{buch}+(V_m^2) \\ \mbox{V=}_{buch}+(V_m^2) \\ \mbox{V=}_{buch}+(V_m^2) \\ \mbox{Single Plume} \\ \mbox{V=}_{buch}+(V_m^2) \\ \mbox{Single Plume} \\ \mbox{V=}_{buch}+(V_m^2) \\ \mbox{V=}_{buch}+(V$	$\label{eq:constraints} \begin{array}{l} ^{1/3} \mbox{ for heights above total merging elet} \\ \ell_{touch} * (z-z_{touch}) / (z_{tult}-z_{touch}) \\ \mbox{ for heights below total merg} \\ \mbox{ for heights below total merg} \\ \mbox{ ground} (z+h_a) \\ \mbox{ NS} \\ \mbox{ support of heights below total merg} \\ \mbox{ for heights below total merg} \\ \mbox{ support of heights below total merg} \\ \mbox{ for heights below total merg} \\ for heights below t$	evation ing elevation 2 _{full} Vm 20 ft Interva 20 ft Interva
Aultiple Plume Calculations Solve for plume-averaged vertical veloc Gives the following Height above Stack z Plume Top-Hat Radius a Vertical Velocity V Solve for Height of CASC critical vertical Find Height above Stack z _{crit} Height above Ground z _{crit} +h _a Fable of MERGED Plume-Averaged Vertical Velocity Begin Merging (touch) = 58.7 60.0 80.0 100.0	s city at height 141.567 28.824 2.342 at velocity V _{orit} 35.345 46.177 above stack 7.06 7.46 13.55 19.65 25.74 31.84 37.94 44.03 50.13 53.66 80.61 111.09 141.57 172.05 202.53 203.01	50000 meters* meters m/s 5.30 meters meters ga t Touchi Plume Radius(m) 1.065 #N/A #N/A #N/A #N/A #N/A #N/A #N/A #N/A	Tables Below feet 464.5 94.6 7.68 m/s 116.0 151.5 Ng Height: Vert. Vel(m/s) 8.97 8.92 8.12 7.33 6.54 5.75 4.96 4.17 3.38 2.69 2.49 2.49 2.34 2.22 2.12	152.4 feet feet fl/sec feet feet	$\begin{array}{l} \mbox{Height above} \\ \mbox{V=}\{n(V^3a)_{hull}(a) \\ \mbox{V=V_{buch}}+(V_m^2) \\ \mbox{Height above} \\ \mbox{Regular EC} \\ \mbox{Regular EC} \\ \mbox{V=}_{buch}+(0,a) \\ \mbox{V=}_{buch}+(V_m^2) \\ \mbox{V=}_{buch}+(V_m^2) \\ \mbox{V=}_{buch}+(V_m^2) \\ \mbox{V=}_{buch}+(V_m^2) \\ \mbox{V=}_{buch}+(V_m^2) \\ \mbox{Single Plume} \\ \mbox{V=}_{buch}+(V_m^2) \\ \mbox{Single Plume} \\ \mbox{V=}_{buch}+(V_m^2) \\ \mbox{V=}_{buch}+(V$	$\label{eq:constraints} \begin{array}{l} ^{1/3} \mbox{ for heights above total merging elet} \\ \ell_{touch} * (z-z_{touch}) / (z_{tult}-z_{touch}) \\ \mbox{ for heights below total merg} \\ \mbox{ for heights below total merg} \\ \mbox{ ground} (z+h_a) \\ \mbox{ NS} \\ \mbox{ support of heights below total merg} \\ \mbox{ for heights below total merg} \\ \mbox{ support of heights below total merg} \\ \mbox{ for heights below total merg} \\ for heights below t$	evation ing elevation 2 _{full} Vm 20 ft Interva 20 ft Interva
Aultiple Plume Calculations Solve for plume-averaged vertical veloc Gives the following Height above Stack z Plume Top-Hat Radius a Vertical Velocity V Solve for Height of CASC critical vertica Find Height above Ground z _{ont} +h _s Table of MERGED Plume-Averaged Vertical Velocity Begin Merging (touch) = 58.7 60.0 80.0 100.0 120.0 120.0 140.0 160.0 180.0 200.0 End Merging (full/mp) = 211.6 300.0 600.0 600.0 600.0 600.0 600.0 600.0 600.0 600.0 600.0 600.0 600.0 600.0 600.0 600.0 700.0 800.0	s city at height 141.567 28.824 2.342 at velocity V _{orit} 35.345 46.177 cities startin (meters) above stack 7.06 7.46 13.55 19.65 25.74 31.84 37.94 44.03 50.13 53.66 80.61 111.09 141.57 172.05 202.53 23.01 263.49	500.00 meters* meters m/s 5.30 meters meters meters ag at Touchi Plume Radius(m) 1.065 #N/A #N/A #N/A #N/A #N/A #N/A #N/A #N/A	Tables Below feet 464.5 94.6 7.68 m/s 116.0 151.5 Ng Height: Vert. Vert. Vel(m/s) 8.92 8.12 7.33 6.54 5.75 4.96 4.17 3.38 2.93 2.69 2.49 2.34 2.22 2.12 2.12	152.4 feet feet fl/sec feet feet	$\begin{array}{l} \mbox{Height above} \\ \mbox{V=}\{n(V^3a)_{hull}(a) \\ \mbox{V=V_{buch}}+(V_m^2) \\ \mbox{Height above} \\ \mbox{Regular EC} \\ \mbox{Regular EC} \\ \mbox{V=}_{buch}+(0,a) \\ \mbox{V=}_{buch}+(V_m^2) \\ \mbox{V=}_{buch}+(V_m^2) \\ \mbox{V=}_{buch}+(V_m^2) \\ \mbox{V=}_{buch}+(V_m^2) \\ \mbox{V=}_{buch}+(V_m^2) \\ \mbox{Single Plume} \\ \mbox{V=}_{buch}+(V_m^2) \\ \mbox{Single Plume} \\ \mbox{V=}_{buch}+(V_m^2) \\ \mbox{V=}_{buch}+(V$	$\label{eq:constraints} \begin{array}{l} ^{1/3} \mbox{ for heights above total merging elet} \\ \ell_{touch} * (z-z_{touch}) / (z_{tult}-z_{touch}) \\ \mbox{ for heights below total merg} \\ \mbox{ for heights below total merg} \\ \mbox{ ground} (z+h_a) \\ \mbox{ NS} \\ \mbox{ support of heights below total merg} \\ \mbox{ for heights below total merg} \\ \mbox{ support of heights below total merg} \\ \mbox{ for heights below total merg} \\ for heights below t$	evation ing elevation 2 _{full} Vm 20 ft Interva 20 ft Interva
Multiple Plume Calculations Solve for plume-averaged vertical veloc Gives the following Height above Stack z Plume Top-Hat Radius a Vertical Velocity V Solve for Height of CASC critical vertica Find Height above Stack z _{ort} Height above Ground z _{ort} +h _e Table of MERGED Plume-Averaged Vertical Velocity Begin Merging (touch) = 58.7 60.0 80.0 100.0 120.0 140.0 180.0 200.0 End Merging (full/mp) = 211.6 300.0 600.0	s city at height 141.567 28.824 2.342 at velocity V _{erit} 35.345 46.177 locities startir (meters) above stack 7.46 13.55 19.65 25.74 31.84 37.94 44.03 50.13 53.66 80.61 111.09 141.57 172.05 202.53 233.01 263.49 293.97	50000 meters* meters m/s 5.30 meters meters g at Touchi Plume Radius(m) 1.065 #N/A #N/A #N/A #N/A #N/A #N/A #N/A #N/A	Tables Below feet 464.5 94.6 7.68 m/s 116.0 151.5 ng Height: Vert. Vel(m/s) 8.92 8.9	152.4 feet feet fl/sec feet feet	$\begin{array}{l} \mbox{Height above} \\ \mbox{V=}\{n(V^3a)_{hull}(a) \\ \mbox{V=V_{buch}}+(V_m^2) \\ \mbox{Height above} \\ \mbox{Regular EC} \\ \mbox{Regular EC} \\ \mbox{V=}_{buch}+(0,a) \\ \mbox{V=}_{buch}+(V_m^2) \\ \mbox{V=}_{buch}+(V_m^2) \\ \mbox{V=}_{buch}+(V_m^2) \\ \mbox{V=}_{buch}+(V_m^2) \\ \mbox{V=}_{buch}+(V_m^2) \\ \mbox{Single Plume} \\ \mbox{V=}_{buch}+(V_m^2) \\ \mbox{Single Plume} \\ \mbox{V=}_{buch}+(V_m^2) \\ \mbox{V=}_{buch}+(V$	$\label{eq:constraints} \begin{array}{l} ^{1/3} \mbox{ for heights above total merging elet} \\ \ell_{touch} * (z-z_{touch}) / (z_{tult}-z_{touch}) \\ \mbox{ for heights below total merg} \\ \mbox{ for heights below total merg} \\ \mbox{ ground} (z+h_a) \\ \mbox{ NS} \\ \mbox{ support of heights below total merg} \\ \mbox{ for heights below total merg} \\ \mbox{ support of heights below total merg} \\ \mbox{ for heights below total merg} \\ for heights below t$	evation ing elevation 2 _{full} Vm 20 ft Interva 20 ft Interva
Aultiple Plume Calculations Solve for plume-averaged vertical veluc Gives the following Height above Stack z Plume Top-Hat Radius a Vertical Velocity V Solve for Height of CASC critical vertica Find Height above Stack z _{ort} Height above Ground z _{ort} +h _s Table of MERGED Plume-Averaged Vertical Velic Begin Merging (touch) = 58.7 60.0 80.0 100.0 120.0 140.0 180.0 200.0 End Merging (full/mp) = 211.6 300.0 600.0 600.0 10	s city at height 141.567 28.824 2.342 at velocity V _{orit} 35.345 46.177 cities startin (meters) above stack 7.46 7.42 7.94 44.03 50.13 53.66 80.61 111.09 141.57 172.05 202.53 233.01 243.97 244.57 244	50000 meters* meters m/s 5.30 meters meters g at Touchi Plume Radius(m) 1.065 #N/A #N/A #N/A #N/A #N/A #N/A #N/A #N/A	Tables Below feet 464.5 94.6 7.68 m/s 116.0 151.5 ng Height: Vel(m/s) 8.97 8.92 8.12 7.33 6.54 5.75 4.96 4.17 3.38 2.93 2.69 2.49 2.34 2.22 2.12 2.04 1.97 1.91	152.4 feet feet fl/sec feet feet	$\begin{array}{l} \mbox{Height above} \\ \mbox{V=}\{n(V^3a)_{hull}(a) \\ \mbox{V=V_{buch}}+(V_m^2) \\ \mbox{Height above} \\ \mbox{Regular EC} \\ \mbox{Regular EC} \\ \mbox{V=}_{buch}+(0,a) \\ \mbox{V=}_{buch}+(V_m^2) \\ \mbox{V=}_{buch}+(V_m^2) \\ \mbox{V=}_{buch}+(V_m^2) \\ \mbox{V=}_{buch}+(V_m^2) \\ \mbox{V=}_{buch}+(V_m^2) \\ \mbox{Single Plume} \\ \mbox{V=}_{buch}+(V_m^2) \\ \mbox{Single Plume} \\ \mbox{V=}_{buch}+(V_m^2) \\ \mbox{V=}_{buch}+(V$	$\label{eq:constraints} \begin{array}{l} ^{1/3} \mbox{ for heights above total merging elet} \\ \ell_{touch} * (z-z_{touch}) / (z_{tult}-z_{touch}) \\ \mbox{ for heights below total merg} \\ \mbox{ for heights below total merg} \\ \mbox{ ground} (z+h_a) \\ \mbox{ NS} \\ \mbox{ support of heights below total merg} \\ \mbox{ for heights below total merg} \\ \mbox{ support of heights below total merg} \\ \mbox{ for heights below total merg} \\ for heights below t$	evation ing elevation 2 _{full} Vm 20 ft Interva 20 ft Interva
Aultiple Plume Calculations Solve for plume-averaged vertical veloc Gives the following Height above Stack z Plume Top-Hat Radius a Vertical Velocity V Solve for Height of CASC critical vertical Find Height above Stack z _{ent} Height above Ground z _{ent} +h _a Fable of MERGED Plume-Averaged Vertical Velocity Begin Merging (touch) = 58.7 60.0 80.0 100.0 1	s city at height 141.567 28.824 2.342 at velocity V _{orit} 35.345 46.177 cities startin (meters) above stack 7.06 7.46 13.55 19.65 25.74 31.84 37.94 44.03 50.13 53.66 80.61 111.09 141.57 172.05 202.53 233.01 263.49 293.97 324.45 354.93	50000 meters* meters m/s 5.30 meters meters ga t Touchi Plume Radius(m) 1.065 #N/A #N/A #N/A #N/A #N/A #N/A #N/A #N/A	Tables Below feet 464.5 94.6 7.68 m/s 116.0 151.5 ng Height: Vert. Vel(m/s) 8.97 8.92 8.12 7.33 6.54 5.75 4.96 4.17 3.38 2.93 2.69 2.49 2.34 2.22 2.12 2.04 1.97 1.91 1.85	152.4 feet* feet fl/sec feet feet	$\begin{array}{l} \mbox{Height above} \\ \mbox{V=}\{n(V^3a)_{hull}(a) \\ \mbox{V=V_{buch}}+(V_m^2) \\ \mbox{Height above} \\ \mbox{Regular EC} \\ \mbox{Regular EC} \\ \mbox{V=}_{buch}+(0,a) \\ \mbox{V=}_{buch}+(V_m^2) \\ \mbox{V=}_{buch}+(V_m^2) \\ \mbox{V=}_{buch}+(V_m^2) \\ \mbox{V=}_{buch}+(V_m^2) \\ \mbox{V=}_{buch}+(V_m^2) \\ \mbox{Single Plume} \\ \mbox{V=}_{buch}+(V_m^2) \\ \mbox{Single Plume} \\ \mbox{V=}_{buch}+(V_m^2) \\ \mbox{V=}_{buch}+(V$	$\label{eq:constraints} \begin{array}{l} ^{1/3} \mbox{ for heights above total merging elet} \\ \ell_{touch} * (z-z_{touch}) / (z_{tult}-z_{touch}) \\ \mbox{ for heights below total merg} \\ \mbox{ for heights below total merg} \\ \mbox{ ground} (z+h_a) \\ \mbox{ NS} \\ \mbox{ support of heights below total merg} \\ \mbox{ for heights below total merg} \\ \mbox{ support of heights below total merg} \\ \mbox{ for heights below total merg} \\ for heights below t$	evation ing elevation 2 _{full} Vm 20 ft Interva 20 ft Interva
Aultiple Plume Calculations Solve for plume-averaged vertical veloc Gives the following Height above Stack z Plume Top-Hat Radius a Vertical Velocity V Solve for Height of CASC critical vertica Find Height above Stack z _{ent} Height above Ground z _{ent} +h _s fable of MERGED Plume-Averaged Vertical Velocity Begin Merging (touch) = 58.7 60.0 80.0 100.0 120.0 120.0 160.0 180.0 200.0 <i>End Merging (full/mp) = 211.6</i> 300.0 600.0 600.0 600.0 600.0 600.0 700.0 800.0 1100.0 1100.0	s city at height 141.567 28.824 2.342 at velocity V _{orti} 35.345 46.177 cities startin (meters) above stack 7.46 7.46 7.46 7.46 7.46 7.46 7.46 8.051 19.65 25.74 31.84 37.94 44.03 50.13 53.66 8.0.61 111.09 141.57 172.05 202.53 233.01 263.49 335.49 345.43 354.93 355.41	500.00 meters* meters m/s 5.30 meters meters meters g at Touchi Plume Radius(m) 1.065 #N/A #N/A #N/A #N/A #N/A #N/A #N/A #N/A	Tables Below feet 464.5 94.6 7.68 m/s 116.0 151.5 Ng Height: Vert. Ver(m/s) 8.92 8.12 7.33 6.54 8.92 8.12 7.33 6.54 4.96 4.17 3.38 2.93 2.69 2.49 2.34 2.29 2.49 2.34 2.21 2.04 1.85 1.80	152.4 feet fu/sec feet feet	$\begin{array}{l} \mbox{Height above} \\ \mbox{V=}\{n(V^3a)_{hull}(a)\\ \mbox{V=V_{buch}}+(V_m^2)\\ \mbox{Height above} \\ \mbox{Regular EC}\\ \mbox{Regular EC}\\ \mbox{a=}a_m^+0.16(2-2)\\ \mbox{V=}V_{buch}+(V_m^2)\\ \mbox{V=}V_{buch}+(V_m^2)\\ \mbox{V=}V_{buch}+(V_m^2)\\ \mbox{V=}V_{buch}+(V_m^2)\\ \mbox{V=}V_{buch}+(V_m^2)\\ \mbox{Single Plume}\\ \mbox{V=}V_{buch}+(I-1e_{b})\\ \mbox{Single Plume}\\ \mbox{V=}V_{buch}+(V_m^2)\\ \mbox{V=}V_{buch}+(V_m$	$\label{eq:constraints} \begin{array}{l} ^{1/3} \mbox{ for heights above total merging elet} \\ \ell_{touch} * (z-z_{touch}) / (z_{tult}-z_{touch}) \\ \mbox{ for heights below total merg} \\ \mbox{ for heights below total merg} \\ \mbox{ ground} (z+h_a) \\ \mbox{ NS} \\ \mbox{ support of heights below total merg} \\ \mbox{ for heights below total merg} \\ \mbox{ support of heights below total merg} \\ \mbox{ for heights below total merg} \\ for heights below t$	evation ing elevation 2 _{full} Vm 20 ft Interva 20 ft Interva
Aultiple Plume Calculations Solve for plume-averaged vertical veluc Gives the following Height above Stack z Plume Top-Hat Radius a Vertical Velocity V Solve for Height of CASC critical vertica Find Height above Stack z _{ort} Height above Ground z _{ort} +h _s above ground Begin Merging (touch) = 58.7 60.0 80.0 100.0 120.0 140.0 180.0 200.0 End Merging (full/mp) = 211.6 300.0 600.0 600.0 000.0 600.0	s botty at height 141.567 28.824 2.342 at velocity V _{erit} 35.345 46.177 botities startin (meters) above stack 7.46 13.55 19.65 25.74 31.84 37.94 44.03 50.13 53.66 80.61 111.09 141.57 172.05 202.53 233.01 263.49 293.97 324.45 354.93 385.41 415.89	500.00 meters* meters m/s 5.30 meters meters ag at Touchi Plume Radius(m) 10.65 #N/A #N/A #N/A #N/A #N/A #N/A #N/A #N/A	Tables Below feet 464.5 94.6 7.68 m/s 116.0 151.5 ng Height: Vert. Vel(m/s) 8.92 8.91 8.95 8.92 8.92 8.92 8.92 8.92 8.92 8.92 8.92 8.92 8.92 8.92 8.92 8.92 8.92 8.93 8.94 8.95 8.94 8.95 8.94 8.95 8.94 8.95 8.94 8.95 8.94 8.95 8.55 8.5	152.4 feet fu/sec feet feet	$\begin{array}{l} \mbox{Height above} \\ \mbox{V=}\{n(V^3a)_{hull}(a)\\ \mbox{V=V_{buch}}+(V_m^2)\\ \mbox{Height above} \\ \mbox{Regular EC}\\ \mbox{Regular EC}\\ \mbox{a=}a_m^+0.16(2-2)\\ \mbox{V=}V_{buch}+(V_m^2)\\ \mbox{V=}V_{buch}+(V_m^2)\\ \mbox{V=}V_{buch}+(V_m^2)\\ \mbox{V=}V_{buch}+(V_m^2)\\ \mbox{V=}V_{buch}+(V_m^2)\\ \mbox{Single Plume}\\ \mbox{V=}V_{buch}+(I-1e_{b})\\ \mbox{Single Plume}\\ \mbox{V=}V_{buch}+(V_m^2)\\ \mbox{V=}V_{buch}+(V_m$	$\label{eq:constraints} \begin{array}{l} ^{1/3} \mbox{ for heights above total merging elet} \\ \ell_{touch} * (z-z_{touch}) / (z_{tult}-z_{touch}) \\ \mbox{ for heights below total merg} \\ \mbox{ for heights below total merg} \\ \mbox{ ground} (z+h_a) \\ \mbox{ NS} \\ \mbox{ support of heights below total merg} \\ \mbox{ for heights below total merg} \\ \mbox{ support of heights below total merg} \\ \mbox{ for heights below total merg} \\ for heights below t$	evation ing elevation 2 _{full} Vm 20 ft Interva 20 ft Interva
Aultiple Plume Calculations Solve for plume-averaged vertical veloc Gives the following Height above Stack z Plume Top-Hat Radius a Vertical Velocity V Solve for Height of CASC critical vertica Find Height above Stack z _{ort} Height above Ground z _{ort} +h _s table of MERGED Plume-Averaged Vertical Velocity Begin Merging (touch) = 58.7 60.0 100.0 120.0 140.0 180.0 200.0 End Merging (full/mp) = 211.6 300.0 600.0	s city at height 141.567 28.824 2.342 al velocity V _{crit} 35.345 46.177 locities startin (meters) above stack 7.46 8.0.61 111.09 141.57 172.05 202.53 233.01 263.49 293.97 324.45 345.41 415.89 446.37 7.46	50000 meters* meters m/s 5.30 meters meters g at Touchi Plume Radius(m) 1.065 #N/A #N/A #N/A #N/A #N/A #N/A #N/A #N/A	Tables Below feet 464.5 94.6 7.68 m/s 116.0 151.5 ng Height: Ver(m/s) 8.97 8.92 8.12 7.33 6.54 5.75 4.96 4.17 3.38 2.93 2.69 2.49 2.49 2.34 2.22 2.12 2.04 1.97 1.91 1.85 1.80 1.72	152.4 feet fu/sec feet feet	$\begin{array}{l} \mbox{Height above} \\ \mbox{V=}\{n(V^3a)_{hull}(a)\\ \mbox{V=V_{buch}}+(V_m^2)\\ \mbox{Height above} \\ \mbox{Regular EC}\\ \mbox{Regular EC}\\ \mbox{a=}a_m^+0.16(2-2)\\ \mbox{V=}V_{buch}+(V_m^2)\\ \mbox{V=}V_{buch}+(V_m^2)\\ \mbox{V=}V_{buch}+(V_m^2)\\ \mbox{V=}V_{buch}+(V_m^2)\\ \mbox{V=}V_{buch}+(V_m^2)\\ \mbox{Single Plume}\\ \mbox{V=}V_{buch}+(I-1e_{b})\\ \mbox{Single Plume}\\ \mbox{V=}V_{buch}+(V_m^2)\\ \mbox{V=}V_{buch}+(V_m$	$\label{eq:constraints} \begin{array}{l} ^{1/3} \mbox{ for heights above total merging elet} \\ \ell_{touch} * (z-z_{touch}) / (z_{tult}-z_{touch}) \\ \mbox{ for heights below total merg} \\ \mbox{ for heights below total merg} \\ \mbox{ ground} (z+h_a) \\ \mbox{ NS} \\ \mbox{ support of heights below total merg} \\ \mbox{ for heights below total merg} \\ \mbox{ support of heights below total merg} \\ \mbox{ for heights below total merg} \\ for heights below t$	evation ing elevation ²² full Vm 20 ft Interva 20 ft Interva 100 ft Interva
Multiple Plume Calculations Solve for plume-averaged vertical veloc Gives the following Height above Stack z Plume Top-Hat Radius a Vertical Velocity V Solve for Height of CASC critical vertica Find Height above Ground z _{ort} +h _s Table of MERGED Plume-Averaged Vertical Velocity Height (feet) above ground Begin Merging (touch) = 58.7 60.0 80.0 10	s city at height 141.567 28.824 2.342 at velocity V _{erit} 35.345 46.177 tocities startin (meters) above stack 7.46 13.55 19.65 25.74 31.84 37.94 44.03 50.13 53.66 80.61 111.09 141.57 172.05 202.53 233.01 243.57 172.05 202.53 233.01 263.49 293.97 324.45 354.93 365.41 41.58 202.53 233.01 263.49 293.97 324.45 354.58 446.37 476.85 202.53 203.01 204.53 204.53 204.53 204.55 204.53 204.55 204.55 204.55 204.55 204.55 204.55 204.55 204.55 204.55 204.55 204.55 205.55 2	50000 meters* meters* meters m/s 5.30 meters meters gat Touchi Plume Radius(m) 1.065 #N/A #N/A #N/A #N/A #N/A #N/A #N/A #N/A	Tables Below feet 464.5 94.6 7.68 m/s 116.0 151.5 ng Height: Vert. Vel(m/s) 8.97 8.92 8.12 7.33 6.54 5.75 4.96 4.17 3.38 2.93 2.69 2.49 2.34 2.22 2.12 2.04 1.97 1.91 1.85 1.80 1.72 1.68	152.4 feet fu/sec feet feet	$\begin{array}{l} \mbox{Height above} \\ \mbox{V=}\{n(V^3a)_{hull}(a)\\ \mbox{V=V_{buch}}+(V_m^2)\\ \mbox{Height above} \\ \mbox{Regular EC}\\ \mbox{Regular EC}\\ \mbox{a=}a_m^+0.16(2-2)\\ \mbox{V=}V_{buch}+(V_m^2)\\ \mbox{V=}V_{buch}+(V_m^2)\\ \mbox{V=}V_{buch}+(V_m^2)\\ \mbox{V=}V_{buch}+(V_m^2)\\ \mbox{V=}V_{buch}+(V_m^2)\\ \mbox{Single Plume}\\ \mbox{V=}V_{buch}+(I-1e_{b})\\ \mbox{Single Plume}\\ \mbox{V=}V_{buch}+(V_m^2)\\ \mbox{V=}V_{buch}+(V_m$	$\label{eq:constraints} \begin{array}{l} ^{1/3} \mbox{ for heights above total merging elet} \\ \ell_{touch} * (z-z_{touch}) / (z_{tult}-z_{touch}) \\ \mbox{ for heights below total merg} \\ \mbox{ for heights below total merg} \\ \mbox{ ground} (z+h_a) \\ \mbox{ NS} \\ \mbox{ support of heights below total merg} \\ \mbox{ for heights below total merg} \\ \mbox{ support of heights below total merg} \\ \mbox{ for heights below total merg} \\ \mbox{ support of heights below total merg} \\ \mbox{ for heights below total merg} \\ for heights $	evation ing elevation ²² full Vm 20 ft Interval 20 ft Interval 100 ft Interval
Multiple Plume Calculations Solve for plume-averaged vertical veloc Gives the following Height above Stack z Plume Top-Hat Radius a Vertical Velocity V Solve for Height of CASC critical vertica Find Height above Stack z _{ent} Height above Ground z _{ent} +h _s Table of MERGED Plume-Averaged Vertical Velocity Begin Merging (touch) = 58.7 60.0 80.0 100.0 120.0 100.0 120.0 100.0 200.0 <i>End Merging (full/mp) = 211.6</i> 300.0 600.0 600.0 600.0 600.0 1	s city at height 141.567 28.824 2.342 at velocity V _{orit} 35.345 46.177 cocities startin (meters) above stack 7.66 7.46 13.55 19.65 25.74 31.84 37.94 44.03 50.13 53.66 80.61 111.09 141.57 172.05 202.53 233.01 263.49 354.45 354.93 355.49 354.93 355.45 354.93 355.49 354.93 355.49 35	50000 meters* meters* meters m/s 5.30 meters meters gat Touchi Plume Radius(m) 1.065 #N/A #N/A #N/A #N/A #N/A #N/A #N/A #N/A	Tables Below feet 464.5 94.6 7.68 m/s 116.0 151.5 Ng Height: Vert. Ver(m/s) 8.97 8.92 8.12 7.33 6.54 8.92 8.12 7.33 6.54 9.2 8.92 8.12 7.33 6.54 9.2 8.94 8.94 8.94 8.94 8.94 8.94 8.94 8.94 8.94 8.94	152.4 feet fu/sec feet feet	$\begin{array}{l} \mbox{Height above} \\ \mbox{V=}\{n(V^3a)_{hull}(a)\\ \mbox{V=V_{buch}}+(V_m^2)\\ \mbox{Height above} \\ \mbox{Regular EC}\\ \mbox{Regular EC}\\ \mbox{a=}a_m^+0.16(2-2)\\ \mbox{V=}V_{buch}+(V_m^2)\\ \mbox{V=}V_{buch}+(V_m^2)\\ \mbox{V=}V_{buch}+(V_m^2)\\ \mbox{V=}V_{buch}+(V_m^2)\\ \mbox{V=}V_{buch}+(V_m^2)\\ \mbox{Single Plume}\\ \mbox{V=}V_{buch}+(I-1e_{b})\\ \mbox{Single Plume}\\ \mbox{V=}V_{buch}+(V_m^2)\\ \mbox{V=}V_{buch}+(V_m$	$\label{eq:constraints} \begin{array}{l} ^{1/3} \mbox{ for heights above total merging elet} \\ \ell_{touch} * (z-z_{touch}) / (z_{tult}-z_{touch}) \\ \mbox{ for heights below total merg} \\ \mbox{ for heights below total merg} \\ \mbox{ ground} (z+h_a) \\ \mbox{ NS} \\ \mbox{ support of heights below total merg} \\ \mbox{ for heights below total merg} \\ \mbox{ support of heights below total merg} \\ \mbox{ for heights below total merg} \\ \mbox{ support of heights below total merg} \\ \mbox{ for heights below total merg} \\ for heights $	evation ing elevation ²² full Vm 20 ft Interval 20 ft Interval 100 ft Interval
Multiple Plume Calculations Solve for plume-averaged vertical veloc Gives the following Height above Stack z Plume Top-Hat Radius a Vertical Velocity V Solve for Height of CASC critical vertica Find Height above Stack z _{ent} Height above Ground z _{ent} +h _s fable of MERGED Plume-Averaged Vertical Velocity Begin Merging (touch) = 58.7 60.0 80.0 100.0 120.0 140.0 180.0 200.0 <i>End Merging (full/mp) = 211.6</i> 300.0 6000.0 6000.0 6000.0 6000.0 10	socity at height 141.567 28.824 2.342 at velocity V _{erit} 35.345 46.177 locities startir (meters) above stack 7.46 13.55 19.65 25.74 31.84 37.94 44.03 50.13 53.66 80.61 111.09 141.57 172.05 202.53 233.01 263.49 293.97 324.45 354.93 3355.41 415.89 446.37 476.85 558.77 751.17	500.00 meters* meters m/s 5.30 meters meters ag at Touchi Plume Radius(m) 1.065 #N/A #N/A #N/A #N/A #N/A #N/A #N/A #N/A	Tables Below feet 464.5 94.6 7.68 m/s 116.0 151.5 ng Height: Vert. Vel(m/s) 8.92 8.12 7.33 6.54 4.77 3.38 2.93 2.69 2.49 2.34 2.69 2.49 2.34 2.69 2.49 2.34 2.69 2.49 2.34 1.65 1.80 1.76 1.80 1.76 1.80 1.76 1.80 1.76 1.80 1.76 1.80 1.76 1.80 1.76 1.72 1.68 1.65 1.54	152.4 feet fu/sec feet feet	$\begin{array}{l} \mbox{Height above} \\ \mbox{V=}\{n(V^3a)_{hull}(a)\\ \mbox{V=V_{buch}}+(V_m^2)\\ \mbox{Height above} \\ \mbox{Regular EC}\\ \mbox{Regular EC}\\ \mbox{a=}a_m^+0.16(2-2)\\ \mbox{V=}V_{buch}+(V_m^2)\\ \mbox{V=}V_{buch}+(V_m^2)\\ \mbox{V=}V_{buch}+(V_m^2)\\ \mbox{V=}V_{buch}+(V_m^2)\\ \mbox{V=}V_{buch}+(V_m^2)\\ \mbox{Single Plume}\\ \mbox{V=}V_{buch}+(I-1e_{b})\\ \mbox{Single Plume}\\ \mbox{V=}V_{buch}+(V_m^2)\\ \mbox{V=}V_{buch}+(V_m$	$\label{eq:constraints} \begin{array}{l} ^{1/3} \mbox{ for heights above total merging elet} \\ \ell_{touch} * (z-z_{touch}) / (z_{tult}-z_{touch}) \\ \mbox{ for heights below total merg} \\ \mbox{ for heights below total merg} \\ \mbox{ ground} (z+h_a) \\ \mbox{ NS} \\ \mbox{ support of heights below total merg} \\ \mbox{ for heights below total merg} \\ \mbox{ support of heights below total merg} \\ \mbox{ for heights below total merg} \\ \mbox{ support of heights below total merg} \\ \mbox{ for heights below total merg} \\ for heights $	evation ing elevation ²² full Vm 20 ft Interval 20 ft Interval 100 ft Interval
Multiple Plume Calculations Solve for plume-averaged vertical veloc Gives the following Height above Stack z Plume Top-Hat Radius a Vertical Velocity V Solve for Height of CASC critical vertica Find Height above Stack z _{ort} Height above Ground z _{ort} +h _s Table of MERGED Plume-Averaged Vertical Velocity Begin Merging (touch) = 58.7 60.0 80.0 100.0 120.0 100.0 120.0 100.0 120.0 100.0 120.0 100	socity at height 141.567 28.824 2.342 at velocity V _{erit} 35.345 46.177 locities startir (meters) above stack 7.46 13.55 19.65 25.74 31.84 37.94 44.03 50.13 53.66 80.61 111.09 141.57 172.05 202.53 233.01 263.49 293.97 324.45 354.93 3355.41 415.89 446.37 476.85 558.77 751.17	50000 meters* meters m/s 5.30 meters meters g at Touchi Plume Radius(m) 1.065 #NAA #N/A #N/A #N/A #N/A #N/A #N/A #N/A	Tables Below feet 464.5 94.6 7.68 m/s 116.0 151.5 ng Height: Vert. Vert(m/s) 8.97 8.92 8.12 7.33 6.54 5.75 4.96 4.17 3.38 2.93 2.69 2.49 2.49 2.49 2.49 2.44 1.97 1.91 1.85 1.80 1.72 1.68 1.68 1.68 1.68 1.64 1.72 1.68 1.68 1.64 1.72 1.68 1.68 1.64 1.72 1.68 1.64 1.72 1.68 1.68 1.64 1.72 1.68 1.68 1.68 1.64 1.72 1.68 1.68 1.68 1.64 1.72 1.68 1.68 1.68 1.64 1.72 1.68 1.68 1.68 1.64 1.72 1.68 1.68 1.68 1.64 1.68 1.68 1.68 1.64 1.72 1.68 1.68 1.68 1.64 1.72 1.68 1.68 1.68 1.68 1.64 1.72 1.68 1.68 1.68 1.68 1.64 1.72 1.68 1.68 1.68 1.68 1.64 1.72 1.68 1.68 1.68 1.64 1.72 1.68 1.68 1.68 1.64 1.72 1.68 1.68 1.68 1.64 1.72 1.68 1.68 1.64 1.72 1.68 1.68 1.64 1.72 1.68 1.64 1.72 1.68 1.64 1.72 1.68 1.64 1.72 1.68 1.64 1.72 1.68 1.64 1.72 1.68 1.64 1.72 1.68 1.64 1.72 1.68 1.64 1.68 1.64 1.68 1.68 1.64 1.54 1.68 1.64 1.54 1.68 1.54	152.4 feet fu/sec feet feet	$\begin{array}{l} \mbox{Height above} \\ \mbox{V=}\{n(V^3a)_{hull}(a)\\ \mbox{V=V_{buch}}+(V_m^2)\\ \mbox{Height above} \\ \mbox{Regular EC}\\ \mbox{Regular EC}\\ \mbox{a=}a_m^+0.16(2-2)\\ \mbox{V=}V_{buch}+(V_m^2)\\ \mbox{V=}V_{buch}+(V_m^2)\\ \mbox{V=}V_{buch}+(V_m^2)\\ \mbox{V=}V_{buch}+(V_m^2)\\ \mbox{V=}V_{buch}+(V_m^2)\\ \mbox{Single Plume}\\ \mbox{V=}V_{buch}+(I-1e_{b})\\ \mbox{Single Plume}\\ \mbox{V=}V_{buch}+(V_m^2)\\ \mbox{V=}V_{buch}+(V_m$	$\label{eq:constraints} \begin{array}{l} ^{1/3} \mbox{ for heights above total merging elet} \\ \ell_{touch} * (z-z_{touch}) / (z_{tult}-z_{touch}) \\ \mbox{ for heights below total merg} \\ \mbox{ for heights below total merg} \\ \mbox{ ground} (z+h_a) \\ \mbox{ NS} \\ \mbox{ support of heights below total merg} \\ \mbox{ for heights below total merg} \\ \mbox{ support of heights below total merg} \\ \mbox{ for heights below total merg} \\ \mbox{ support of heights below total merg} \\ \mbox{ for heights below total merg} \\ for heights $	evation ing elevation ²² full Vm 20 ft Interval 20 ft Interval 100 ft Interval
Multiple Plume Calculations Solve for plume-averaged vertical veloc Gives the following Height above Stack z Plume Top-Hat Radius a Vertical Velocity V Solve for Height of CASC critical vertica Find Height above Ground z _{crit} +h _a Height above Ground z _{crit} +h _a Table of MERGED Plume-Averaged Vertical Velocity Begin Merging (touch) = 58.7 60.0 80.0 100.0 120.0 140.0 160.0 180.0 100.0	s botty at height 141.567 28.824 2.342 at velocity V _{crit} 35.345 46.177 locities startin (meters) above stack 7.46 7.47 7.51.17 903.57	50000 meters* meters m/s 5.30 meters meters g at Touchi Plume Radius(m) 1.065 #N/A #N/A #N/A #N/A #N/A #N/A #N/A #N/A	Tables Below feet 464.5 94.6 7.68 m/s 116.0 151.5 ng Height: Vert. Ver(m/s) 8.97 8.92 8.12 7.33 6.54 5.75 4.96 4.17 3.38 2.93 2.69 2.49 2.34 2.22 2.12 2.04 1.97 1.91 1.85 1.80 1.72 1.68 1.65 1.54	152.4 feet fu/sec feet feet	$\begin{array}{l} \mbox{Height above} \\ \mbox{V=}\{n(V^3a)_{hull}(a)\\ \mbox{V=V_{buch}}+(V_m^2)\\ \mbox{Height above} \\ \mbox{Regular EC}\\ \mbox{Regular EC}\\ \mbox{a=}a_m^+0.16(2-2)\\ \mbox{V=}V_{buch}+(V_m^2)\\ \mbox{V=}V_{buch}+(V_m^2)\\ \mbox{V=}V_{buch}+(V_m^2)\\ \mbox{V=}V_{buch}+(V_m^2)\\ \mbox{V=}V_{buch}+(V_m^2)\\ \mbox{Single Plume}\\ \mbox{V=}V_{buch}+(I-1e_{b})\\ \mbox{Single Plume}\\ \mbox{V=}V_{buch}+(V_m^2)\\ \mbox{V=}V_{buch}+(V_m$	$\label{eq:constraints} \begin{array}{l} ^{1/3} \mbox{ for heights above total merging elet} \\ \ell_{touch} * (z-z_{touch}) / (z_{tult}-z_{touch}) \\ \mbox{ for heights below total merg} \\ \mbox{ for heights below total merg} \\ \mbox{ ground} (z+h_a) \\ \mbox{ NS} \\ \mbox{ support of heights below total merg} \\ \mbox{ for heights below total merg} \\ \mbox{ support of heights below total merg} \\ \mbox{ for heights below total merg} \\ \mbox{ support of heights below total merg} \\ \mbox{ for heights below total merg} \\ for heights $	evation ing elevation ⁵² full Vm 20 ft Interval 20 ft Interval 100 ft Interval
Multiple Plume Calculations Solve for plume-averaged vertical veloc Gives the following Height above Stack z Plume Top-Hat Radius a Vertical Velocity V Solve for Height of CASC critical vertica Find Height above Stack z _{ent} Height above Ground z _{ent} +h _a Table of MERGED Plume-Averaged Vertical Velocity Begin Merging (touch) = 58.7 60.0 80.0 100.0 120.0 100.0 120.0 100.0 200.0 <i>End Merging (full/mp) = 211.6</i> 300.0 600.0 600.0 600.0 1	south at height 141.567 28.824 2.342 at velocity V _{erit} 35.345 46.177 bocities startin (meters) above stack 7.46 7.46 7.46 7.46 7.46 7.46 7.46 7.46	50000 meters* meters* meters m/s 5.30 meters meters ga t Touchi Plume Radius(m) 1.065 #N/A #N/A #N/A #N/A #N/A #N/A #N/A #N/A	Tables Below feet 464.5 94.6 7.68 m/s 116.0 151.5 Ng Height: Vert. Vel(m/s) 8.97 8.92 8.12 7.33 6.54 5.75 4.96 4.17 3.38 2.69 2.49 2.34 2.59 2.49 2.34 2.59 2.49 2.49 2.34 2.59 2.49 2.49 2.49 2.34 1.15 1.85 1.80 1.76 1.85 1.85 1.85 1.80 1.76 1.85 1.8	152.4 feet fu/sec feet feet	$\begin{array}{l} \mbox{Height above} \\ \mbox{V=}\{n(V^3a)_{hull}(a)\\ \mbox{V=V_{buch}}+(V_m^2)\\ \mbox{Height above} \\ \mbox{Regular EC}\\ \mbox{Regular EC}\\ \mbox{a=}a_m^+0.16(2-2)\\ \mbox{V=}V_{buch}+(V_m^2)\\ \mbox{V=}V_{buch}+(V_m^2)\\ \mbox{V=}V_{buch}+(V_m^2)\\ \mbox{V=}V_{buch}+(V_m^2)\\ \mbox{V=}V_{buch}+(V_m^2)\\ \mbox{Single Plume}\\ \mbox{V=}V_{buch}+(I-1e_{b})\\ \mbox{Single Plume}\\ \mbox{V=}V_{buch}+(V_m^2)\\ \mbox{V=}V_{buch}+(V_m$	$\label{eq:constraints} \begin{array}{l} ^{1/3} \mbox{ for heights above total merging elet} \\ \ell_{touch} * (z-z_{touch}) / (z_{tult}-z_{touch}) \\ \mbox{ for heights below total merg} \\ \mbox{ for heights below total merg} \\ \mbox{ ground} (z+h_a) \\ \mbox{ NS} \\ \mbox{ support of heights below total merg} \\ \mbox{ for heights below total merg} \\ \mbox{ support of heights below total merg} \\ \mbox{ for heights below total merg} \\ \mbox{ support of heights below total merg} \\ \mbox{ for heights below total merg} \\ for heights $	evation ing elevation z _{full} vL V _m

ased on 9 chillers w/ 6 cells/chiller. Calc'	"Aviation Saf				ethodology - Wint st, et. al.		
f.diam for each chiller wiith each cell at 33" ID	"The Evaluati	on of Maxim	um Updraft S	peeds for	Calm Conditions	at Various Heights in the Plum	е
9,000 ACFM total for each chiller).		from a Gas-	Turbine Pow		•	land, Australia," Dr. K.T. Spilla	
mbient Conditions:						me neutral conditions (dθ/dz=0 o	rθ _a =θ _e)
Ambient Potential Temp θ_a	278.15	Kelvins	41.0	۳F		.3048 meters/feet 9.81 m/s ²	
lume Exit Conditions: Stack Height h	10.83	meters	35 6/12	feet-inches	Gravity g λ	9.81 m/s ⁻ 1.11	
Individual Chiller Stack Diameter D	2.0404			inches	λ,	~1.0	
Stack Velocity V _{exit}	9.96			ft/sec	4Vol/(60πD ²)		
Individual Chiller Volumetric Flow	32.56	cu.m/sec	69,000	ACFM	πV _{exit} D ² /4		Sect.2/¶1
Stack Potential Temp θ_s	289.26	Kelvins	61.0	°F			
Initial Stack Buoyancy Flux F_o	3.9060	m ⁴ /s ³	20.0	ΔT(°F)	$gV_{exit}D^2(1-\theta_a/\theta_s)/4$	= Vol.Flow(g/ π)(1- θ_a/θ_s)	Sect.2/¶1
Plume Buoyancy Flux F		m ⁴ /s ³			- · · · · · · · · · · · ·	or a, V, θ_p at plume height (see bel	ow)
Number of Chillers n	9			1.732	Multiple Stack Mu	ultiplication Factor (n ^{0.25})	
onditions at End (Top) of Jet Phase:	40 750	*	44.0	61*	6 25D moto	ro*=motoro obovo otook too	C+ 0/#14
Height above Stack z _{jet} Height above Ground z _{iet} +h _s		meters* meters	41.8 77.4	feet*	z _{jet} – 6.25D, mete	ers*=meters above stack top	Sect.3/¶1
Vertical Velocity V _{iet}	4.980			ft/sec	V _{jet} = 0.5V _{exit} = V _e		
Plume Top-Hat Diameter 2a _{iet}		meters	13.4		2a _{iet} = 2D	Conservation of momentur	m "
· · · · · · · · · · · · · · · · · · ·				1001	jet		
illane Methodology - Analytical Solutions fo	r Calm Condit	ions for Plu	ne Heights al	oove Jet Ph	lase		
Single Plume-averaged Vertical Velocity V	iven by Analy	tical Solutio	n in Paper wh	nere Produc	ct Va given by eq	uations below:	
Plume Top-Hat Radius a	S	olutions in	Table Below		,	ar increase with height	Sect.2/Eq.6
Virtual Source Height z_v	0.247	meters*		feet*	$6.25D[1-(\theta_e/\theta_s)^{1/2}]$, meters*=meters above stack top	Sect.2/Eq.6
Height above Ground z_v +h _s		meters	36.4	feet		where $(\theta_a/\theta_s)^{1/2} = (\theta_e/\theta_s)^{1/2}$	
Vertical Velocity V		olutions in	Table Below			(z-z _v) ² - (6.25D-z _v) ²]} ^(1/3) / a	Sect.2.1(6)
Product (Va) _o	9.963	m²/s			$V_{exit}D/2(\theta_e/\theta_s)^{1/2}$		
ngle Chiller Results:	aity of baight	500.0	6 t	450.4			
Solve for plume-averaged vertical velo Gives the following Height above Stack z'	141.567	500.0 meters*	teet 464.5		meters above gro	unu (Ζ τη _s)	
Plume Top-Hat Diameter 2a	45.222		464.5 148.4		2a'=2*0.16(z'-z,)		Sect.2/Eq.6
Vertical Velocity V	0.962			ft/sec	(1)	[(z-z _v) ² -(6.25D-z _v) ²]} ^(1/3) /(2a'/2)	Sect.2/Eq.6
	0.002		0.10		v ((vu) ₀ · 0.121 c	(2 2 ₀) (0.200 2 ₀)]j /(20/2)	
Solve for Height of CASC critical vertica	al velocity V _{crit}	5.30	m/s plume-a	veraged ve	ertical velocity	Critic	cal VV < Top of
Find Height above Stack z _{crit}	#N/A	meters	#N/A	-	-	simultaneously in both eqs. (i.e.,	-
Height above Ground z _{crit} +h _s	#N/A	meters	#N/A	feet	for V=V _{crit} using t	he cubic equation ax ³ +bx ² +cx+d=	=0, where
						, c=0, and b=-(0.12F _o)/(V _{crit} ³ 0.16 ³	
Interpolated Height of critical vertical ve	locity in Jet P	hase:				$0 = (0, 0 = 0)^2 (1/2) \frac{3}{1} (1/2) \frac{3}{2} (1/2) \frac{3}{$	1501
					and d=[0.1	2F _o (6.25D-z _v) ² -(Va) _o ³]/(V _{crit} ³ 0.16 ³	
Find Height above Stack z _{crit}	11.932		39.1		and d=[0.1		
Find Height above Stack z_{crit} Height above Ground z_{crit} +h _s	11.932 22.765	meters	39.1 74.7		and d=[0.1	<u>http://www</u> gives the real solution x = z-zv	<u>.1728.org/cubic.</u> y = 11.7
•		meters			and d=[0.1	<u>http://www</u> gives the real solution x = z-zv or z(m/above stack)	x.1728.org/cubic.l y = 11.7) = 11.9
Height above Ground z_{ent} +h _s	22.765	meters meters	74.7	feet		<u>http://www</u> gives the real solution x = z-zv	x.1728.org/cubic.l y = 11.7) = 11.9
Height above Ground z _{crit} +h _s able of Plume Top-Hat Diameters (2a) and Plu	22.765 I me-Averaged	meters meters Vertical Vel	74.7 ocities startin	feet og at end of		<u>http://www</u> gives the real solution x = z-zv or z(m/above stack)	x.1728.org/cubic.l y = 11.7) = 11.9
Height above Ground z _{crit} +h _s ble of Plume Top-Hat Diameters (2a) and Plu Height (feet)	22.765 Ime-Averaged (meters)	meters meters Vertical Vel Plume	74.7 ocities startin SingleStk	feet ng at end of Plume		<u>http://www</u> gives the real solution x = z-zv or z(m/above stack)	x.1728.org/cubic.l y = 11.7) = 11.9
Height above Ground z _{crit} +h _s ble of Plume Top-Hat Diameters (2a) and Plu	22.765 Ime-Averaged (meters)	meters meters Vertical Vel Plume	74.7 ocities startin SingleStk VertVel(m/s)	feet ng at end of Plume		<u>http://www</u> gives the real solution x = z-zv or z(m/above stack)	x.1728.org/cubic.l y = 11.7) = 11.9
Height above Ground z _{crit} +h _s ble of Plume Top-Hat Diameters (2a) and Plu Height (feet) above ground	22.765 ume-Averaged (meters) above stack	meters meters Vertical Vele Plume Radius(m)	74.7 ocities startin SingleStk VertVel(m/s) 9.96	feet ng at end of Plume Temp(K)		<u>http://www</u> gives the real solution x = z-zv or z(m/above stack)	x.1728.org/cubic. y = 11.7) = 11.
Height above Ground z _{crit} +h _s ble of Plume Top-Hat Diameters (2a) and Plu Height (feet) above ground <u>Stack.Rel.Ht = 35.5</u>	22.765 ume-Averaged (meters) above stack 0.00	meters meters Vertical Velo Plume Radius(m) 1.020	74.7 ocities startin SingleStk VertVel(m/s) <u>9.96</u> 9.43	feet ng at end of Plume Temp(K)		http://www gives the real solution x = z-zv or z(m/above stack; z(ft/above ground)	1728.org/cubic. r = 11.7) = 11.7) = 7 10 ft Interva
Height above Ground z _{crit} +h _s ble of Plume Top-Hat Diameters (2a) and Plu Height (feet) above ground <i>Stack.Rel.Ht</i> = 35.5 40.0	22.765 Ime-Averaged (meters) above stack 0.00 1.36	meters meters Vertical Vel- Plume Radius(m) 1.020 1.125	74.7 ocities startin SingleStk VertVel(m/s) 9.96 9.43 8.24	feet ng at end of Plume Temp(K)		http://www gives the real solution x = z-zv or z(m/above stack) z(ft/above ground) Jet Phase Eqs:	1728.org/cubic. r = 11.7) = 11.7) = 7 10 ft Interva
Height above Ground z _{crit} +h _s ble of Plume Top-Hat Diameters (2a) and Plu Height (feet) above ground <u>Stack.Rel.Ht</u> = 35.5 40.0 50.0	22.765 ume-Averaged (meters) above stack 0.00 1.36 4.41	meters meters Vertical Velo Plume Radius(m) 1.020 1.125 1.359	74.7 ocities startin SingleStk VertVel(m/s) 9.96 9.43 8.24 7.05	feet ng at end of Plume Temp(K)		http://www gives the real solution x = z-zv or z(m/above stack) z(ft/above ground) Jet Phase Eqs: Linearly interpolated from Stack	1728.org/cubic. = 11.7 = 11.7 = 11. = 7 10 ft Interva Rel.Ht to Top of Jet
Height above Ground z _{crit} +h _s ble of Plume Top-Hat Diameters (2a) and Plu Height (feet) above ground <i>Stack.Rel.Ht</i> = 35.5 40.0 50.0 60.0 70.0 <i>Single Jet 5.3 m/s Height</i> = 74.7	22.765 ume-Averaged (meters) above stack 0.00 1.36 4.41 7.46	meters meters Vertical Velo Plume Radius(m) 1.020 1.125 1.359 1.593	74.7 ocities startin SingleStk VertVel(m/s) 9.96 9.43 8.24 7.05 5.86	feet ng at end of Plume Temp(K)		http://www gives the real solution x = z-zv or z(m/above stack) z(ft/above ground) Jet Phase Eqs: Linearly interpolated from Stack Spillane Equations:	1728.org/cubic. = 11.7 = 11.7 = 11. = 7 10 ft Interva Rel.Ht to Top of Jet
Height above Ground z _{crit} +h _s ble of Plume Top-Hat Diameters (2a) and Plu Height (feet) above ground <i>Stack.Rel.Ht</i> = 35.5 40.0 50.0 70.0	22.765 ume-Averaged (meters) above stack 0.00 1.36 4.41 7.46 10.50	meters meters Vertical Velu- Plume Radius(m) 1.020 1.125 1.359 1.593 1.828	74.7 ocities startin SingleStk VertVel(m/s) 9.96 9.43 8.24 7.05 5.86 5.30	feet ng at end of Plume Temp(K)	f jet phase:	$\label{eq:started} \begin{array}{l} \label{eq:started} & \label{eq:started} \\ \mbox{gives the real solution x = z-zv} & \mbox{or } z(m/above stack), \\ \mbox{z}(ff/above ground) \\ \mbox{z}(ff/above ground) \\ \mbox{Jet Phase Eqs:} \\ \mbox{Linearly interpolated from Stack} \\ \mbox{Spillame Equations:} \\ \mbox{V}_{\mu tume} = \{(Va)_a^3 + 0.12F_a[(z-z_a)^2 - (6.2 a a 0.16[(z-z_a))^2 - ($.1728.org/cubic = 11.7 = 11.7 = 11. 1. 1. 1. 1. 1. 1. 1. 1. 1.
Height above Ground z _{crit} +h _s ble of Plume Top-Hat Diameters (2a) and Plu Height (feet) above ground Stack.Rel.Ht = 35.5 40.0 50.0 60.0 70.0 Single Jet 5.3 m/s Height = 74.7 Top of Single jet = 77.4 80.0	22.765 ume-Averaged (meters) above stack 0.00 1.36 4.41 7.46 10.50 11.93 12.75 13.55	meters meters Vertical Velu Plume Radius(m) 1.020 1.125 1.593 1.593 1.628 1.938 2.001 2.129	74.7 SingleStk VertVel(m/s) 9.96 9.43 8.24 7.05 5.86 5.30 4.98 4.70	feet g at end of Plume Temp(K) 282.67 282.66	f jet phase:	$\label{eq:started} \begin{array}{l} \mbox{http://www}\\ \mbox{gives the real solution x = z-zv.}\\ \mbox{or } z(m/above stack;\\ z(ft/above ground)\\ \mbox{ground}\\ \mbox$.1728.org/cubic = 11.7 = 11.7 = 11.7 = 11.7 = 11.7 ■ 10 ft Interva Rel.Ht to Top of Jet = = = = = = = = = = = = =
Height above Ground z _{crit} +h _s ble of Plume Top-Hat Diameters (2a) and Plu Height (feet) above ground Stack.Rel.Ht = 35.5 40.0 50.0 60.0 70.0 Single Jet 5.3 m/s Height = 74.7 Top of Single jet = 77.4 80.0 90.0	22.765 ame-Averaged (meters) above stack 0.00 1.36 4.41 7.46 10.50 11.93 12.75 13.55 16.60	meters meters Vertical Velu Plume Radius(m) 1.020 1.125 1.359 1.593 1.828 1.938 2.001 2.129 2.616	74.7 SingleStk VertVel(m/s) 9.96 9.43 8.24 7.05 5.86 5.30 4.98 4.70 3.87	feet g at end of Plume Temp(K) 282.67 282.66 282.37	f jet phase:	$\label{eq:started} \begin{array}{l} \label{eq:started} & \mbox{http://www} \\ \mbox{gives the real solution x = z-zv.} \\ \mbox{or } z(m/above stack; \\ z(ft/above ground) \\ \mbox{ground} \\ \mbox{ground} \\ \mbox{Jet Phase Eqs:} \\ \mbox{Linearly interpolated from Stack} \\ \mbox{Spillane Equations:} \\ \mbox{v}_{\mu n m} = \{(va)_a^3 + 0.12F_a(z-zv)^2 (6.2, a)^2 + 0.12F_a(z-zv)^2 + 0.12F_a(z$.1728.org/cubic = 11.7 = 11.7 = 11. 1. 1. 1. 1. 1. 1. 1. 1. 1.
Height above Ground z _{crit} +h _s ble of Plume Top-Hat Diameters (2a) and Plu Height (feet) above ground Stack.Rel.Ht = 35.5 40.0 50.0 60.0 70.0 Single Jet 5.3 m/s Height = 74.7 Top of Single jet = 77.4 80.0 90.0	22.765 ime-Averaged (meters) above stack 0.00 1.36 4.41 7.46 10.50 11.93 12.75 13.55 16.60 19.65	meters meters Vertical Velu Plume Radius(m) 1.020 1.125 1.359 1.593 1.828 1.938 2.001 2.129 2.616 3.104	74.7 cocities startin SingleStk VertVel(m/s) 9.96 9.43 8.24 7.05 5.86 5.30 4.98 4.70 3.87 3.32	feet g at end of Plume Temp(K) 282.67 282.66 282.37 281.54	fjet phase:	$\label{eq:stars} \begin{array}{l} \label{eq:stars} http://www \\ gives the real solution x = z-zv \\ or z(m/above stack) \\ z(ff/above ground) \\ \hline \end{array}$	1728.org/cubic = 11.7 = 11.7 = 11.7 = 11.7 = 11.7 10 ft Interva Rel.Ht to Top of Jet 25D-z,) ²] ^{1/3} / a /(4V _{plume} *a ^{2*} λ ²))
Height above Ground z _{crit} +h _s ble of Plume Top-Hat Diameters (2a) and Plu Height (feet) above ground <i>Stack.Rel.Ht</i> = 35.5 40.0 50.0 60.0 70.0 <i>Single Jet 5.3 m/s Height = 74.7</i> <i>Top of Single jet = 77.4</i> 80.0 90.0 100.0 110.0	22.765 me-Averaged (meters) above stack 0.00 1.36 4.41 7.46 10.50 11.93 12.75 13.55 16.60 19.65 22.70	meters meters Vertical Velo Plume Radius(m) 1.020 1.125 1.359 1.593 1.693 1.693 2.001 2.129 2.616 3.104 3.592	74.7 cotties startin SingleStk VertVel(m/s) 9.96 9.43 8.24 7.05 5.86 5.30 4.98 4.70 3.87 3.32 2.92	feet g at end of Plume Temp(K) 282.67 282.66 282.37 281.54 280.96	f jet phase:	$\label{eq:stars} \begin{array}{l} \label{eq:stars} http://www \\ gives the real solution x = z-zv \\ or z(m/above stack) \\ z(ff/above ground) \\ \hline \end{array}$	1728.org/cubic = 11.7 = 11.7 = 11.7 = 11.7 = 11.7 10 ft Interva Rel.Ht to Top of Jet 25D-z.) ²] ^{1/3} / a /(4V _{plume} *a ² *λ ²));
Height above Ground z _{crit} +h _s ble of Plume Top-Hat Diameters (2a) and Plu Height (feet) above ground <i>Stack.Rel.Ht</i> = 35.5 40.0 50.0 60.0 70.0 <i>Single Jet 5.3 m/s Height</i> = 74.7 <i>Top of Single jet</i> = 77.4 80.0 90.0 110.0	22.765 ume-Averaged (meters) above stack 0.00 1.36 4.41 7.46 10.50 11.93 12.75 13.55 16.60 19.65 22.70 25.74	meters meters Vertical Velu Plume Radius(m) 1.020 1.125 1.359 1.593 1.828 1.938 2.001 2.129 2.616 3.104 3.592 4.079	74.7 singleStk VertVel(m/s) 9.96 9.43 8.24 7.05 5.86 5.30 4.98 4.70 3.87 3.32 2.92 2.62	feet g at end of Plume Temp(K) 282.67 282.66 282.37 281.54 280.96 280.54	f jet phase:	$\label{eq:stars} \begin{array}{l} \label{eq:stars} http://www \\ gives the real solution x = z-zv \\ or z(m/above stack) \\ z(ff/above ground) \\ \hline \end{array}$	1728.org/cubic = 11.7 = 11.7 = 11.7 = 11.7 = 11.7 10 ft Interva Rel.Ht to Top of Jet 25D-z,) ²] ^{1/3} / a /(4V _{plume} *a ^{2*} λ ²))
Height above Ground z _{crit} +h _s ble of Plume Top-Hat Diameters (2a) and Plu Height (feet) above ground <i>Stack.Rel.Ht</i> = 35.5 40.0 50.0 60.0 70.0 <i>Single Jet 5.3 m/s Height</i> = 74.7 <i>Top of Single jet</i> = 77.4 80.0 90.0 110.0 110.0 130.0	22.765 me-Averaged (meters) above stack 0.00 1.36 4.41 7.46 10.50 11.93 12.75 13.55 16.60 19.65 22.70 25.74 28.79	meters meters Vertical Velu Plume Radius(m) 1.020 1.125 1.359 1.593 1.593 1.828 1.938 2.001 2.129 2.616 3.104 3.592 4.079 4.567	74.7 SingleStk VertVel(m/s) 9.96 9.43 8.24 7.05 5.86 5.30 4.98 4.70 3.87 3.32 2.92 2.62 2.39	feet g at end of Plume Temp(K) 282.67 282.66 282.37 281.54 280.54 280.54 280.54	f jet phase:	$\label{eq:stars} \begin{array}{l} \label{eq:stars} http://www \\ gives the real solution x = z-zv \\ or z(m/above stack) \\ z(ff/above ground) \\ \hline \end{array}$	1728.org/cubic = 11.7 = 11.7 = 11.7 = 11.7 = 11.7 10 ft Interva Rel.Ht to Top of Jet 25D-z,) ²] ^{1/3} / a /(4V _{plume} *a ^{2*} λ ²))
Height above Ground z _{ent} +h _a Ible of Plume Top-Hat Diameters (2a) and Plu Height (feet) above ground Stack.Rel.HI = 35.5 40.0 50.0 60.0 70.0 Single Jet 5.3 m/s Height = 74.7 Top of Single jet = 77.4 80.0 90.0 110.0 120.0 130.0 150.0	22.765 me-Averaged (meters) above stack 0.00 1.36 4.41 7.46 10.50 11.93 12.75 13.55 16.60 19.65 22.70 25.74 28.79 34.89	meters meters Vertical Velu Plume Radius(m) 1.020 1.125 1.593 1.593 1.828 1.938 2.001 2.129 2.616 3.104 3.592 4.079 4.567 5.542	74.7 SingleStk VertVel(m/s) 9.96 9.43 8.24 7.05 5.86 5.30 4.98 4.70 3.87 3.32 2.92 2.62 2.39 2.06	feet g at end of Plume Temp(K) 282.67 282.66 282.37 281.54 280.96 280.54 280.96 280.21 279.95	f jet phase:	$\label{eq:stars} \begin{array}{l} \label{eq:stars} http://www \\ gives the real solution x = z-zv \\ or z(m/above stack) \\ z(ff/above ground) \\ \hline \end{array}$	$\frac{1728. \text{ org/cubic.}}{11.7}$ $= 11.7$ $= 11.7$ $= 11.7$ $= 11.7$ 10 ft Interva Rel.Ht to Top of Jet $(550-z_2)^2)^{1/3} / a$ $((4V_{plume} * a^{2+}\lambda^2)))$ $(4V_{plume} * a^{2+}\lambda^2))$
Height above Ground z _{ent} +h _s ble of Plume Top-Hat Diameters (2a) and Plu Height (feet) above ground Stack.Rel.Ht = 35.5 40.0 50.0 60.0 70.0 Single Jet 5.3 m/s Height = 77.4 80.0 90.0 110.0 120.0 130.0 150.0 150.0	22.765 ame-Averaged (meters) above stack 0.00 1.36 4.41 7.46 10.50 11.93 12.75 13.55 16.60 19.65 22.70 25.74 28.79 34.89 50.13	meters meters Vertical Velu Plume Radius(m) 1.020 1.125 1.593 1.593 1.593 1.828 1.938 2.001 2.129 2.616 3.104 3.592 4.079 4.567 5.542 7.981	74.7 SingleStk VertVel(m/s) 9.96 9.43 8.24 7.05 5.86 5.30 4.98 4.70 3.87 3.32 2.92 2.62 2.39 2.06 1.60	feet g at end of Plume Temp(K) 282.67 282.66 282.37 281.54 280.96 280.54 280.95 280.54 280.95 279.57	fjet phase:	http://www gives the real solution x = z-zv or z(m/above stack) z(ft/above ground) Jet Phase Eqs: Linearly interpolated from Stack Spillane Equations: $V_{pums} = (V(a)_s^{3} + 0.12F_d(z-z)^2 (6.2 a = 0.16(z-zv) \theta_p = \theta_s (1 + (1 - (\theta_d) - \theta_s))^* (V_{est}D^2CEC Staff Equation:V_{mp} = n^{2S_V} v_{sp}Brigg's Equation:V_{msigs's} = (2/3) \times 1.6^{3/2} \times F_{mp}^{(1/2)} xwhere F_{mp} = nF_{sp}$	$\frac{.1728. \text{ org/cubic}}{.1728. \text{ org/cubic}}$ $= 11.7$
Height above Ground z _{crit} +h _s ble of Plume Top-Hat Diameters (2a) and Plu Height (feet) above ground Stack.Rel.Ht = 35.5 0.0 60.0 70.0 Single Jet 5.3 m/s Height = 74.7 Top of Single jet = 77.4 80.0 90.0 100.0 110.0 130.0 130.0 250.0	22.765 ame-Averaged (meters) above stack 0.00 1.36 4.41 7.46 10.50 11.93 12.75 13.55 16.60 19.65 22.70 25.74 28.79 34.89 50.13 65.37	meters meters Vertical Velu Plume Radius(m) 1.020 1.125 1.359 1.693 1.893 1.893 2.001 2.129 2.616 3.104 3.592 4.079 4.567 5.542 7.981 10.419	74.7 SingleStk VertVel(m/s) 9.96 9.43 8.24 7.05 5.86 5.30 4.98 4.70 3.87 3.32 2.92 2.62 2.39 2.06 1.60 1.37	feet g at end of Plume Temp(K) 282.67 282.66 282.37 281.54 280.96 280.54 280.65 280.54 280.52 279.57 279.03	i jet phase:	$\label{eq:stars} \begin{array}{l} \label{eq:stars} http://www \\ gives the real solution x = z-zv \\ or z(m/above stack) \\ z(ff/above ground) \\ \hline \end{array}$	$\frac{.1728. \text{ org/cubic}}{.1728. \text{ org/cubic}}$ $= 11.7$
Height above Ground z _{ent} +h _s ble of Plume Top-Hat Diameters (2a) and Plu Height (feet) above ground <i>Stack.Rel.Ht</i> = 35.5 40.0 50.0 60.0 70.0 <i>Single Jet 5.3 m/s Height = 74.7 Top of Single jet = 77.4</i> 80.0 90.0 110.0 120.0 130.0 200.0 250.0 200.0 250.0 200.0	22.765 me-Averaged (meters) above stack 0.00 1.36 4.41 7.46 10.50 11.93 12.75 13.55 16.60 19.65 22.70 25.74 28.79 34.89 50.13 65.37 80.61	meters meters Vertical Vela Plume Radius(m) 1.020 1.125 1.359 1.593 1.828 1.938 2.001 2.129 2.616 3.104 3.592 4.079 4.567 5.542 7.981 10.419 12.858	74.7 singleStk VertVel(m/s) 9.96 9.43 8.24 7.05 5.86 5.30 4.98 4.70 3.82 2.92 2.62 2.39 2.06 1.60 1.37 1.23	feet g at end of Plume Temp(K) 282.67 282.66 282.37 281.54 280.96 280.96 280.54 280.96 280.21 279.95 279.95 279.93 278.75	i jet phase:	http://www gives the real solution x = z-zv or z(m/above stack) z(ft/above ground) Jet Phase Eqs: Linearly interpolated from Stack Spillane Equations: $V_{pums} = (V(a)_s^{3} + 0.12F_d(z-z)^2 (6.2 a = 0.16(z-zv) \theta_p = \theta_s (1 + (1 - (\theta_d) - \theta_s))^* (V_{est}D^2CEC Staff Equation:V_{mp} = n^{2S_V} v_{sp}Brigg's Equation:V_{msigs's} = (2/3) \times 1.6^{3/2} \times F_{mp}^{(1/2)} xwhere F_{mp} = nF_{sp}$	$\frac{.1728. \text{ org/cubic}}{.1728. \text{ org/cubic}}$ $= 11.7$
Height above Ground z _{ent} +h _s ble of Plume Top-Hat Diameters (2a) and Plu Height (feet) above ground <i>Stack.Rel.Ht</i> = 35.5 40.0 50.0 60.0 70.0 <i>Single Jet 5.3 m/s Height</i> = 74.7 <i>Top of Single jet</i> = 77.4 80.0 90.0 100.0 110.0 120.0 300.0 225.0 330.0	22.765 me-Averaged (meters) above stack 0.00 1.36 4.41 7.46 7.46 7.45 10.50 11.93 12.75 13.55 16.60 19.65 22.70 25.74 28.79 34.89 50.13 65.37 80.61 95.85	meters meters Vertical Velu Plume Radius(m) 1.020 1.125 1.359 1.593 1.828 1.938 2.001 2.129 2.616 3.104 3.592 4.079 4.567 5.542 7.981 10.419 12.858 15.296	74.7 SingleStk VertVel(m/s) 9.96 9.43 8.24 7.05 5.86 5.30 4.98 4.70 3.87 3.32 2.92 2.62 2.39 2.06 1.60 1.37 1.23 1.13	feet g at end of Plume Temp(K) 282.67 282.66 282.37 281.54 280.54 280.54 280.54 280.54 280.54 280.54 280.57 279.57 279.57 278.59	f jet phase:	http://www gives the real solution x = z-zv or z(m/above stack) z(ft/above ground) Jet Phase Eqs: Linearly interpolated from Stack Spillane Equations: $V_{pums} = (V(a)_s^{3} + 0.12F_d(z-z)^2 (6.2 a = 0.16(z-zv) \theta_p = \theta_s (1 + (1 - (\theta_d) - \theta_s))^* (V_{est}D^2CEC Staff Equation:V_{mp} = n^{2S_V} v_{sp}Brigg's Equation:V_{msigs's} = (2/3) \times 1.6^{3/2} \times F_{mp}^{(1/2)} xwhere F_{mp} = nF_{sp}$	$\frac{.1728. \text{ org/cubic}}{.1728. \text{ org/cubic}}$ $= 11.7$
Height above Ground z _{ent} +h _a ble of Plume Top-Hat Diameters (2a) and Plu Height (feet) above ground <i>Stack.Rel.Ht</i> = 35.5 40.0 50.0 60.0 70.0 <i>Single Jet 5.3 m/s Height</i> = 74.7 <i>Top of Single jet</i> = 77.4 80.0 90.0 100.0 110.0 130.0 300.0 3300.0 3300.0 3300.0	22.765 me-Averaged (meters) above stack 0.00 1.36 4.41 7.46 10.50 11.93 12.75 13.55 16.60 19.65 22.70 25.74 28.79 34.89 50.13 65.37 80.61 95.85 111.09	meters meters Metrical Velu Plume Radius(m) 1.020 1.125 1.359 1.593 1.593 1.693 2.001 2.129 2.616 3.104 3.592 4.567 5.542 7.981 10.419 12.858 15.296 17.734	74.7 SingleStk VertVel(m/s) 9.96 9.43 8.24 7.05 5.86 5.30 4.98 4.70 3.87 3.32 2.92 2.62 2.39 2.06 1.60 1.37 1.23 1.13 1.06	feet g at end of Plume Temp(K) 282.67 282.66 282.37 281.54 280.54 280.54 280.54 280.54 280.54 280.54 280.57 279.55 279.55 278.59 278.59 278.49	f jet phase:	http://www gives the real solution x = z-zv or z(m/above stack); z(ft/above ground) Jet Phase Eqs: Linearly interpolated from Stack Spillane Equations: $V_{pums} = (V(a)_s^{3} + 0.12F_d(z-z)^2 (6.2 a = 0.16(z-zv) \theta_p = \theta_s (1 + (1 - (\theta_d) - \theta_s))^* (V_{est}D^2 - CEC Staff Equation: V_{mp} = n^{2S_V} v_{sp}Brigg's Equation:V_{msigs's} = (2/3) \times 1.6^{3/2} \times F_{mp}^{(1/2)} \times where F_{mp} = nF_{sp}$	$\frac{1728. \text{ org/cubic.}}{11.7}$ $= 11.7$ $= 11.7$ $= 11.$ $= $
Height above Ground z _{ent} +h _s ble of Plume Top-Hat Diameters (2a) and Plu Height (feet) above ground <i>Stack.Rel.Ht</i> = 35.5 40.0 50.0 60.0 70.0 <i>Single Jet 5.3 m/s Height</i> = 74.7 <i>Top of Single jet</i> = 77.4 80.0 90.0 100.0 110.0 120.0 300.0 225.0 330.0	22.765 me-Averaged (meters) above stack 0.00 1.36 4.41 7.46 10.50 11.93 12.75 13.55 16.60 19.65 22.70 25.74 28.79 34.89 50.13 65.37 80.61 95.85 111.09 126.33	meters meters Vertical Velu Plume Radius(m) 1.020 1.125 1.359 1.593 1.828 1.938 2.001 2.129 2.616 3.104 3.592 4.079 4.567 5.542 7.981 10.419 12.858 15.296	74.7 SingleStk VertVel(m/s) 9.96 9.43 8.24 7.05 5.86 5.30 4.98 4.70 3.87 3.32 2.92 2.62 2.39 2.06 1.60 1.37 1.23 1.13 1.06 1.01	feet g at end of Plume Temp(K) 282.67 282.66 282.37 281.54 280.96 280.54 280.96 280.54 280.96 279.95 279.95 279.03 279.03 279.03 279.03 278.75 279.03 278.79 278.49 278.49 278.49	f jet phase:	http://www gives the real solution x = z-zv or z(m/above stack); z(ft/above ground) Jet Phase Eqs: Linearly interpolated from Stack Spillane Equations: $V_{pums} = (V(a)_s^{3} + 0.12F_d(z-z)^2 (6.2 a = 0.16(z-zv) \theta_p = \theta_s (1 + (1 - (\theta_d) - \theta_s))^* (V_{est}D^2 - CEC Staff Equation: V_{mp} = n^{2S_V} v_{sp}Brigg's Equation:V_{msigs's} = (2/3) \times 1.6^{3/2} \times F_{mp}^{(1/2)} \times where F_{mp} = nF_{sp}$	$\frac{1728. \text{ org/cubic.}}{11.7}$ $= 11.7$ $= 11.7$ $= 11.$ $= $
Height above Ground z _{ent} +h _s ble of Plume Top-Hat Diameters (2a) and Plu Height (feet) above ground <i>Stack.Rel.Ht</i> = 35.5 40.0 50.0 60.0 70.0 <i>Single Jet 5.3 m/s Height</i> = 74.7 <i>Top of Single jet</i> = 77.4 80.0 90.0 100.0 110.0 130.0 130.0 300.0 300.0 300.0 300.0 400.0	22.765 me-Averaged (meters) above stack 0.00 1.36 4.41 7.46 10.50 11.93 12.75 13.55 16.60 19.65 22.70 25.74 28.79 34.89 50.13 65.37 80.61 95.85 111.09	meters meters Meters Vertical Velu Plume Radius(m) 1.020 1.125 1.593 1.593 1.693 2.001 2.129 2.616 3.104 3.592 4.079 4.567 5.542 7.981 10.419 12.858 15.296 17.734 20.173	74.7 SingleStk VertVel(m/s) 9.96 9.43 8.24 7.05 5.86 5.30 4.98 4.70 3.87 3.32 2.92 2.62 2.39 2.06 1.60 1.37 1.23 1.13 1.06 1.01 0.96	feet g at end of Plume Temp(K) 282.67 282.66 282.37 281.54 280.96 280.54 280.96 280.54 280.95 279.57 279.03 278.75 278.59 278.59 278.59 278.42 278.42 278.42 278.42 278.43	i jet phase:	http://www gives the real solution x = z-zv or z(m/above stack); z(ft/above ground) Jet Phase Eqs: Linearly interpolated from Stack Spillane Equations: $V_{pums} = (V(a)_s^{3} + 0.12F_d(z-z)^2 (6.2 a = 0.16(z-zv) \theta_p = \theta_s (1 + (1 - (\theta_d) - \theta_s))^* (V_{est}D^2 - CEC Staff Equation: V_{mp} = n^{2S_V} v_{sp}Brigg's Equation:V_{msigs's} = (2/3) \times 1.6^{3/2} \times F_{mp}^{(1/2)} \times where F_{mp} = nF_{sp}$	$\frac{.1728. \text{ org/cubic}}{.1728. \text{ org/cubic}}$ $= 11.7$
Height above Ground z _{ent} +h _s ble of Plume Top-Hat Diameters (2a) and Plu Height (feet) above ground <i>Stack.Rel.Ht</i> = 35.5 40.0 50.0 60.0 70.0 <i>Single Jet 5.3 m/s Height</i> = 74.7 <i>Top of Single jet</i> = 77.4 80.0 90.0 110.0 110.0 120.0 130.0 250.0 300.0 250.0	22.765 me-Averaged (meters) above stack 0.00 1.36 4.41 7.46 10.50 11.93 12.75 13.55 16.60 19.65 22.70 25.74 28.79 34.89 50.13 65.37 80.61 95.85 111.09 126.33 141.57	meters meters Metrical Velu Plume Radius(m) 1.020 1.125 1.359 1.593 1.693 1.693 2.001 2.129 2.616 3.104 3.592 4.079 4.567 5.542 7.981 10.419 12.858 15.296 17.734 20.173 22.611	74.7 SingleStk VertVel(m/s) 9.96 9.43 8.24 7.05 5.86 5.30 4.98 4.70 3.87 3.32 2.92 2.62 2.39 2.06 1.60 1.37 1.23 1.13 1.06 1.01 0.96 0.89	feet g at end of Plume Temp(K) 282.67 282.66 282.37 281.54 280.96 280.54 280.95 279.57 279.03 278.75 279.03 278.75 278.59 278.49 278.59	i jet phase:	http://www gives the real solution x = z-zv or z(m/above stack); z(ft/above ground) Jet Phase Eqs: Linearly interpolated from Stack Spillane Equations: $V_{pums} = (V(a)_s^{3} + 0.12F_d(z-z)^2 (6.2 a = 0.16(z-zv) \theta_p = \theta_s (1 + (1 - (\theta_d) - \theta_s))^* (V_{est}D^2 - CEC Staff Equation: V_{mp} = n^{2S_V} v_{sp}Brigg's Equation:V_{msigs's} = (2/3) \times 1.6^{3/2} \times F_{mp}^{(1/2)} \times where F_{mp} = nF_{sp}$	<u>1728.org/cubic</u> = <u>11.7</u> = <u>11.7</u> = <u>11.7</u> = <u>11.7</u> = <u>11.7</u> 10 ft Interva Rel.Ht to Top of Jet (50-z,) ²) ^{1/3} / a /(4V _{plume} *a ² *λ ²)) (4V _{plume} *a ² *λ ²)) 50 ft Interva //s
Height above Ground z _{ent} +h _s ble of Plume Top-Hat Diameters (2a) and Plu Height (feet) above ground <i>Stack.Rel.Ht</i> = 35.5 40.0 50.0 60.0 70.0 <i>Single Jet 5.3 m/s Height</i> = 74.7 <i>Top of Single jet</i> = 77.4 80.0 90.0 100.0 110.0 120.0 130.0 135.0 200.0 250.0 300.0 250.0 300.0 250.0 300.0 250.0 300.0 250.0 300.0 250.0 300.0 250.0 300.0 250.0 300.0 250.0 300.0 250.0 300.0 250.0 300.0 250.0 300.0 250.0 300.0 250.0 300.0 250.0 300.0 250.0 300.0 250.0 300.0 250.0 300.0 250.0 300.0 250.0	22.765 ame-Averaged (meters) above stack 0.00 1.36 4.41 7.46 10.50 11.93 12.75 13.55 16.60 19.65 22.70 25.74 28.79 34.89 50.13 65.37 80.61 95.85 111.09 126.33 141.57 172.05	meters meters Meters Vertical Vela Plume Radius(m) 1.020 1.125 1.359 1.693 1.828 1.938 2.001 2.129 2.616 3.104 3.592 4.079 4.567 5.542 7.881 10.419 12.858 15.296 17.734 20.173 22.611 27.488	74.7 SingleStk VertVel(m/s) 9.96 9.43 8.24 7.05 5.86 5.30 4.98 4.70 3.87 3.32 2.92 2.62 2.39 2.06 1.60 1.37 1.23 1.13 1.06 1.01 0.96 0.89 0.84	feet g at end of Plume Temp(K) 282.67 282.66 282.37 281.54 280.54 270.57 278.59 278.49 278.49 278.43 278.37 278.33 278.55 278.54 278.37 278.33 278.55 278.37 278.33 278.54 278.37 278.33 278.54 278.33 278.55 278.34 278.35 278.35 278.35 278.35 278.35 278.35 278.35 278.35 278.35 278.35 278.35 278.35 278.35 278.35 278.35 278.35 278.28 278	fjet phase:	http://www gives the real solution x = z-zv or z(m/above stack); z(ft/above ground) Jet Phase Eqs: Linearly interpolated from Stack Spillane Equations: $V_{pums} = (V(a)_s^{3} + 0.12F_d(z-z)^2 (6.2 a = 0.16(z-zv) \theta_p = \theta_s (1 + (1 - (\theta_d) - \theta_s))^* (V_{est}D^2 - CEC Staff Equation: V_{mp} = n^{2S_V} v_{sp}Brigg's Equation:V_{msigs's} = (2/3) \times 1.6^{3/2} \times F_{mp}^{(1/2)} \times where F_{mp} = nF_{sp}$	$\frac{.1728. \text{ org/cubic}}{.1728. \text{ org/cubic}}$ $= 11.7$ $= 11.7$ $= 11.7$ 10 ft Interva Rel.H to Top of Jet $(10 \text{ ft Interva})^{11/3} / a$ $(4V_{plume} * a^{2*} \lambda^{2}))$ $(4V_{plume} * a^{2*} \lambda^{2})$ 50 ft Interva $1/5$
Height above Ground z _{ent} +h _s ble of Plume Top-Hat Diameters (2a) and Plu Height (feet) above ground <i>Stack.Rel.Ht</i> = 35.5 40.0 50.0 60.0 70.0 <i>Single Jet 5.3 m/s Height</i> = 74.7 <i>Top of Single jet</i> = 77.4 80.0 90.0 100.0 110.0 120.0 130.0 150.0 2050.0 600.0 300.0 350.0 400.0 600.0 70.0	22.765 me-Averaged (meters) above stack 0.00 1.36 4.41 7.46 10.50 11.93 12.75 13.55 16.60 19.65 22.70 25.74 28.79 34.89 50.13 65.37 80.61 95.85 111.09 126.33 141.57 172.05 202.53	meters meters Meters Vertical Vela Plume Radius(m) 1.020 1.125 1.359 1.593 1.828 1.938 2.001 2.129 2.616 3.104 3.592 4.079 4.567 5.542 7.981 10.419 12.858 15.296 17.734 20.173 22.611 27.488 32.365	74.7 SingleStk VertVel(m/s) 9.96 9.43 8.24 7.05 5.86 5.30 4.98 4.70 3.87 2.92 2.62 2.39 2.06 1.60 1.37 1.23 1.13 1.06 1.01 0.96 0.89 0.84 0.80	feet g at end of Plume Temp(K) 282.67 282.66 282.37 281.54 280.54 278.59 278.59 278.33 278.32 278.32 278.32 278.32 278.32 278.32 278.32 278.32 278.32 278.32 278.32 278.32 278.32 278.32 278.32 278.32 278.25 278.32 278.32 278.32 278.25 278.32 278.32 278.25 278.32 278.25 278.32 278.32 278.25 278.32 278.25 278.32 278.25 278.32 278.25 278.32 278.25 278.32 278.25 278.32 278.25 278.32 278.25 278.35 278.25 278.35 278.25 278.35 278.25 278.35 278.25 278.35 278.25 278	f jet phase:	http://www gives the real solution x = z-zv or z(m/above stack); z(ft/above ground) Jet Phase Eqs: Linearly interpolated from Stack Spillane Equations: $V_{pums} = (V(a)_s^{3} + 0.12F_d(z-z)^2 (6.2 a = 0.16(z-zv) \theta_p = \theta_s (1 + (1 - (\theta_d) - \theta_s))^* (V_{est}D^2 - CEC Staff Equation: V_{mp} = n^{2S_V} v_{sp}Brigg's Equation:V_{msigs's} = (2/3) \times 1.6^{3/2} \times F_{mp}^{(1/2)} \times where F_{mp} = nF_{sp}$	$\frac{.1728. \text{ org/cubic}}{.1728. \text{ org/cubic}}$ $= 11.7$ $= 11.7$ $= 11.7$ 10 ft Interva Rel.H to Top of Jet $(10 \text{ ft Interva})^{11/3} / a$ $(4V_{plume} * a^{2*} \lambda^{2}))$ $(4V_{plume} * a^{2*} \lambda^{2})$ 50 ft Interva $1/5$
Height above Ground z _{ent} +h _a ble of Plume Top-Hat Diameters (2a) and Plu Height (feet) above ground <i>Stack.Rel.Ht</i> = 35.5 40.0 50.0 60.0 70.0 <i>Single Jet 5.3 m/s Height</i> = 74.7 <i>Top of Single jet</i> = 77.4 80.0 90.0 100.0 110.0 120.0 130.0 130.0 150.0 250.0 3300.0 350.0 400.0 450.0 300.0 800.0 800.0 800.0	22.765 me-Averaged (meters) above stack 0.00 1.36 4.41 7.46 10.50 11.93 12.75 13.55 16.60 19.65 22.70 25.74 28.79 34.89 50.13 65.37 80.61 95.85 111.09 126.33 141.57 172.05 202.53 233.01	meters meters meters Vertical Velu Plume Radius(m) 1.020 1.125 1.359 1.593 1.828 1.938 2.001 2.129 2.616 3.104 3.592 4.079 4.567 5.542 7.981 10.419 12.858 15.296 17.734 20.173 22.611 1.27.488 32.365 37.242	74.7 SingleStk VertVel(m/s) 9.96 9.43 8.24 7.05 5.86 5.30 4.98 4.70 3.87 3.32 2.92 2.62 2.39 2.06 1.60 1.37 1.23 1.13 1.06 1.01 0.96 0.89 0.84 0.84 0.84 0.84 0.84 0.84 0.84 0.84 0.84 0.84 0.84 0.84 0.84 0.84 0.84 0.84 0.84 0.84 0.85 0.84 0.85	feet g at end of Plume Temp(K) 282.67 282.66 282.37 281.54 280.54 270.57 278.59 278.59 278.59 278.59 278.52 278.33 278.52 278.55 278.55 278.55 278.55 278.55 278	f jet phase:	http://www gives the real solution x = z-zv or z(m/above stack); z(ft/above ground) Jet Phase Eqs: Linearly interpolated from Stack Spillane Equations: $V_{pums} = (V(a)_s^{3} + 0.12F_d(z-z)^2 (6.2 a = 0.16(z-zv) \theta_p = \theta_s (1 + (1 - (\theta_d) - \theta_s))^* (V_{est}D^2 - CEC Staff Equation: V_{mp} = n^{2S_V} v_{sp}Brigg's Equation:V_{msigs's} = (2/3) \times 1.6^{3/2} \times F_{mp}^{(1/2)} \times where F_{mp} = nF_{sp}$	$\frac{.1728. \text{ org/cubic}}{.1728. \text{ org/cubic}}$ $= 11.7$ $= 11.7$ $= 11.7$ 10 ft Interva Rel.H to Top of Jet $(10 \text{ ft Interva})^{11/3} / a$ $(4V_{plume} * a^{2*} \lambda^{2}))$ $(4V_{plume} * a^{2*} \lambda^{2})$ 50 ft Interva $1/5$
Height above Ground z _{ent} +h _a ble of Plume Top-Hat Diameters (2a) and Plu Height (feet) above ground <i>Stack.Rel.Ht</i> = 35.5 40.0 50.0 60.0 70.0 <i>Single Jet 5.3 m/s Height</i> = 74.7 <i>Top of Single jet</i> = 77.4 80.0 90.0 100.0 110.0 110.0 130.0 130.0 300.0 250.0 300.0 250.0 300.0 200.0 250.0 300.0 200.0 250.0 300.0 200.0	22.765 me-Averaged (meters) above stack 0.00 1.36 4.41 7.46 10.50 11.93 12.75 13.55 16.60 19.65 22.70 25.74 28.79 34.89 50.13 65.37 80.61 95.85 111.09 126.33 141.57 172.05 202.53 203.01 263.49	meters meters meters Vertical Velu Plume Radius(m) 1.020 1.125 1.359 1.593 1.828 1.593 2.001 2.129 2.616 3.104 3.592 4.079 4.567 5.542 7.981 10.419 12.858 15.296 17.734 20.173 22.611 2.7.488 32.365 37.242 42.118	74.7 SingleStk VertVel(m/s) 9.96 9.43 8.24 7.05 5.86 5.30 4.98 4.70 3.87 3.32 2.92 2.62 2.39 2.06 1.60 1.37 1.23 1.13 1.13 1.13 1.106 1.01 0.96 0.89 0.84 0.80 0.74	feet g at end of Plume Temp(K) 282.67 282.66 282.37 281.54 280.54 270.57 278.59 278.59 278.59 278.59 278.52 278.33 278.52 278.55 278.55 278.55 278.55 278.55 278	i jet phase:	http://www gives the real solution x = z-zv or z(m/above stack); z(ft/above ground) Jet Phase Eqs: Linearly interpolated from Stack Spillane Equations: $V_{pums} = (V(a)_s^{3} + 0.12F_d(z-z)^2 (6.2 a = 0.16(z-zv) \theta_p = \theta_s (1 + (1 - (\theta_d) - \theta_s))^* (V_{est}D^2 - CEC Staff Equation: V_{mp} = n^{2S_V} v_{sp}Brigg's Equation:V_{msigs's} = (2/3) \times 1.6^{3/2} \times F_{mp}^{(1/2)} \times where F_{mp} = nF_{sp}$	<u>1728.org/cubic</u> = <u>11.7</u> = <u>11.7</u> = <u>11.7</u> = <u>11.7</u> = <u>11.7</u> 10 ft Interva Rel.Ht to Top of Jet (50-z,) ²) ^{1/3} / a /(4V _{plume} *a ² *λ ²)) (4V _{plume} *a ² *λ ²)) 50 ft Interva //s
Height above Ground z _{ent} +h _s ble of Plume Top-Hat Diameters (2a) and Plu Height (feet) above ground Stack.Rel.Ht = 35.5 40.0 50.0 60.0 70.0 Single Jet 5.3 m/s Height = 74.7 Top of Single jet = 77.4 80.0 90.0 100.0 110.0 120.0 130.0 150.0 200.0 200.0 200.0 200.0 300.0 350.0 400.0 350.0 400.0 100.0	22.765 me-Averaged (meters) above stack 0.00 1.36 4.41 7.46 10.50 11.93 12.75 13.55 16.60 19.65 22.70 25.74 28.79 34.89 50.13 65.37 80.61 95.85 111.09 126.33 141.57 172.05 202.53 233.01 263.49 293.97	meters meters meters Vertical Velu Plume Radius(m) 1.020 1.125 1.359 1.593 1.628 1.938 2.001 2.129 2.616 3.104 3.592 4.079 4.567 5.542 7.981 10.419 12.858 15.296 17.734 20.173 22.611 27.488 32.365 37.242 42.118 46.995	74.7 SingleStk VertVel(m/s) 9.96 9.43 8.24 7.05 5.86 5.30 4.98 4.70 3.87 3.32 2.92 2.62 2.62 2.39 2.06 1.60 1.37 1.23 1.13 1.06 0.89 0.84 0.89 0.84 0.89 0.84 0.74 0.71	feet g at end of Plume Temp(K) 282.67 282.66 282.37 281.54 280.96 280.42 279.95 279.95 279.95 279.95 279.03 278.75 278.59 278.42 278.42 278.42 278.33 278.28 278.28 278.22 278.22 278.21	i jet phase:	http://www gives the real solution x = z-zv or z(m/above stack); z(ft/above ground) Jet Phase Eqs: Linearly interpolated from Stack Spillane Equations: $V_{pums} = (V(a)_s^{3} + 0.12F_d(z-z)^2 (6.2 a = 0.16(z-zv) \theta_p = \theta_s (1 + (1 - (\theta_d) - \theta_s))^* (V_{est}D^2 - CEC Staff Equation: V_{mp} = n^{2S_V} v_{sp}Brigg's Equation:V_{msigs's} = (2/3) \times 1.6^{3/2} \times F_{mp}^{(1/2)} \times where F_{mp} = nF_{sp}$	<u>1728.org/cubic</u> = <u>11.7</u> = <u>11.7</u> = <u>11.7</u> = <u>11.7</u> = <u>11.7</u> 10 ft Interva Rel.Ht to Top of Jet (50-z,) ²) ^{1/3} / a /(4V _{plume} *a ² *λ ²)) (4V _{plume} *a ² *λ ²)) 50 ft Interva //s
Height above Ground z _{ent} +h _s ble of Plume Top-Hat Diameters (2a) and Plu Height (feet) above ground Stack.Rel.Ht = 35.5 40.0 50.0 60.0 70.0 Single Jet 5.3 m/s Height = 74.7 Top of Single jet = 77.4 80.0 90.0 110.0 110.0 120.0 100.0	22.765 me-Averaged (meters) above stack 0.00 1.36 4.41 7.46 10.50 11.93 12.75 13.55 16.60 19.65 22.70 25.74 28.79 34.89 50.13 65.37 80.61 95.85 111.09 126.33 141.57 172.05 202.53 141.57 172.05 202.53 233.01 263.49 293.97 324.45	meters meters Meters Vertical Velu Plume Radius(m) 1.020 1.125 1.359 1.693 1.828 1.938 2.001 2.129 2.616 3.104 3.592 4.079 4.567 5.542 7.881 10.419 12.858 15.296 17.734 20.0173 22.611 27.488 32.365 37.242 42.118 46.995 51.872	74.7 singleStk VertVel(m/s) 9.96 9.43 8.24 7.05 5.86 5.30 4.98 4.70 3.87 2.92 2.62 2.39 2.06 1.60 1.37 1.23 1.13 1.06 1.01 0.96 0.84 0.84 0.84 0.86 0.74 0.71 0.69	feet g at end of Plume Temp(K) 282.67 282.66 282.37 281.54 280.96 280.54 280.96 280.54 280.92 279.95 279.93 278.75 278.59 278.49 278.49 278.42 278.33 278.42 278.33 278.25 278.23 278.24 278.25 278.25 278.25 278.25 278.25 278.25 278.25 278.25 278.25 278.25 278.25 278.25 278.25 278.25 278.25 278.25 278.25 278.25 278.25 278	f jet phase:	http://www gives the real solution x = z-zv or z(m/above stack); z(ft/above ground) Jet Phase Eqs: Linearly interpolated from Stack Spillane Equations: $V_{pums} = (V(a)_s^{3} + 0.12F_d(z-z)^2 (6.2 a = 0.16(z-zv) \theta_p = \theta_s (1 + (1 - (\theta_d) - \theta_s))^* (V_{est}D^2 - CEC Staff Equation: V_{mp} = n^{2S_V} v_{sp}Brigg's Equation:V_{msigs's} = (2/3) \times 1.6^{3/2} \times F_{mp}^{(1/2)} \times where F_{mp} = nF_{sp}$	<u>1728.org/cubic</u> = <u>11.7</u> = <u>11.7</u> = <u>11.7</u> = <u>11.7</u> = <u>11.7</u> 10 ft Interva Rel.Ht to Top of Jet (50-z,) ²) ^{1/3} / a /(4V _{plume} *a ² *λ ²)) (4V _{plume} *a ² *λ ²)) 50 ft Interva //s
Height above Ground z _{ent} +h _a able of Plume Top-Hat Diameters (2a) and Plu Height (feet) above ground Stack. Rel.Ht = 35.5 40.0 50.0 60.0 70.0 Single Jet 5.3 m/s Height = 74.7 Top of Single jet = 77.4 80.0 90.0 100.0 110.0 120.0 3300.0 350.0 60.0 70.0 Single Jet 5.3 m/s Height = 74.7 80.0 90.0 100.0 120.0 130.0 120.0 130.0 120.0 3300.0 600.0 700.0 600.0 700.0 600.0 90.0 100.0 100.0 100.0 100.0 1100.0 1200.0 1200.0 1300.0 1300.0	22.765 above stack 0.00 1.36 4.41 7.46 10.50 11.93 12.75 13.55 16.60 19.65 22.70 25.74 28.79 34.89 50.13 65.37 80.61 95.85 111.09 126.33 141.57 172.05 202.53 233.01 263.49 263.49 263.49 263.49 324.45 354.93 385.41 446.37	meters meters meters Vertical Velu Plume Radius(m) 1.020 1.125 1.359 1.593 1.828 1.938 2.001 2.129 2.616 3.104 3.592 4.079 4.567 5.542 7.981 10.419 12.858 15.296 17.734 20.173 22.611 1.27.488 32.365 37.242 42.118 46.995 5.1.872 56.749 61.626 71.379	74.7 SingleStk VertVel(m/s) 9.96 9.43 8.24 7.05 5.86 5.30 4.98 4.70 3.87 3.32 2.92 2.62 2.39 2.06 1.60 1.37 1.23 1.13 1.06 1.01 0.96 0.89 0.84 0.80 0.74 0.74 0.69 0.67 0.64	feet g at end of Plume Temp(K) 282.67 282.66 282.37 281.54 280.54 270.55 278.59 278.59 278.59 278.59 278.52 278.32 278.22 278.23 278.25 278.24 278.27 278.24 278.27 278.24 278.27 278.24 278.27 278.24 278.27 278.24 278.27 278.27 278.29 278.27 278.27 278.29 278.27 278.29 278.27 278.29 278.27 278.29 278.27 278.29 278.27 278.29 278	f jet phase:	http://www gives the real solution x = z-zv or z(m/above stack); z(ft/above ground) Jet Phase Eqs: Linearly interpolated from Stack Spillane Equations: $V_{pums} = (V(a)_s^{3} + 0.12F_d(z-z)^2 (6.2 a = 0.16(z-zv) \theta_p = \theta_s (1 + (1 - (\theta_d) - \theta_s))^* (V_{est}D^2 - CEC Staff Equation: V_{mp} = n^{2S_V} v_{sp}Brigg's Equation:V_{msigs's} = (2/3) \times 1.6^{3/2} \times F_{mp}^{(1/2)} \times where F_{mp} = nF_{sp}$	1728.org/cubic = 11.7 = 11.7 = 11.7 = 11.7 = 11.7 Note: 11.7 =
Height above Ground z _{ent} +h _a able of Plume Top-Hat Diameters (2a) and Plu Height (feet) above ground Stack.Rel.Ht = 35.5 40.0 50.0 60.0 70.0 Single Jet 5.3 m/s Height = 74.7 Top of Single jet = 77.4 80.0 90.0 100.0 110.0 120.0 130.0 250.0 300.0 250.0 300.0 250.0 300.0 200.0 250.0 300.0 100.	22.765 mme-Averaged (meters) above stack 0.00 1.36 4.41 7.46 10.50 11.93 12.75 13.55 16.60 19.65 22.70 25.74 28.79 34.89 50.13 65.37 80.61 95.85 111.09 126.33 141.57 172.05 202.53 203.01 263.49 203.97 324.45 354.93 336.41 446.37 598.77	meters meters meters Vertical Velu Plume Radius(m) 1.020 1.125 1.359 1.593 1.828 1.938 2.001 2.129 2.616 3.104 3.592 4.079 4.567 5.542 7.981 10.419 12.858 15.296 17.734 20.173 22.611 2.458 3.7.242 42.118 46.955 51.872 2.56.749 61.626 71.379 95.763	74.7 SingleStk VertVel(m/s) 9.96 9.43 8.24 7.05 5.86 5.30 4.98 4.70 3.87 3.32 2.92 2.62 2.39 2.62 2.39 2.62 1.60 1.37 1.23 1.13 1.06 1.01 0.96 0.89 0.84 0.74 0.74 0.71 0.64 0.58	feet g at end of Plume Temp(K) 282.67 282.67 282.66 282.37 281.54 280.55 278.55 278.55 278.55 278.55 278.55 278.52 278.33 278.25 278.33 278.25 278.25 278.23 278.25 278.23 278.24 278.25 278.25 278.24 278.25 278.25 278.25 278.25 278.26 278.26 278.26 278.26 278.27 278.29 278.27 278.29 278.27 278.29 278	i jet phase:	http://www gives the real solution x = z-zv or z(m/above stack); z(ft/above ground) Jet Phase Eqs: Linearly interpolated from Stack Spillane Equations: $V_{pums} = (V(a)_s^{3} + 0.12F_d(z-z)^2 (6.2 a = 0.16(z-zv) \theta_p = \theta_s (1 + (1 - (\theta_d) - \theta_s))^* (V_{est}D^2 - CEC Staff Equation: V_{mp} = n^{2S_V} v_{sp}Brigg's Equation:V_{msigs's} = (2/3) \times 1.6^{3/2} \times F_{mp}^{(1/2)} \times where F_{mp} = nF_{sp}$	1728.org/cubic. = 11.7 = 11.7 = 11.7 = 11.7 = 11.7 Rel.Ht to Top of Jet (4V _{plume} *a ² *λ ²))) (4V _{plume} *a ² *λ ²))) 50 ft Interva 50 ft Interva 100 ft Interva
Height above Ground z _{ent} +h _a able of Plume Top-Hat Diameters (2a) and Plu Height (feet) above ground Stack.Rel.Ht = 35.5 40.0 50.0 60.0 70.0 Single Jet 5.3 m/s Height = 74.7 Top of Single jet = 77.4 80.0 90.0 100.0 110.0 120.0 130.0 150.0 200.0 250.0 300.0 900.0 100.0 100.0 100.0 150.0 200.0 250.0 300.0 100.	22.765 me-Averaged (meters) above stack 0.00 1.36 4.41 7.46 10.50 11.93 12.75 13.55 16.60 19.65 22.70 25.74 28.79 34.89 50.13 65.37 80.61 95.85 111.09 126.33 141.57 172.05 202.53 233.01 263.49 202.53 233.01 263.49 202.53 233.01 263.49 202.53 233.01 263.49 202.53 233.01 263.49 202.53 233.01 263.49 202.53 233.01 263.49 202.53 233.01 263.49 202.53 233.01 263.49 202.53 233.01 263.49 202.53 233.01 263.49 202.53 233.01 263.49 203.57 144.57 155.55 111.09 126.33 134.65 112.05 202.53 233.01 263.49 203.55 126.55 114.65 126.55 126.55 126.55 126.55 126.55 126.55 126.55 126.55 126.55 111.09 126.55	meters meters Meters Vertical Velu Plume Radius(m) 1.020 1.125 1.359 1.620 1.933 1.828 1.938 2.001 2.129 2.616 3.104 3.592 4.079 4.567 5.542 7.981 10.419 12.858 15.296 17.734 20.0173 22.611 27.488 32.365 37.242 42.118 46.995 51.872 56.749 61.626 71.379 95.763 120.147	74.7 SingleStk VertVel(m/s) 9.96 9.43 8.24 7.05 5.86 5.30 4.98 4.70 3.87 3.32 2.92 2.62 2.62 2.62 2.62 2.62 1.60 1.37 1.23 1.13 1.13 1.13 1.13 1.13 1.16 1.01 0.96 0.89 0.84 0.89 0.84 0.89 0.84 0.89 0.64 0.74 0.74 0.71 0.65 0.65 0.53	feet g at end of Plume Temp(K) 282.67 282.66 282.37 281.54 280.96 280.95 279.95 279.95 279.93 278.75 278.90 278.42 278.33 278.27 278.33 278.28 278.27 278.33 278.28 278.27 278.33 278.28 278.27 278.33 278.28 278.27 278.33 278.28 278.27 278.20 278.21 278.20 278.21 278.20 278.21 278.20 278.21 278.20 278.21 278.20 278.21 278.20 278.21 278.20 278.21 278.21 278.21 278.20 278.21 278	i jet phase:	http://www gives the real solution x = z-zv or z(m/above stack); z(ft/above ground) Jet Phase Eqs: Linearly interpolated from Stack Spillane Equations: $V_{pums} = (V(a)_s^{3} + 0.12F_d(z-z)^2 (6.2 a = 0.16(z-zv) \theta_p = \theta_s (1 + (1 - (\theta_d) - \theta_s))^* (V_{est}D^2 - CEC Staff Equation: V_{mp} = n^{2S_V} v_{sp}Brigg's Equation:V_{msigs's} = (2/3) \times 1.6^{3/2} \times F_{mp}^{(1/2)} \times where F_{mp} = nF_{sp}$	1728.org/cubic. = 11.7 = 11.7 = 11.7 = 11.7 = 11.7 Rel.Ht to Top of Jet (4V _{plume} *a ² *λ ²))) (4V _{plume} *a ² *λ ²))) 50 ft Interva 50 ft Interva 100 ft Interva
Height above Ground z _{ent} +h _a able of Plume Top-Hat Diameters (2a) and Plu Height (feet) above ground Stack. Rel. Ht = 35.5 40.0 50.0 60.0 70.0 Single Jet 5.3 m/s Height = 74.7 Top of Single jet = 77.4 80.0 90.0 110.0 120.0 130.0 150.0 2200.0 250.0 300.0 350.0 400.0 350.0 400.0 100.0 100.0 100.0 110.0 120.0 130.0 100.0 100.0 100.0 100.0 100.0 100.0 100.0 100.0 100.0 100.0 100.0 100.0 100.0 100.0 100.0 2	22.765 me-Averaged (meters) above stack 0.00 1.36 4.41 7.46 10.50 11.93 12.75 13.55 16.60 19.65 22.70 25.74 28.79 34.89 50.13 65.37 80.61 95.85 111.09 126.33 141.57 172.05 202.53 233.01 263.49 293.97 324.45 354.93 345.41 446.37 598.77 751.17 903.57	meters meters meters Vertical Velu Plume Radius(m) 1.020 1.125 1.3593 1.828 1.938 2.001 2.129 2.616 3.104 3.592 4.079 4.567 5.542 7.881 10.419 12.858 15.296 17.734 20.173 32.611 27.488 32.365 37.242 42.118 46.995 51.872 56.749 61.626 71.379 95.763 120.147 144.531	74.7 singleStk VertVel(m/s) 9.96 9.43 8.24 7.05 5.86 5.80 4.98 4.70 3.87 2.92 2.62 2.39 2.06 1.60 1.37 1.23 1.13 1.06 1.01 0.96 0.89 0.84 0.88 0.76 0.74 0.69 0.67 0.64 0.58 0.53 0.55	feet g at end of Plume Temp(K) 282.67 282.66 282.37 281.54 280.96 280.54 280.96 280.54 280.96 280.54 280.96 280.54 280.96 280.54 280.96 280.54 280.96 280.54 280.96 280.54 280.96 280.54 280.95 279.95 279.93 278.55 278.59 278.49 278.49 278.49 278.49 278.25 278.23 278.25 278.23 278.23 278.24 278.25 278.24 278.25 278.24 278.25 278.24 278.25 278.24 278.25 278.24 278.25 278.24 278.25 278.27 278.24 278.25 278.24 278.25 278.24 278.25 278.24 278.25 278.24 278.25 278.24 278.25 278.24 278.25 278.24 278.25 278.25 278.24 278.25 278.25 278.25 278.24 278.25 278	i jet phase:	http://www gives the real solution x = z-zv or z(m/above stack); z(ft/above ground) Jet Phase Eqs: Linearly interpolated from Stack Spillane Equations: $V_{pums} = (V(a)_s^{3} + 0.12F_d(z-z)^2 (6.2 a = 0.16(z-zv) \theta_p = \theta_s (1 + (1 - (\theta_d) - \theta_s))^* (V_{est}D^2 - CEC Staff Equation: V_{mp} = n^{2S_V} v_{sp}Brigg's Equation:V_{msigs's} = (2/3) \times 1.6^{3/2} \times F_{mp}^{(1/2)} \times where F_{mp} = nF_{sp}$	1728.org/cubic. = 11.7 = 11.7 = 11.7 = 11.7 = 7 10 ft Interva Rel.Ht to Topord Jet (5D-2.) ²) ^{1/3} / a ((4V _{plume} *a ² *λ ²))) (4V _{plume} *a ² *λ ²))) 50 ft Interva 50 ft Interva
Height above Ground z _{ent} +h _a able of Plume Top-Hat Diameters (2a) and Plu Height (feet) above ground Stack. Rel.Ht = 35.5 40.0 50.0 60.0 70.0 Single Jet 5.3 m/s Height = 74.7 Top of Single jet = 77.4 80.0 90.0 100.0 120.0 130.0 150.0 250.0 300.0 350.0 60.0 100.0 120.0 130.0 120.0 130.0 120.0 130.0 120.0 130.0 150.0 200.0 300.0 300.0 1000.0 1000.0 1000.0 1000.0 1000.0 1000.0 1000.0 1000.0 1000.0 1000.0 1000.0	22.765 me-Averaged (meters) above stack 0.00 1.36 4.41 7.46 10.50 11.93 12.75 13.55 16.60 19.65 22.70 25.74 28.79 34.89 50.13 65.37 80.61 95.85 111.09 126.33 141.57 172.05 202.53 233.01 263.49 293.97 324.45 354.93 355.41 446.37 598.77 751.17 903.57 1055.97	meters meters meters Vertical Velu Plume Radius(m) 1.020 1.125 1.359 1.593 1.828 1.938 2.001 2.129 2.616 3.104 3.592 4.079 4.567 5.542 7.981 10.419 12.858 15.296 17.734 22.611 27.488 32.365 37.242 42.118 46.995 51.872 56.749 61.626 71.379 95.763 120.147 144.531 168.915	74.7 SingleStk VertVel(m/s) 9.96 9.43 8.24 7.05 5.86 5.80 4.98 4.70 3.87 2.262 2.39 2.06 1.60 1.37 1.23 1.13 1.06 1.01 0.96 0.89 0.84 0.88 0.74 0.74 0.69 0.67 0.64 0.53 0.53 0.53 0.50 0.48	feet g at end of Plume Temp(K) 282.67 282.66 282.37 282.66 280.34 280.64 280.64 280.64 280.54 278.49 278.49 278.49 278.49 278.49 278.23 278.25 278.20 278.24 278.20 278.24 278	f jet phase:	http://www gives the real solution x = z-zv or z(m/above stack); z(ft/above ground) Jet Phase Eqs: Linearly interpolated from Stack Spillane Equations: $V_{pums} = (V(a)_s^{3} + 0.12F_d(z-z)^2 (6.2 a = 0.16(z-zv) \theta_p = \theta_s (1 + (1 - (\theta_d) - \theta_s))^* (V_{est}D^2 - CEC Staff Equation: V_{mp} = n^{2S_V} v_{sp}Brigg's Equation:V_{msigs's} = (2/3) \times 1.6^{3/2} \times F_{mp}^{(1/2)} \times where F_{mp} = nF_{sp}$	$\frac{1728. \text{ org/cubic.}}{11.7}$ $= 11.7$ $= 11.7$ $= 11.$ $= 7$ 10 ft Interva ReI.Ht to Top of Jet $\frac{10}{550-z_{2}} \frac{1}{3} \frac{1}{3} \frac{1}{3} \frac{1}{3}$ $((4V_{plume} *a^{2*}\lambda^{2})))$ $: u^{(1/2)} \times z^{(1/2)}$ 50 ft Interva
Height above Ground z _{ent} +h _a able of Plume Top-Hat Diameters (2a) and Plu Height (feet) above ground Stack. Rel. Ht = 35.5 40.0 50.0 60.0 70.0 Single Jet 5.3 m/s Height = 74.7 Top of Single jet = 77.4 80.0 90.0 110.0 120.0 130.0 150.0 2200.0 250.0 300.0 350.0 400.0 350.0 400.0 100.0 100.0 100.0 110.0 120.0 130.0 100.0 100.0 100.0 100.0 100.0 100.0 100.0 100.0 100.0 100.0 100.0 100.0 100.0 2	22.765 me-Averaged (meters) above stack 0.00 1.36 4.41 7.46 10.50 11.93 12.75 13.55 16.60 19.65 22.70 25.74 28.79 34.89 50.13 65.37 80.61 95.85 111.09 126.33 141.57 172.05 202.53 233.01 263.49 293.97 324.45 354.93 345.41 446.37 598.77 751.17 903.57	meters meters meters Vertical Velu Plume Radius(m) 1.020 1.125 1.3593 1.828 1.938 2.001 2.129 2.616 3.104 3.592 4.079 4.567 5.542 7.881 10.419 12.858 15.296 17.734 20.173 32.611 27.488 32.365 37.242 42.118 46.995 51.872 56.749 61.626 71.379 95.763 120.147 144.531	74.7 SingleStk VertVel(m/s) 9.96 9.43 8.24 7.05 5.86 5.30 4.98 4.70 3.87 3.32 2.92 2.62 2.39 2.06 1.60 1.37 1.23 1.13 1.06 1.01 0.96 0.89 0.84 0.80 0.74 0.71 0.69 0.67 0.64 0.58 0.53 0.50 0.48 0.53 0.50 0.48 0.53 0.50 0.48 0.53 0.53 0.55	feet g at end of Plume Temp(K) 282.67 282.66 282.37 281.54 280	f jet phase:	http://www gives the real solution x = z-zv or z(m/above stack); z(ft/above ground) Jet Phase Eqs: Linearly interpolated from Stack Spillane Equations: $V_{pums} = (V(a)_s^{3} + 0.12F_d(z-z)^2 (6.2 a = 0.16(z-zv) \theta_p = \theta_s (1 + (1 - (\theta_d) - \theta_s))^* (V_{est}D^2 - CEC Staff Equation: V_{mp} = n^{2S_V} v_{sp}Brigg's Equation:V_{msigs's} = (2/3) \times 1.6^{3/2} \times F_{mp}^{(1/2)} \times where F_{mp} = nF_{sp}$	1728.org/cubic. = 11.7 = 11.7 = 11.7 = 11.7 = 11.7 Rel.Ht to Top of Jet (4V _{plume} *a ² *λ ²))) (4V _{plume} *a ² *λ ²))) 50 ft Interva 50 ft Interva 100 ft Interva

*Winter Min = Monthly Mean of Minimum Daily Temperatures for 1971-2000 (Lowest in Dece 278.15 NOAA Sources: Climatography of the United

MERGED (along length) Plume Average Vertical Velocities for SVY03A CRACs using CEC Staff Methodology - Winter Min*

"Aviation Safety and Buoyant Plumes," Peter Best, et. al. "The Evaluation of Maximum Updraft Speeds for Calm Conditions at Various Heights in the Merged

Ambient Conditions: Ambient Potential Plume Exit Conditions: Stack H			Plu	ime from Two	Gas-Turbir			ralia," Dr. K.T. Spil
Plume Exit Conditions:		070.45				Constants: As	ssume neutral conditions (d0/dz=	=0 or θ _a =θ _e)
	Temp θ _a	278.15	Kelvins	41.0	°F	Gravity g	0.3048 meters/feet 9.81 m/s ²	
	Height h _s	10.83	meters	35 6/12	feet-inches	Gravity g	9.81 m/s ⁻ 1.11	
Individual Stack Dia		2.040382			inches	λ,	~1.0	
Stack Velo	ocity V _{exit}	9.96	m/s		ft/sec	4Vol/(60πD ²)		
Individual Volume			cu.m/sec		ACFM	$\pi V_{exit} D^2/4$		Sect.2/¶1
Stack Potential			Kelvins	61.0		D2 (4 0 /0		Cast 2/11
Initial Stack Buoyanc Plume Buoyanc			m ⁴ /s ³ m ⁴ /s ³	20.0	ΔT(°F)		$ _{s}$)/4 = Vol.Flow(g/ π)(1- θ_{a}/θ_{s}) ,) for a,V, θ_{p} at plume height (see	Sect.2/¶1
Total Number of	-	9	111 / 5			∧ gva (1-o _a /o _p) for a, v, op at plume neight (see	below)
Average Adjacent Stack Sepa	aration d	2.13	meters	7.0	feet	Calcs based of	n multiple plume treatment in Pet	er Best Paper:
Number of Stacks along Orier	ntation N	9				-	es increased by N ^{0.25} at the height	
Conditions of End (Ton) of lot Disease						fully merged (i	nterp. below ht, single merged sta	ack above ht)
Conditions at End (Top) of Jet Phase: Height above S	Stack 7	12 752	meters*	41.8	feet*	z. = 6.25D m	eters*=meters above stack top	Sect.3/¶1
Height above Grour	,	23.585			feet	z _{jet} = 0.23D, m	eters -meters above stack top	0000.0/ 1
Vertical Vel		4.980	m/s	16.34	ft/sec	V _{jet} = 0.5V _{exit} =	: V _{exit} /2	
Plume Top-Hat Diam	eter 2a _{jet}	4.081	meters	13.4	feet	2a _{jet} = 2D	Conservation of mome	entum "
Spillane Methodology - Analytical Solu Single Plume-averaged Vertical Ve				-				
Single Plume Values: Plume Top-Hat I		-	-	e Merging Only			or linear increase with height	Sect.2/Eq.6
Virtual Source I			meters*		feet*		θ_0/θ_0) ^{1/2}], meters*=meters above stack	
Height above Grou	-	11.080	meters		feet		where $(\theta_a/\theta_s)^{1/2} = (\theta_e/\theta_s)^{1/2}$	
Single Plume Values: Vertical V	elocity V	Us	ed in Plum	e Merging Only	у	{(Va)₀ ³ + 0.12F	$F_{o} [(z-z_{v})^{2} - (6.25D-z_{v})^{2}]^{(1/3)} / a$	Sect.2.1(6)
Prode	uct (Va) _o	9.963	m²/s			V _{exit} (D/2)(θ _e /θ _s		
Plume Merging - Based on Single Plum								Sect.3/¶3
Begin Merging Plume Top-Hat Diamete			meters		feet foot*	$2a_{touch}=d$, (or a		took tor
Height above Sta Height above Ground			meters* meters		feet*	$z_{touch} = z_v + d/(2$	*0.16), meters*=meters above s	аск тор
Height above Ground Vertical Veloc		9.186			ft/sec	$V_{\text{true}} = J/V_{2}V_{2}^{2}$	$^{3} + 0.12F_{o} [(z-z_{v})^{2} - (6.25D-z_{v})^{2}]^{(1)}$	^{1/3)} /a
Total Merging Plume Top-Hat Diame			meters		feet		2, (or a _{full} =d(N-1)/2) FOR 2 STAC	
Height above S			meters*	175.5			*0.16), meters*=meters above st	
Height above Groun	ıd z _{full} +h _s	64.330	meters	211.1	feet			
Vertical Vel	ocity V _{full}	1.537	m/s	5.0	ft/sec	V _{full} = {(Va) _o ³ +	+ 0.12F _o [(z _{full} -z _v) ² - (6.25D-z _v) ²]} ⁽	^{1/3)} / a _{full}
Produc	ct (V³a) _{full}	31	m ⁴ /s ³					
Conditions at End (Top) of Merging Pha					Plume calc			
Merged Plume Values: Plume Diar				Table Below			0.16(z-z _{full})), or linear increase w	
Revised Merged Plume Ra			meters		feet		²⁵ a _{full} where Total Merging Occur	
Revised Merged Plume Ve Revised Virtual Source H		2.662	m/s meters*		ft/sec		²⁵ V _{full} where Total Merging Occur	
Revised Virtual Source H Revised Vertical V				175.5 Tables Below	teet	-	stack where Total Merging Occur ^{1/3} for heights above total mergir	
Nevised ventical v	elocity v			100.000 20.011			V _{touch})*(Z-Z _{touch})/(Z _{full} -Z _{touch})	ig elevation
Multiple Plume Calculations						• - • touch • (• m -	for heights below total	merging elevation
Solve for plume-averaged vert	tical veloc	ity at height	500.0	feet	152.4	a meters above	-	5 5
Gives the following Height above	e Stack z	141.567	meters*	464.5	feet*	REGULAR EC)NS	
Plume Top-Hat I	Radius a	28.848	meters	94.6	feet	a=a _m +0.16(z-z		
Vertical V	elocity V	2.129	m/s	6.98	ft/sec	V={n(V ³ a) _{full} /a]		
							V _{touch})*(z'-z _{touch})/(z _{full} -z _{touch}) if z _{tou}	_{ch} <z<z<sub>full</z<z<sub>
Solve for Height of CASC critica		volocity V		m/s			ne values if z<z< b="">touch TOP OF MERGING PHASE-INTE</z<>	PROL
Find Height above S		34.657		m/s 113.7	feet		(V ³ a) _{full} /(V _{crit}) ³]-a _m }/0.16 if V_{crit}<v< b=""></v<>	
Height above Groun			meters	149.2			(V a) _{full} /(V _{crit})]-a _m }/0.10 If V _{crit} <v _I-z_{touch})*(V_{crit}-V_{touch})/(V_m-V_{touch}) if V</v 	
noight aborto choan	C Long The	10.100	motoro			-crit -touch (-tui	-touch/ (*crit *touch/(*m *touch/*	V>V
	rtical Velo		a at Touchi					V _{crit} >V _m
Table of MERGED Plume-Averaged Ver		cities startin	ig at roucin	ing Height:		Single Plume	Eqns (see Single Plume spreads	
•	ght (feet)	cities startin (meters)	Plume			V _{plume} ={(Va) _o ³ +0.1	Eqns (see Single Plume spreads 2F _o [(z-z _v) ² -(6.25D-z _v) ²]} ^{1/3} / a	
Heig above	ground	(meters) above stack	Plume Radius(m)	Vert. Vel(m/s)		$V_{plume} = {(Va)_o^3 + 0.1}$ a = 0.16(z-z_v)	$2F_o[(z-z_v)^2-(6.25D-z_v)^2]$ ^{1/3} / a	
Heig	e ground h) = 58.2	(meters) above stack 6.91	Plume Radius(m) 1.065	Vert. Vel(m/s) 9.19		$V_{plume} = {(Va)_o^3 + 0.1}$ a = 0.16(z-z_v) $\theta_p = \theta_s (1 + (1 - (\theta_e))^2)$	2F _o [(z-z _v) ² -(6.25D-z _v) ²]) ^{1/3} / a /θ _s))*(V _{exit} D ² /(4V _{plume} *a ^{2*} λ ²)))	sheet)
Heig above	e ground h) = 58.2 60.0	(meters) above stack 6.91 7.46	Plume Radius(m) 1.065 #N/A	Vert. Vel(m/s) 9.19 9.11		$V_{plume} = \{(Va)_o^3 + 0.1 \\ a = 0.16(z-z_v) \\ \theta_p = \theta_s(1+(1-(\theta_e + 1))) \\ Interpolated Label{eq:polated}$	2F _o [(z-z _v) ² -(6.25D-z _v) ²]) ^{1/3} / a /θ _s))*(V _{exit} D ² /(4V _{ptume} *a ² *λ ²))) ayer Eqns	
Heig above	e ground (h) = 58.2 60.0 80.0	(meters) above stack 6.91 7.46 13.55	Plume Radius(m) 1.065 #N/A #N/A	Vert. Vel(m/s) 9.19 9.11 8.26		$V_{plume} = \{(Va)_o^3 + 0.1 \\ a = 0.16(z-z_v) \\ \theta_p = \theta_s(1+(1-(\theta_e + 1))) \\ Interpolated Label{eq:polated}$	2F _o [(z-z _v) ² -(6.25D-z _v) ²]) ^{1/3} / a //θ _s))*(V _{exit} D ² /(4V _{plume} *a ^{2*} λ ²)))	sheet)
Heig above	e ground h) = 58.2 60.0 80.0 100.0	(meters) above stack 6.91 7.46 13.55 19.65	Plume Radius(m) 1.065 #N/A #N/A #N/A	Vert. Vel(m/s) 9.19 9.11 8.26 7.40		$V_{plume} = \{(Va)_o^3 + 0.1 \\ a = 0.16(z-z_v) \\ \theta_p = \theta_s(1+(1-(\theta_e + 1))) \\ Interpolated Label{eq:polated}$	2F _o [(z-z _v) ² -(6.25D-z _v) ²]) ^{1/3} / a /θ _s))*(V _{exit} D ² /(4V _{ptume} *a ² *λ ²))) ayer Eqns	sheet)
Heig above	e ground h) = 58.2 60.0 80.0 100.0 120.0	(meters) above stack 6.91 7.46 13.55 19.65 25.74	Plume Radius(m) 1.065 #N/A #N/A #N/A #N/A	Vert. Vel(m/s) 9.19 9.11 8.26 7.40 6.55		$V_{plume} = \{(Va)_o^3 + 0.1 \\ a = 0.16(z-z_v) \\ \theta_p = \theta_s(1+(1-(\theta_e + 1))) \\ Interpolated Label{eq:polated}$	2F _o [(z-z _v) ² -(6.25D-z _v) ²]) ^{1/3} / a /θ _s))*(V _{exit} D ² /(4V _{ptume} *a ² *λ ²))) ayer Eqns	sheet)
Heig above	e ground h) = 58.2 60.0 80.0 100.0	(meters) above stack 6.91 7.46 13.55 19.65	Plume Radius(m) 1.065 #N/A #N/A #N/A #N/A	Vert. Vel(m/s) 9.19 9.11 8.26 7.40 6.55 5.69		$V_{plume} = \{(Va)_o^3 + 0.1 \\ a = 0.16(z-z_v) \\ \theta_p = \theta_s(1+(1-(\theta_e + 1))) \\ Interpolated Label{eq:polated}$	2F _o [(z-z _v) ² -(6.25D-z _v) ²]) ^{1/3} / a /θ _s))*(V _{exit} D ² /(4V _{ptume} *a ² *λ ²))) ayer Eqns	sheet)
Heig above	e ground b) = 58.2 60.0 80.0 100.0 120.0 140.0	(meters) above stack 6.91 7.46 13.55 19.65 25.74 31.84	Plume Radius(m) 1.065 #N/A #N/A #N/A #N/A #N/A	Vert. Vel(m/s) 9.19 9.11 8.26 7.40 6.55 5.69 4.84		$V_{plume} = \{(Va)_o^3 + 0.1 \\ a = 0.16(z-z_v) \\ \theta_p = \theta_s(1+(1-(\theta_e + 1))) \\ Interpolated Label{eq:polated}$	2F _o [(z-z _v) ² -(6.25D-z _v) ²]) ^{1/3} / a /θ _s))*(V _{exit} D ² /(4V _{ptume} *a ² *λ ²))) ayer Eqns	sheet)
Heig above	ground b) = 58.2 60.0 80.0 100.0 120.0 140.0 160.0	(meters) above stack 6.91 7.46 13.55 19.65 25.74 31.84 37.94	Plume Radius(m) 1.065 #N/A #N/A #N/A #N/A #N/A	Vert. Vel(m/s) 9.19 9.11 8.26 7.40 6.55 5.69 4.84 3.99		$V_{plume} = \{(Va)_o^3 + 0.1 \\ a = 0.16(z-z_v) \\ \theta_p = \theta_s(1+(1-(\theta_e + 1))) \\ Interpolated Label{eq:polated}$	2F _o [(z-z _v) ² -(6.25D-z _v) ²]) ^{1/3} / a /θ _s))*(V _{exit} D ² /(4V _{ptume} *a ² *λ ²))) ayer Eqns	sheet)
Heig above	e ground h) = 58.2 60.0 80.0 100.0 120.0 140.0 160.0 180.0 200.0 e 211.1	(meters) above stack 6.91 7.46 13.55 19.65 25.74 31.84 37.94 44.03	Plume Radius(m) 1.065 #N/A #N/A #N/A #N/A #N/A	Vert. Vel(m/s) 9.19 9.11 8.26 7.40 6.55 5.69 4.84 3.99 3.13		$\label{eq:vpine} \begin{split} & v_{pine} = (va)_{e}^{3} \cdot o.1 \\ & a = 0.16(z \cdot z_{v}) \\ & \theta_{p} = \theta_{e}(1 + (1 - (\theta_{e} - 1 + 1 - (\theta_{e} - 1 + 1 - \theta_{e}))) \\ & Interpolated Li \\ & V' = V_{touch} + (V_{m} - 1 - 1 - 1 - \theta_{e}) \\ & Merged Plume \end{split}$	2F ₆ [(z-z,) ² -(6.25D-z,) ²]) ^{1/3} / a /θ ₂))*(V _{exit} D ² /(4V _{plume} *a ² *λ ²))) ayer Eqns V _{touch})*(z [*] -z _{touch})/(z _{tull} -z _{touch})	sheet)
Heig above Begin Merging (touch	e ground h) = 58.2 60.0 80.0 100.0 120.0 140.0 160.0 180.0 200.0 = 211.1 300.0	(meters) above stack 6.91 7.46 13.55 19.65 25.74 31.84 37.94 44.03 50.13 50.13 53.51 80.61	Plume Radius(m) 1.065 #N/A #N/A #N/A #N/A #N/A #N/A #N/A 14.757 19.095	Vert. Vel(m/s) 9.19 9.11 8.26 6.55 5.69 4.84 3.99 3.13 2.66 2.44		$\label{eq:vpine} \begin{split} & v_{pine} = (va)_o^3 \cdot 0.1 \\ & a = 0.16(z \cdot z_v) \\ & \theta_p \cdot \theta_a(1+(1-(\theta_e \ Interpolated \ Li \ V' = V_{touch} + (V_m)^2 \end{split}$	2F ₆ ((z-z,) ² (6.25D-z,) ²)) ^{1/3} / a /θ ₂))*(V _{exit} D ² /(4V _{plume} *a ^{2*} λ ²))) ayer Eqns V _{touch})*(z ⁺ -z _{touch})/(Z _{tull} -z _{touch})	sheet)
Heig above Begin Merging (touch	e ground h) = 58.2 60.0 80.0 100.0 120.0 140.0 160.0 180.0 200.0 = 211.1 300.0 400.0	(meters) above stack 6.91 7.46 13.55 25.74 31.84 37.94 44.03 50.13 53.51 80.61 111.09	Plume Radius(m) 1.065 #N/A #N/A #N/A #N/A #N/A #N/A #N/A 14.757 19.095 23.971	Vert. Vel(m/s) 9.19 9.11 8.26 7.40 6.55 5.69 4.84 3.99 3.13 2.66 2.44 2.26		$\label{eq:vpine} \begin{split} & v_{pine} = (va)_{e}^{3} \cdot o.1 \\ & a = 0.16(z \cdot z_{v}) \\ & \theta_{p} = \theta_{e}(1 + (1 - (\theta_{e} - 1 + 1 - (\theta_{e} - 1 + 1 - \theta_{e}))) \\ & Interpolated Li \\ & V' = V_{touch} + (V_{m} - 1 - 1 - 1 - \theta_{e}) \\ & Merged Plume \end{split}$	2F ₆ ((z-z,) ² (6.25D-z,) ²)) ^{1/3} / a /θ ₂))*(V _{exit} D ² /(4V _{plume} *a ^{2*} λ ²))) ayer Eqns V _{touch})*(z ⁺ -z _{touch})/(Z _{tull} -z _{touch})	sheet) 20 ft Interva
Heig above Begin Merging (touch	e ground h) = 58.2 60.0 80.0 100.0 120.0 140.0 160.0 180.0 200.0 = 211.1 300.0 400.0 500.0	(meters) above stack 6.91 7.46 13.55 25.74 31.84 37.94 44.03 50.13 50.13 53.51 8.0.61 111.09 141.57	Plume Radius(m) 1.065 #N/A #N/A #N/A #N/A #N/A #N/A 14.757 19.095 23.971 28.848	Vert. Vel(m/s) 9.19 9.11 8.26 7.40 6.55 5.69 4.84 3.99 3.13 2.66 2.44 2.26 2.13		$\label{eq:vpine} \begin{split} & v_{pine} = (va)_o^3 \cdot 0.1 \\ & a = 0.16(z \cdot z_v) \\ & \theta_p \cdot \theta_a(1+(1-(\theta_e \ Interpolated \ Li \ V' = V_{touch} + (V_m)^2 \end{split}$	2F ₆ ((z-z,) ² (6.25D-z,) ²)) ^{1/3} / a /θ ₂))*(V _{exit} D ² /(4V _{plume} *a ^{2*} λ ²))) ayer Eqns V _{touch})*(z ⁺ -z _{touch})/(Z _{tull} -z _{touch})	sheet) 20 ft Interva
Heig above Begin Merging (touch	e ground (* * * * * * * * * * * * * * * * * * *	(meters) above stack 6.91 7.46 13.355 25.74 31.84 37.94 44.03 50.13 53.51 80.61 111.09 141.57 172.05	Plume Radius(m) 1.065 #N/A #N/A #N/A #N/A #N/A #N/A #N/A 14.757 19.055 23.971 28.848 33.725	Vert. Vel(m/s) 9.19 9.11 8.26 7.40 6.55 5.69 4.84 3.89 3.13 2.66 2.44 2.26 2.13 2.02		$\label{eq:vpine} \begin{split} & v_{pine} = (va)_o^3 \cdot 0.1 \\ & a = 0.16(z \cdot z_v) \\ & \theta_p \cdot \theta_a(1+(1-(\theta_e \ Interpolated \ Li \ V' = V_{touch} + (V_m)^2 \end{split}$	2F ₆ ((z-z,) ² (6.25D-z,) ²)) ^{1/3} / a /θ ₂))*(V _{exit} D ² /(4V _{plume} *a ^{2*} λ ²))) ayer Eqns V _{touch})*(z ⁺ -z _{touch})/(Z _{tull} -z _{touch})	sheet) 20 ft Interva
Heig above Begin Merging (touch	e ground (1) (b) = 58.2 60.0 80.0 100.0 120.0 140.0 160.0 180.0 200.0 = 211.1 300.0 400.0 500.0 600.0 700.0	(meters) above stack 6.91 7.46 13.555 25.74 31.84 37.94 44.03 50.13 53.51 80.61 111.09 141.57 172.05 202.53	Plume Radius(m) 1.065 #N/A #N/A #N/A #N/A #N/A #N/A #N/A 14.757 19.095 23.971 28.848 38.602	Vert. Vel(m/s) 9.19 9.11 8.26 7.40 6.55 5.69 4.84 3.99 3.13 2.66 2.44 2.26 2.13 2.02 1.93		$\label{eq:vpine} \begin{split} & v_{pine} = (va)_o^3 \cdot 0.1 \\ & a = 0.16(z \cdot z_v) \\ & \theta_p \cdot \theta_a(1+(1-(\theta_e \ Interpolated \ Li \ V' = V_{touch} + (V_m)^2 \end{split}$	2F ₆ ((z-z,) ² (6.25D-z,) ²)) ^{1/3} / a /θ ₂))*(V _{exit} D ² /(4V _{plume} *a ^{2*} λ ²))) ayer Eqns V _{touch})*(z ⁺ -z _{touch})/(Z _{tull} -z _{touch})	20 ft interva 20 ft interva 20 ft interva
Heig above Begin Merging (touch	e ground (1) (b) = 58.2 60.0 80.0 100.0 120.0 140.0 160.0 180.0 200.0 (200.0) (201	(meters) above stack 6.91 7.464 13.55 19.65 225.74 31.84 44.03 50.13 53.51 8.0.61 111.09 141.57 172.05 202.53 233.01	Plume Radius(m) 1.065 #NIA #NIA #NIA #NIA #NIA #NIA #NIA 14.757 19.095 23.971 28.848 33.725 38.602 43.479	Vert. Vel(m/s) 9.19 9.11 8.26 7.40 6.55 5.69 4.84 3.99 3.13 2.66 2.44 2.26 2.13 2.02 1.93 1.86		$\label{eq:vpine} \begin{split} & v_{pine} = (va)_o^3 \cdot 0.1 \\ & a = 0.16(z \cdot z_v) \\ & \theta_p = \theta_a(1 + (1 - (\theta_a \\ interpolated Li \\ V' = V_{touch} + (V_m)^2 \\ \end{split}$	2F ₆ ((z-z,) ² (6.25D-z,) ²)) ^{1/3} / a /θ ₂))*(V _{exit} D ² /(4V _{plume} *a ^{2*} λ ²))) ayer Eqns V _{touch})*(z ⁺ -z _{touch})/(Z _{tull} -z _{touch})	sheet) 20 ft Interva
Heig above Begin Merging (touch	e ground (1) b) = 58.2 60.0 80.0 100.0 120.0 140.0 140.0 160.0 200.0 200.0 200.0 500.0 600.0 700.0 800.0 900.0	(meters) above stack 6.91 7.46 13.55 25.74 31.94 37.94 44.03 50.13 50.13 53.51 80.61 111.09 141.57 172.05 202.53 203.01 263.49	Plume Radius(m) 1.065 #N/A #N/A #N/A #N/A #N/A #N/A #N/A 19.095 23.971 28.848 33.725 38.602 43.479 48.355	Vert. Vel(m/s) 9.19 9.11 8.26 7.40 6.55 5.69 4.84 3.99 3.13 2.66 2.44 2.26 2.13 2.02 1.93 1.86 1.79		$\label{eq:vpine} \begin{split} & v_{pine} = (va)_o^3 \cdot 0.1 \\ & a = 0.16(z \cdot z_v) \\ & \theta_p = \theta_a(1 + (1 - (\theta_a \\ interpolated Li \\ V' = V_{touch} + (V_m)^2 \\ \end{split}$	2F ₆ ((z-z,) ² (6.25D-z,) ²)) ^{1/3} / a /θ ₂))*(V _{exit} D ² /(4V _{plume} *a ^{2*} λ ²))) ayer Eqns V _{touch})*(z ⁺ -z _{touch})/(Z _{tull} -z _{touch})	20 ft interva 20 ft interva 20 ft interva
Heig above Begin Merging (touch	e ground (1) (b) = 58.2 60.0 80.0 100.0 120.0 140.0 160.0 180.0 200.0 (200.0) (201	(meters) above stack 6.91 7.464 13.55 19.65 225.74 31.84 44.03 50.13 53.51 8.0.61 111.09 141.57 172.05 202.53 233.01	Plume Radius(m) 1.065 #NIA #NIA #NIA #NIA #NIA #NIA #NIA 14.757 19.095 23.971 28.848 33.725 38.602 43.479	Vert. Vel(m/s) 9.19 9.11 8.26 7.40 6.55 5.69 4.84 3.99 3.13 2.66 2.44 4.2.26 2.13 2.02 1.93 1.86 6.1.79		$\label{eq:vpine} \begin{split} & v_{pine} = (va)_o^3 \cdot 0.1 \\ & a = 0.16(z \cdot z_v) \\ & \theta_p = \theta_a(1 + (1 - (\theta_a \\ interpolated Li \\ V' = V_{touch} + (V_m)^2 \\ \end{split}$	2F ₆ ((z-z,) ² (6.25D-z,) ²)) ^{1/3} / a /θ ₂))*(V _{exit} D ² /(4V _{plume} *a ^{2*} λ ²))) ayer Eqns V _{touch})*(z ⁺ -z _{touch})/(Z _{tull} -z _{touch})	20 ft interva 20 ft interva 20 ft interva
Heig above Begin Merging (touch	ground +) = 58.2 60.0 80.0 100.0 120.0 140.0 120.0 140.0 200.0 200.0 1 = 211.1 300.0 400.0 500.0 600.0 700.0 800.0 900.0 1000.0	(meters) above stack 6.91 7.46 13.55 25.74 31.84 37.94 44.03 50.13 53.51 80.61 111.09 141.57 172.05 202.53 203.01 263.49 263.49 263.93	Plume Radius(m) 1.065 #N/A #N/A #N/A #N/A #N/A #N/A #N/A #N/A	Vert. Vel(m/s) 9.19 9.11 8.26 7.40 6.55 5.69 4.84 3.89 3.13 2.66 2.44 2.26 2.13 2.02 1.93 1.86 1.79 1.74		$\label{eq:vpine} \begin{split} & v_{pine} = (va)_o^3 \cdot 0.1 \\ & a = 0.16(z \cdot z_v) \\ & \theta_p = \theta_a(1 + (1 - (\theta_a \\ interpolated Li \\ V' = V_{touch} + (V_m)^2 \\ \end{split}$	2F ₆ ((z-z,) ² (6.25D-z,) ²)) ^{1/3} / a /θ ₂))*(V _{exit} D ² /(4V _{plume} *a ^{2*} λ ²))) ayer Eqns V _{touch})*(z ⁺ -z _{touch})/(Z _{tull} -z _{touch})	20 ft interva 20 ft interva 20 ft interva
Heig above Begin Merging (touch	e ground (*) *) = 58.2 60.0 80.0 100.0 120.0 140.0 120.0 140.0 200.0 200.0 = 211.1 300.0 400.0 500.0 600.0 700.0 800.0 900.0 1000.0 1100.0	(meters) above stack 6.91 7.46 13.855 25.74 31.84 37.94 44.03 50.13 53.51 80.61 111.09 141.57 172.05 202.53 203.01 263.49 263.49 263.49 324.45	Plume Radius(m) 1.065 #N/A #N/A #N/A #N/A #N/A #N/A #N/A 14.757 19.095 23.971 28.848 33.725 38.602 43.479 48.355 38.602 43.479 48.355 35.2322 58.109	Vert. Vel(m/s) 9.19 9.11 8.26 7.40 6.55 5.69 4.84 3.99 3.13 2.66 2.44 2.26 2.13 2.02 1.93 1.86 1.79 1.74 4.89 1.64		$\label{eq:vpine} \begin{split} & v_{pine} = (va)_o^3 \cdot 0.1 \\ & a = 0.16(z \cdot z_v) \\ & \theta_p = \theta_a(1 + (1 - (\theta_a \\ interpolated Li \\ V' = V_{touch} + (V_m)^2 \\ \end{split}$	2F ₆ ((z-z,) ² (6.25D-z,) ²)) ^{1/3} / a /θ ₂))*(V _{exit} D ² /(4V _{plume} *a ^{2*} λ ²))) ayer Eqns V _{touch})*(z ⁺ -z _{touch})/(Z _{tull} -z _{touch})	20 ft Interva 20 ft Interva 20 ft Interva
Heig above Begin Merging (touch	e ground h) = 58.2 60.0 80.0 120.0 140.0 120.0 140.0 200.	(meters) above stack 6.91 7.464 13.55 19.65 225.74 31.84 44.03 50.13 53.51 8.0.61 111.09 141.57 172.05 223.33 233.01 263.49 293.97 324.45 354.93	Plume Radius(m) 1.065 #N/A #N/A #N/A #N/A #N/A #N/A #N/A #N/A	Vert. Vel(m/s) 9.19 9.11 8.26 7.40 6.55 5.69 4.84 3.99 3.13 2.66 2.44 2.26 2.43 2.02 1.93 1.86 1.79 1.74 1.69 1.64		$\label{eq:vpine} \begin{split} & v_{pine} = (va)_o^3 \cdot 0.1 \\ & a = 0.16(z \cdot z_v) \\ & \theta_p = \theta_a(1 + (1 - (\theta_a \\ interpolated Li \\ V' = V_{touch} + (V_m)^2 \\ \end{split}$	2F ₆ ((z-z,) ² (6.25D-z,) ²)) ^{1/3} / a /θ ₂))*(V _{exit} D ² /(4V _{plume} *a ^{2*} λ ²))) ayer Eqns V _{touch})*(z ⁺ -z _{touch})/(Z _{tull} -z _{touch})	20 ft Interva 20 ft Interva 20 ft Interva
Heig above Begin Merging (touch	e ground ()) = 58.2 60.0 80.0 100.0 120.0 140.0 160.0 180.0 200.0 = 211.1 300.0 400.0 500.0 600.0 700.0 800.0 900.0 100.0 1100.0 1100.0 1100.0 1100.0 1200.0 1100.0	(meters) above stack 6.91 7.46 13.55 25.74 31.84 44.03 50.13 50.13 50.51 80.61 111.09 141.57 172.05 202.53 233.01 263.49 293.97 324.45 354.33 385.41	Plume Radius(m) 1.065 #N/A #N/A #N/A #N/A #N/A #N/A #N/A 19.095 23.971 28.848 33.725 33.971 28.848 33.725 33.971 28.848 33.725 33.971 28.848 33.725 33.971 28.848 33.725 33.232 58.109 62.966 67.863	Vert. Vel(m/s) 9.19 9.11 8.26 7.40 6.55 5.69 4.84 3.99 3.13 2.66 2.44 2.26 2.13 2.02 1.93 1.86 1.79 1.74 1.69 1.64 1.60		$\label{eq:vpine} \begin{split} & v_{pine} = (va)_o^3 \cdot 0.1 \\ & a = 0.16(z \cdot z_v) \\ & \theta_p = \theta_a(1 + (1 - (\theta_a \\ interpolated Li \\ V' = V_{touch} + (V_m)^2 \\ \end{split}$	2F ₆ ((z-z,) ² (6.25D-z,) ²)) ^{1/3} / a /θ ₂))*(V _{exit} D ² /(4V _{plume} *a ^{2*} λ ²))) ayer Eqns V _{touch})*(z ⁺ -z _{touch})/(Z _{tull} -z _{touch})	20 ft Interva 20 ft Interva 20 ft Interva
Heig above Begin Merging (touch	e ground (*) *) = 58.2 60.0 80.0 100.0 120.0 140.0 120.0 140.0 180.0 200.0 **********************************	(meters) above stack 6.91 7.46 13.55 25.74 31.84 37.94 44.03 50.13 53.51 80.61 111.09 141.57 172.05 202.53 203.01 263.49 233.01 263.49 324.45 354.93 354.41 415.89	Plume Radius(m) 1.065 #N/A #N/A #N/A #N/A #N/A #N/A #N/A #N/A	Vert. Vel(m/s) 9.19 9.11 8.26 7.40 6.55 5.69 4.84 3.99 3.13 2.66 2.44 2.26 2.13 2.02 1.93 1.86 1.79 1.74 1.69 1.64 1.60 1.53		$\label{eq:vpine} \begin{split} & v_{pine} = (va)_o^3 \cdot 0.1 \\ & a = 0.16(z \cdot z_v) \\ & \theta_p = \theta_a(1 + (1 - (\theta_a \\ interpolated Li \\ V' = V_{touch} + (V_m)^2 \\ \end{split}$	2F ₆ ((z-z,) ² (6.25D-z,) ²)) ^{1/3} / a /θ ₂))*(V _{exit} D ² /(4V _{plume} *a ^{2*} λ ²))) ayer Eqns V _{touch})*(z ⁺ -z _{touch})/(Z _{tull} -z _{touch})	20 ft interva 20 ft interva 20 ft interva
Heig above Begin Merging (touch	e ground ()) = 58.2 60.0 80.0 100.0 120.0 140.0 160.0 200.0 200.0 201.0 180.0 200.0 200.0 201.1 300.0 500.0 600.0 700.0 800.0 900.0 100.0 1100.0 1200.0 1100.0 1200.0 1100.0 1200.0 1100.0 1200.0 1100.0 1200.0 1100.0 1200.0 100.	(meters) above stack 6.91 7.464 13.55 19.65 25.74 31.84 44.03 50.13 50.13 50.13 50.13 50.13 50.13 50.13 50.13 50.13 50.13 50.13 50.13 50.13 111.09 141.57 172.05 225.53 233.01 263.49 324.53 325.41 32	Plume Radius(m) 1.065 #N/A #N/A #N/A #N/A #N/A #N/A #N/A #N/A	Vert. Vel(m/s) 9.19 9.11 8.26 7.40 6.55 5.69 4.84 3.99 3.13 2.66 2.44 2.26 2.13 2.02 1.93 1.86 1.79 1.74 1.69 1.64 1.60 1.56 1.53 1.50		$\label{eq:vpine} \begin{split} & v_{pine} = (va)_o^3 \cdot 0.1 \\ & a = 0.16(z \cdot z_v) \\ & \theta_p = \theta_a(1 + (1 - (\theta_a \\ interpolated Li \\ V' = V_{touch} + (V_m)^2 \\ \end{split}$	2F ₆ ((z-z,) ² (6.25D-z,) ²)) ^{1/3} / a /θ ₂))*(V _{exit} D ² /(4V _{plume} *a ^{2*} λ ²))) ayer Eqns V _{touch})*(z ⁺ -z _{touch})/(Z _{tull} -z _{touch})	20 ft Interva 20 ft Interva 20 ft Interva 100 ft Interv
Heig above Begin Merging (touch	e ground (*) *) = 58.2 60.0 80.0 100.0 120.0 140.0 160.0 200.0 * 271.1 300.0 400.0 500.0 600.0 700.0 800.0 900.0 1000.0 1100.0 1200.0 1100.0 1200.0 1000.0 1200.0 1200.0 1200.0 1200.0 1000.0 1200	(meters) above stack 6.91 7.46 13.55 25.74 31.84 44.03 50.13 50.13 50.51 80.61 111.09 141.57 172.05 202.53 203.07 263.49 293.97 324.45 354.93 385.41 415.89 346.37 476.85 598.77 751.17	Plume Radius(m) 1.065 #N/A #N/A #N/A #N/A #N/A #N/A #N/A #N/A	Vert. Vel(m/s) 9.19 9.11 8.26 7.40 6.55 5.69 4.84 2.46 2.46 2.43 2.26 2.13 2.02 1.93 1.86 1.79 1.74 1.69 1.64 1.60 1.56 1.53 1.50 1.40		$\label{eq:vpine} \begin{split} & v_{pine} = (va)_o^3 \cdot 0.1 \\ & a = 0.16(z \cdot z_v) \\ & \theta_p = \theta_a(1 + (1 - (\theta_a \\ interpolated Li \\ V' = V_{touch} + (V_m)^2 \\ \end{split}$	2F ₆ ((z-z,) ² (6.25D-z,) ²)) ^{1/3} / a /θ ₂))*(V _{exit} D ² /(4V _{plume} *a ^{2*} λ ²))) ayer Eqns V _{touch})*(z ⁺ -z _{touch})/(Z _{tull} -z _{touch})	20 ft Interva 20 ft Interva 20 ft Interva 100 ft Interv
Heig above Begin Merging (touch	e ground (*) *) = 58.2 60.0 80.0 100.0 120.0 140.0 120.0 140.0 120.0 120.0 140.0 200.0 * * 200.0 *	(meters) above stack 6.91 7.46 13.55 25.74 31.84 37.94 44.03 50.13 53.51 80.61 111.09 141.57 172.05 202.53 203.01 263.49 293.97 324.45 354.93 385.41 415.89 446.37 476.85 598.77 751.17	Plume Radius(m) 1.065 #N/A #N/A #N/A #N/A #N/A #N/A #N/A #N/A	Vert. Vei(m/s) 9.19 9.11 8.26 7.40 6.55 5.69 4.84 3.99 3.13 2.66 2.44 2.26 2.13 2.20 1.93 1.86 1.79 1.74 1.69 1.64 1.60 1.53 1.50 1.40 0.43 1.30 1.43		$\label{eq:vpine} \begin{split} & v_{pine} = (va)_o^3 \cdot 0.1 \\ & a = 0.16(z \cdot z_v) \\ & \theta_p = \theta_a(1 + (1 - (\theta_a \\ interpolated Li \\ V' = V_{touch} + (V_m)^2 \\ \end{split}$	2F ₆ ((z-z,) ² (6.25D-z,) ²)) ^{1/3} / a /θ ₂))*(V _{exit} D ² /(4V _{plume} *a ^{2*} λ ²))) ayer Eqns V _{touch})*(z ⁺ -z _{touch})/(Z _{tull} -z _{touch})	20 ft Interva 20 ft Interva 20 ft Interva 100 ft Interv
Heig above Begin Merging (touch	ground aground b) = 58.2 60.0 80.0 100.0 120.0 140.0 160.0 180.0 200.0 200.0 200.0 200.0 200.0 200.0 200.0 200.0 200.0 200.0 300.0 400.0 500.0 900.0 1000.0 1100.0 1200.0 1300.0 1400.0 200.0 2500.0 3000.0 3000.0	(meters) above stack 6.91 7.464 13.55 19.65 225.74 31.84 33.94 44.03 50.13 53.51 8.0.61 111.09 141.57 172.05 225.53 233.01 263.49 293.97 324.45 354.93 385.41 415.89 476.85 55.97 751.17 903.57 51.07	Plume Radius(m) 1.065 #N/A #N/A #N/A #N/A #N/A #N/A #N/A #N/A	Vert. Vel(m/s) 9.19 9.11 8.26 7.40 6.55 5.69 4.84 3.99 3.13 2.66 2.44 2.26 2.13 2.02 1.93 1.86 1.79 1.74 1.69 1.64 1.60 1.53 1.50 1.53 1.50 1.40 1.33		$\label{eq:vpine} \begin{split} & v_{pine} = (va)_o^3 \cdot 0.1 \\ & a = 0.16(z \cdot z_v) \\ & \theta_p = \theta_a(1 + (1 - (\theta_a \\ interpolated Li \\ V' = V_{touch} + (V_m)^2 \\ \end{split}$	2F ₆ ((z-z,) ² (6.25D-z,) ²)) ^{1/3} / a /θ ₂))*(V _{exit} D ² /(4V _{plume} *a ^{2*} λ ²))) ayer Eqns V _{touch})*(z ⁺ -z _{touch})/(Z _{tull} -z _{touch})	20 ft Interva 20 ft Interva 20 ft Interva 100 ft Interv
Heig above Begin Merging (touch	e ground (*) *) = 58.2 60.0 80.0 100.0 120.0 140.0 120.0 140.0 120.0 120.0 140.0 200.0 * * 200.0 *	(meters) above stack 6.91 7.46 13.55 25.74 31.84 37.94 44.03 50.13 53.51 80.61 111.09 141.57 172.05 202.53 203.01 263.49 293.97 324.45 354.93 385.41 415.89 446.37 476.85 598.77 751.17	Plume Radius(m) 1.065 #N/A #N/A #N/A #N/A #N/A #N/A #N/A #N/A	Vert. Vel(m/s) 9.19 9.11 8.26 7.40 6.55 5.69 4.84 3.99 3.13 2.66 2.44 2.26 2.13 2.02 1.93 1.86 1.79 1.74 1.69 1.64 1.60 1.55 1.50 1.40 1.50 1.40 1.51 1.50 1.40 1.23 1.50 1.40 1.23 1.50 1.40 1.23 1.50 1.40 1.40 1.23 1.50 1.40 1.40 1.40 1.40 1.40 1.40 1.40 1.4		$\label{eq:vpine} \begin{split} & v_{pine} = (va)_o^3 \cdot 0.1 \\ & a = 0.16(z \cdot z_v) \\ & \theta_p = \theta_a(1 + (1 - (\theta_a \\ interpolated Li \\ V' = V_{touch} + (V_m)^2 \\ \end{split}$	2F ₆ ((z-z,) ² (6.25D-z,) ²)) ^{1/3} / a /θ ₂))*(V _{exit} D ² /(4V _{plume} *a ^{2*} λ ²))) ayer Eqns V _{touch})*(z ⁺ -z _{touch})/(Z _{tull} -z _{touch})	20 ft Interva 20 ft Interva 20 ft Interva 100 ft Interv

SINGLE Plume Average Vertical Velocities for	-		-			gnt - winter win	
	"Aviation Saf "The Evaluati	-	•			Various Heights in the Plume	
	The Evaluation		•	•		d, Australia ," Dr. K.T. Spillan	
Ambient Conditions:						neutral conditions (d0/dz=0 or	
Ambient Potential Temp θ_a	278.15	Kelvins	41.0	°F	0.304	18 meters/feet	
Plume Exit Conditions:					Gravity g 9.8	31 m/s ²	
Maximum Stack Height h _s	30.48	meters	100	feet-inches	λ 1.1	11	
Stack Diameter D	0.5080	meters	20	inches	λ _o ~1	.0	
Stack Velocity V _{exit}	51.34		168.45		0		
Volumetric Flow		cu.m/sec	22,050		πV _{exit} D²/4		Sect.2/¶1
Stack Potential Temp θ_s		Kelvins	896	°F			0.10/7/
Initial Stack Buoyancy Flux F _o	20.4929					Vol.Flow(g/ π)(1- θ_a/θ_s)	Sect.2/¶1
Plume Buoyancy Flux F No.of Stacks N	N/A 1	m ⁴ /s ³		1 000	O (u p/	V, θ_p at plume height (see belo	W)
NU.UI STACKS N				1.000	Multiple Stack Multip	lication Factor (N)	
Conditions at End (Top) of Jet Phase:							
Height above Stack z _{iet}	3 175	meters*	10.4	feet*	z _{int} = 6.25D, meters*	=meters above stack top	Sect.3/¶1
Height above Ground z _{iet} +h _s		meters	110.4		jot		
Vertical Velocity V _{jet}	25.670			ft/sec	V _{jet} = 0.5V _{exit} = V _{exit} /2		
Plume Top-Hat Diameter 2a _{jet}	1.016	meters	3.3	feet	2a _{jet} = 2D	Conservation of momentum	ı "
Spillane Methodology - Analytical Solutions for	r Calm Conditi	ions for Plur	ne Heights at	ove Jet Ph	ase		
Single Plume-averaged Vertical Velocity V g	iven by Analy	tical Solutio	n in Paper wh	ere Produc	ct Va given by equat	ions below:	
Plume Top-Hat Radius a	S	Solutions in	Table Below		0.16(z-z _v), or linear in	-	Sect.2/Eq.6
Virtual Source Height z _v	1.246	meters*	4.1	feet*	$6.25D[1-(\theta_e/\theta_s)^{1/2}], m$	eters*=meters above stack top	Sect.2/Eq.6
Height above Ground z_v + h_s		meters	104.1	feet	2	where $(\theta_a/\theta_s)^{1/2} = (\theta_e/\theta_s)^{1/2}$	
Vertical Velocity V		Solutions in	Table Below			z _v) ² - (6.25D-z _v) ²]} ^(1/3) / a	Sect.2.1(6)
Product (Va) _o	7.925	m²/s			$V_{exit}D/2(\theta_e/\theta_s)^{1/2}$		
Solve for plume-averaged vertical velo					meters above groun	d (z'+h _s)	
Gives the following Height above Stack z'		meters*	100.0				
Plume Top-Hat Diameter 2a'		meters	30.7		2a'=2*0.16(z'-z _v)	0 (10)	Sect.2/Eq.6
Vertical Velocity V	2.936	m/s	9.63	ft/sec	V={(Va) _o ³ +0.12F _o [(z-	z _v) ² -(6.25D-z _v) ²]} ^(1/3) /(2a'/2)	Sect.2/Eq.6
				<u>.</u>			
Solve for Height of CASC critical vertica				-	ertical velocity		/V > Top of Jet (Spillane)
Find Height above Stack z _{crit}		meters	39.7			nultaneously in both eqs. (i.e.,)	
Height above Ground z _{crit} +h _s	42.570	meters	139.7	leet		the cubic equation ax ³ +bx ² +cx- 0, and b=-(0.12F _o)/(4.3 ³ 0.16 ³):	
Interpolated Height of critical vertical ve	locity in .let P	hase.				,(6.25D-z _v) ² -(Va) _o ³]/(4.3 ³ 0.16 ³)=	
Find Height above Stack z _{crit}	-	meters	#N/A	feet	and u-lo. 12F	, , , , , , , , ,	://www.1728.org/cubic.htm
T ind height above older z _{crit}		meters	#IN/A	1001			
Height above Ground z+h.	#N/Δ	meters	#N/Δ	feet		ives the real solution $x = 7.77$	= 10.8450
Height above Ground $z_{\rm crit} + h_s$	#N/A	meters	#N/A	feet	g	ives the real solution x = z-zv =	
Height above Ground z_{crit} +h _s	#N/A	meters	#N/A	feet	g	or z(m/above stack) =	= 12.090
							= 12.090
Height above Ground z _{crit} +h _s Table of Plume Top-Hat Diameters (2a) and Plu Height (feet)			ocities startir		f jet phase:	or z(m/above stack) =	= 12.090
Table of Plume Top-Hat Diameters (2a) and Plu	ıme-Averaged (meters)	Vertical Vel Plume	ocities startir	ng at end of	f jet phase:	or z(m/above stack) =	= 12.090
Table of Plume Top-Hat Diameters (2a) and Plu Height (feet)	ıme-Averaged (meters)	Vertical Vel Plume	ocities startir SingleStk VertVel(m/s)	ig at end of Plume	f jet phase:	or z(m/above stack) =	= 12.090
Table of Plume Top-Hat Diameters (2a) and Plu Height (feet) above ground	ime-Averaged (meters) above stack	Vertical Vel Plume Radius(m) 0.254	ocities startir SingleStk VertVel(m/s) 51.34	ig at end of Plume	f jet phase:	or z(m/above stack) =	= 12.090
Table of Plume Top-Hat Diameters (2a) and Plu Height (feet) above ground <u>Stack.Rel.Ht = 100.0</u>	ime-Averaged (meters) above stack 0.00	Vertical Vel Plume Radius(m) 0.254	ocities startir SingleStk VertVel(m/s) 51.34 39.00	ig at end of Plume	f jet phase:	or z(m/above stack) = z(ft/above ground) = Jet Phase Eqs: Linearly interpolated from Stack Re	= 12.090 = 139.7 5 foot Intervals
Table of Plume Top-Hat Diameters (2a) and Plu Height (feet) above ground <i>Stack.Rel.Ht = 100.0</i> 105.0 110.0 Top of jet = 110.4	ime-Averaged (meters) above stack 0.00 1.52 3.05 3.17	Vertical Vel Plume Radius(m) 0.254 0.376 0.498 0.508	ocities startir SingleStk VertVel(m/s) 51.34 39.00 26.66 25.67	ng at end of Plume Temp(K)	f jet phase:	or z(m/above stack) = z(ft/above ground) = Jet Phase Eqs: Linearly interpolated from Stack Re Spillane Equations:	= 12.090 = 139.7 5 foot Intervals el. Ht to Top of Jet
Table of Plume Top-Hat Diameters (2a) and Plu Height (feet) above ground Stack.Rel.Ht = 100.0 105.0 110.0 Top of jet = 110.4 120.0	ime-Averaged (meters) above stack 0.00 1.52 3.05 3.17 6.10	Vertical Vel Plume Radius(m) 0.254 0.376 0.498 0.508 0.776	ocities startin SingleStk VertVel(m/s) 51.34 39.00 26.66 25.67 10.53	ng at end of Plume Temp(K) 352.48	f jet phase:	or z(m/above stack) = z(ft/above ground) = Jet Phase Eqs: Linearly interpolated from Stack Re Spillane Equations: V _{plume} ={(Va) _o ³ +0.12F _o [(z-z) ² -(6.250	= 12.090 = 139.7 al.Hi to Top of Jet D-z,) ²]) ¹⁰ / a
Stable of Plume Top-Hat Diameters (2a) and Plu Height (feet) above ground Stack.Rel.Ht = 100.0 105.0 110.0 Top of jet = 110.4 120.0 130.0	ime-Averaged (meters) above stack 0.00 1.52 3.05 3.17 6.10 9.14	Vertical Vel Plume Radius(m) 0.254 0.376 0.498 0.508 0.776 1.264	ocities startir SingleStk VertVel(m/s) 51.34 39.00 26.66 25.67 10.53 6.83	ng at end of Plume Temp(K) 352.48 321.41	f jet phase:	or z(m/above stack) = z(ft/above ground) = Jet Phase Eqs: Linearly interpolated from Stack Re Spillane Equations: V _{plune} ={(Va) _c ³ +0.12F _c](z-z _c) ² -(6.25D a = 0.16(z-z _c)	= 12.090 = 139.7 B. Ht to Top of Jet D-z,) ²) ¹⁴ / a 10 foot Intervals
Table of Plume Top-Hat Diameters (2a) and Plu Height (feet) above ground Stack.Rel.Ht = 100.0 105.0 110.0 Top of jet = 110.4 120.0 130.0 140.0	Ime-Averaged (meters) above stack 0.00 1.52 3.05 3.17 6.10 9.14 12.19	Vertical Vel Plume Radius(m) 0.254 0.376 0.498 0.508 0.508 0.776 1.264 1.751	ocities startir SingleStk VertVel(m/s) 51.34 39.00 26.66 25.67 10.53 6.83 5.26	ng at end of Plume Temp(K) 352.48 321.41 307.36	f jet phase:	or z(m/above stack) = z(ft/above ground) = Jet Phase Eqs: Linearly interpolated from Stack Re Spillane Equations: V _{plume} ={(Va) _o ³ +0.12F _o [(z-z) ² -(6.250	= 12.090 = 139.7 B. Ht to Top of Jet D-z,) ²) ¹⁴ / a 10 foot Intervals
Table of Plume Top-Hat Diameters (2a) and Plu Height (feet) above ground Stack.Rel.Ht = 100.0 105.0 110.0 Top of jet = 110.4 120.0 130.0 140.0 Spillane 5.3 m/s Height = 139.7	Ime-Averaged (meters) above stack 0.00 1.52 3.05 3.17 6.10 9.14 12.19 12.09	Vertical Vel Plume Radius(m) 0.254 0.376 0.498 0.508 0.508 0.776 1.264 1.751 1.735	ocities startir SingleStk VertVel(m/s) 51.34 39.00 26.66 25.67 10.53 6.83 5.26 5.30	ag at end of Plume Temp(K) 352.48 321.41 307.36 307.70	f jet phase:	or z(m/above stack) = z(ft/above ground) = Jet Phase Eqs: Linearly interpolated from Stack Re Spillane Equations: V _{plune} ={(Va) _c ³ +0.12F _c](z-z _c) ² -(6.25D a = 0.16(z-z _c)	= 12.090 = 139.7 B. Ht to Top of Jet D-z,) ²) ¹⁴ / a 10 foot Intervals
Table of Plume Top-Hat Diameters (2a) and Plu Height (feet) above ground Stack.Rel.Ht = 100.0 105.0 110.0 Top of jet = 110.4 120.0 130.0 140.0 Spillane 5.3 m/s Height = 139.7 150.0	Ime-Averaged (meters) above stack 0.00 1.52 3.05 3.17 6.10 9.14 12.19 12.09 15.24	Vertical Vel Plume Radius(m) 0.254 0.376 0.498 0.508 0.776 1.264 1.751 1.735 2.239	ocities startir SingleStk VertVel(m/s) 51.34 39.00 26.66 25.67 10.53 6.83 5.26 5.30 4.42	ng at end of Plume Temp(K) 352.48 321.41 307.36 307.70 299.43	f jet phase:	or z(m/above stack) = z(ft/above ground) = Jet Phase Eqs: Linearly interpolated from Stack Re Spillane Equations: V _{plune} ={(Va) _c ³ +0.12F _c](z-z _c) ² -(6.25D a = 0.16(z-z _c)	= 12.090 = 139.7 B. Ht to Top of Jet D-z,) ²) ¹⁴ / a 10 foot Intervals
Table of Plume Top-Hat Diameters (2a) and Plu Height (feet) above ground Stack.Rel.Ht = 100.0 105.0 110.0 Top of jet = 110.4 120.0 130.0 Spillane 5.3 m/s Height = 139.7 150.0 160.0	Ime-Averaged (meters) above stack 0.00 1.52 3.05 3.17 6.10 9.14 12.19 12.09 15.24 18.29	Vertical Vel Plume Radius(m) 0.254 0.376 0.498 0.508 0.776 1.264 1.751 1.735 2.239 2.727	ocities startir SingleStk VertVel(m/s) 26.66 25.67 10.53 6.83 5.26 5.30 4.42 3.90	ng at end of Plume Temp(K) 352.48 321.41 307.36 307.70 299.43 294.41	f jet phase:	or z(m/above stack) = z(ft/above ground) = Jet Phase Eqs: Linearly interpolated from Stack Re Spillane Equations: V _{plune} ={(Va) _c ³ +0.12F _c](z-z _c) ² -(6.25D a = 0.16(z-z _c)	= 12.090 = 139.7 store intervals st.Ht to Top of Jet -z,y ²) ^{1/3} / a 10 foot intervals *a ² *A ²)))
Table of Plume Top-Hat Diameters (2a) and Plu Height (feet) above ground Stack.Rel.Ht = 100.0 105.0 110.0 Top of jet = 110.4 120.0 130.0 140.0 Spillane 5.3 m/s Height = 139.7 150.0 170.0	Ime-Averaged (meters) above stack 0.00 1.52 3.05 3.17 6.10 9.14 12.19 12.09 15.24 18.29 21.34	Vertical Vel Plume Radius(m) 0.254 0.376 0.498 0.508 0.776 1.264 1.755 2.239 2.727 3.214	ocities startir SingleStk VertVel(m/s) 51.34 39.00 26.66 25.67 10.53 6.83 5.26 5.30 4.42 3.90 3.55	g at end of Plume Temp(K) 352.48 321.41 307.36 307.70 299.43 294.41 291.02	f jet phase:	or z(m/above stack) = z(ft/above ground) = Jet Phase Eqs: Linearly interpolated from Stack Re Spillane Equations: V _{plune} ={(Va) _c ³ +0.12F _c](z-z _c) ² -(6.25D a = 0.16(z-z _c)	= 12.090 = 139.7 B. Ht to Top of Jet D-z,) ²) ¹⁴ / a 10 foot Intervals
Table of Plume Top-Hat Diameters (2a) and Plu Height (feet) above ground Stack. Rel.Ht = 100.0 105.0 110.0 Top of jet = 110.4 120.0 130.0 140.0 Spillane 5.3 m/s Height = 139.7 150.0 170.0 180.0	Ime-Averaged (meters) above stack 0.00 1.52 3.05 3.17 6.10 9.14 12.19 12.09 15.24 18.29 21.34 24.38	Vertical Vel Plume Radius(m) 0.254 0.376 0.498 0.508 0.776 1.264 1.755 2.239 2.727 3.214 3.702	ocities startin SingleStk VertVel(m/s) 51.34 39.00 26.66 25.67 10.53 6.83 5.26 5.30 4.42 3.90 3.55 3.29	g at end of Plume Temp(K) 352.48 321.41 307.36 307.70 299.43 294.41 291.02 288.61	f jet phase:	or z(m/above stack) = z(ft/above ground) = Jet Phase Eqs: Linearly interpolated from Stack Re Spillane Equations: V _{plune} ={(Va) _c ³ +0.12F _c](z-z _c) ² -(6.25D a = 0.16(z-z _c)	= 12.090 = 139.7 store intervals st.Ht to Top of Jet -z,y ²) ^{1/3} / a 10 foot intervals *a ² *A ²)))
Table of Plume Top-Hat Diameters (2a) and Plu Height (feet) above ground Stack. Rel.Ht = 100.0 105.0 110.0 Top of jet = 110.4 120.0 130.0 140.0 Spillane 5.3 m/s Height = 139.7 150.0 170.0 180.0 190.0	Ime-Averaged (meters) above stack 0.00 1.52 3.05 3.17 6.10 9.14 12.19 12.09 15.24 18.29 21.34 24.38 27.43	Vertical Vel Plume Radius(m) 0.254 0.376 0.498 0.508 0.776 1.264 1.751 1.735 2.239 2.727 3.214 3.702 4.190	ocities startin SingleStk VertVel(m/s) 51.34 39.00 26.66 25.67 10.53 6.83 5.26 5.30 4.42 3.90 3.55 3.29 3.09	g at end of Plume Temp(K) 352.48 321.41 307.36 307.70 299.43 294.41 291.02 288.61 286.84	f jet phase:	or z(m/above stack) = z(ft/above ground) = Jet Phase Eqs: Linearly interpolated from Stack Re Spillane Equations: V _{plune} ={(Va) _c ³ +0.12F _c](z-z _c) ² -(6.25D a = 0.16(z-z _c)	= 12.090 = 139.7 store intervals st.Ht to Top of Jet -z,y ²) ^{1/3} / a 10 foot intervals *a ² *A ²)))
Table of Plume Top-Hat Diameters (2a) and Plu Height (feet) above ground Stack.Rel.Ht = 100.0 105.0 110.0 Top of jet = 110.4 120.0 130.0 140.0 Spillane 5.3 m/s Height = 139.7 150.0 160.0 170.0 180.0 190.0 190.0 200.0	Ime-Averaged (meters) above stack 0.00 1.52 3.05 3.17 6.10 9.14 12.19 12.09 15.24 18.29 21.34 24.38 27.43 30.48	Vertical Vel Plume Radius(m) 0.254 0.376 0.498 0.508 0.776 1.264 1.264 1.751 1.735 2.239 2.727 3.214 3.702 4.190 4.678	ocities startii SingleStk VertVel(m/s) 51.34 39.00 26.66 25.67 10.53 6.83 5.26 5.30 4.42 3.90 3.55 3.29 3.09 2.94	ag at end of Plume Temp(K) 352.48 321.41 307.36 307.70 299.43 294.41 291.02 288.61 286.84 286.84	f jet phase:	or z(m/above stack) = z(ft/above ground) = Jet Phase Eqs: Linearly interpolated from Stack Re Spillane Equations: V _{plune} ={(Va) _c ³ +0.12F _c](z-z _c) ² -(6.25D a = 0.16(z-z _c)	= 12.090 = 139.7 5 foot Intervals I.H to Top of Jet D-2,) ²) ^{3/3} / a 10 foot Intervals *a ²⁺ A ²))) Max<5.30 m/s
Table of Plume Top-Hat Diameters (2a) and Plu Height (feet) above ground Stack.Rel.Ht = 100.0 105.0 110.0 Top of jet = 110.4 120.0 130.0 140.0 Spillane 5.3 m/s Height = 139.7 150.0 160.0 170.0 180.0 180.0 180.0 180.0 200.0 250.0	Ime-Averaged (meters) above stack 0.00 1.52 3.05 3.17 6.10 9.14 12.19 12.09 15.24 18.29 21.34 24.38 27.43 30.48 45.72	Vertical Vel Plume Radius(m) 0.254 0.376 0.498 0.508 0.776 1.264 1.751 1.735 2.239 2.727 3.214 3.702 4.190 4.678 7.116	ocities startir SingleStk VertVel(m/s) 51.34 39.00 26.66 25.67 10.53 6.83 5.26 5.30 4.42 3.90 3.55 3.29 3.09 3.09	352.48 321.41 307.36 307.70 299.43 294.41 291.02 288.61 288.64 285.49 281.94	f jet phase:	or z(m/above stack) = z(ft/above ground) = Jet Phase Eqs: Linearly interpolated from Stack Re Spillane Equations: V _{plune} ={(Va) _c ³ +0.12F _c](z-z _c) ² -(6.25D a = 0.16(z-z _c)	= 12.090 = 139.7 store intervals st.Ht to Top of Jet -z,y ²) ^{1/3} / a 10 foot intervals *a ² *A ²)))
Table of Plume Top-Hat Diameters (2a) and Plu Height (feet) above ground Stack.Rel.Ht = 100.0 105.0 110.0 Top of jet = 110.4 120.0 130.0 140.0 Spillane 5.3 m/s Height = 139.7 150.0 160.0 170.0 180.0 200.0 200.0 250.0 300.0	Ime-Averaged (meters) above stack 0.00 1.52 3.05 3.17 6.10 9.14 12.19 12.09 15.24 18.29 21.34 24.38 27.43 30.48 45.72 60.96	Vertical Vel Plume Radius(m) 0.254 0.376 0.498 0.508 0.776 1.264 1.751 1.735 2.239 2.727 3.214 3.702 4.190 4.678 7.116 9.554	ocities startir SingleStk VertVel(m/s) 51.34 39.00 26.66 25.67 10.53 6.83 5.26 5.30 4.42 3.90 3.55 3.29 2.94 2.94 2.20	g at end of Plume Temp(K) 352.48 321.41 307.36 307.70 299.43 294.41 291.02 288.61 286.84 281.94 281.94 281.94 281.94	f jet phase:	or z(m/above stack) = z(ft/above ground) = Jet Phase Eqs: Linearly interpolated from Stack Re Spillane Equations: V _{plune} ={(Va) _c ³ +0.12F _c](z-z _c) ² -(6.25D a = 0.16(z-z _c)	= 12.090 = 139.7 5 foot Intervals I.H to Top of Jet D-2,) ²) ^{3/3} / a 10 foot Intervals *a ²⁺ A ²))) Max<5.30 m/s
Table of Plume Top-Hat Diameters (2a) and Plu Height (feet) above ground Stack.Rel.Ht = 100.0 105.0 110.0 Top of jet = 110.4 120.0 130.0 140.0 Spillane 5.3 m/s Height = 139.7 150.0 160.0 170.0 180.0 190.0 250.0 300.0 350.0	Ime-Averaged (meters) above stack 0.00 1.52 3.05 3.17 6.10 9.14 12.19 12.09 15.24 18.29 21.34 24.38 27.43 30.48 45.72 60.96 76.20	Vertical Vel Plume Radius(m) 0.254 0.376 0.498 0.508 0.776 1.264 1.751 1.735 2.239 2.727 3.214 3.702 4.190 4.678 7.116 9.554 11.993	ocities startir SingleStk VertVel(m/s) 51.34 39.00 26.66 25.67 10.53 6.83 5.26 5.30 4.42 3.90 3.55 3.29 3.09 2.94 2.46 2.20 2.02	g at end of Plume Temp(K) 352.48 321.41 307.60 299.43 294.41 291.02 288.61 286.84 285.49 281.94 280.50 279.77	f jet phase:	or z(m/above stack) = z(ft/above ground) = Jet Phase Eqs: Linearly interpolated from Stack Re Spillane Equations: V _{plune} ={(Va) _c ³ +0.12F _c](z-z _c) ² -(6.25D a = 0.16(z-z _c)	= 12.090 = 139.7 5 foot Intervals I.H to Top of Jet D-2,) ²) ^{3/3} / a 10 foot Intervals *a ²⁺ A ²))) Max<5.30 m/s
Table of Plume Top-Hat Diameters (2a) and Plu Height (feet) above ground Stack.Rel.Ht = 100.0 105.0 110.0 Top of jet = 110.4 120.0 130.0 140.0 Spillane 5.3 m/s Height = 139.7 150.0 160.0 170.0 180.0 190.0 200.0 300.0 350.0 400.0	Ime-Averaged (meters) above stack 0.00 1.52 3.05 3.17 6.10 9.14 12.19 12.09 15.24 18.29 21.34 24.38 27.43 30.48 45.72 60.96 76.20 91.44	Vertical Vel Plume Radius(m) 0.254 0.376 0.498 0.508 0.776 1.264 1.755 2.239 2.727 3.214 3.702 4.190 4.678 7.116 9.554 11.993 14.431	ocities startir SingleStk VertVel(m/s) 51.34 39.00 26.66 25.67 10.53 6.83 5.26 5.30 4.42 3.90 4.42 3.90 3.55 3.29 3.09 2.94 2.46 2.20 2.02 1.90	g at end of Plume Temp(K) 352.48 321.41 307.36 307.70 299.43 294.41 291.02 288.61 286.84 281.94 281.94 281.94 281.94	f jet phase:	or z(m/above stack) = z(ft/above ground) = Jet Phase Eqs: Linearly interpolated from Stack Re Spillane Equations: V _{plune} ={(Va) _c ³ +0.12F _c](z-z _c) ² -(6.25D a = 0.16(z-z _c)	= 12.090 = 139.7 5 foot Intervals I.H to Top of Jet D-2,) ²) ^{3/3} / a 10 foot Intervals *a ²⁺ A ²))) Max<5.30 m/s
Table of Plume Top-Hat Diameters (2a) and Plu Height (feet) above ground Stack.Rel.Ht = 100.0 105.0 110.0 Top of jet = 110.4 120.0 130.0 140.0 Spillane 5.3 m/s Height = 139.7 150.0 160.0 170.0 180.0 190.0 250.0 300.0 350.0	Ime-Averaged (meters) above stack 0.00 1.52 3.05 3.17 6.10 9.14 12.19 12.09 15.24 18.29 21.34 24.38 27.43 30.48 45.72 60.96 76.20	Vertical Vel Plume Radius(m) 0.254 0.376 0.498 0.508 0.776 1.264 1.755 2.239 2.727 3.214 3.702 4.190 4.678 7.116 9.554 11.933 14.431 16.870	ocities startin SingleStk VertVel(m/s) 51.34 39.00 26.66 25.67 10.53 6.83 5.26 5.30 3.90 3.90 3.90 3.90 3.90 3.90 3.90 2.94 2.94 2.20 2.02 1.90 1.80	g at end of Plume Temp(K) 352.48 321.41 307.36 307.70 299.43 294.41 291.02 288.61 288.64 285.49 281.94 285.49 281.94 285.49 281.94 280.50 279.77 279.34	f jet phase:	or z(m/above stack) = z(ft/above ground) = Jet Phase Eqs: Linearly interpolated from Stack Re Spillane Equations: V _{plune} ={(Va) _c ³ +0.12F _c](z-z _c) ² -(6.25D a = 0.16(z-z _c)	= 12.090 = 139.7 5 foot Intervals I.H to Top of Jet D-2,) ²) ^{3/3} / a 10 foot Intervals *a ²⁺ A ²))) Max<5.30 m/s
Table of Plume Top-Hat Diameters (2a) and Plu Height (feet) above ground Stack.Rel.Ht = 100.0 105.0 110.0 Top of jet = 110.4 120.0 130.0 140.0 Spillane 5.3 m/s Height = 139.7 160.0 170.0 180.0 190.0 200.0 250.0 350.0 400.0 450.0	Ime-Averaged (meters) above stack 0.00 1.52 3.05 3.17 6.10 9.14 12.19 12.09 15.24 18.29 21.34 24.38 27.43 30.48 45.72 60.96 76.20 91.44 106.68	Vertical Vel Plume Radius(m) 0.254 0.376 0.498 0.508 0.776 1.264 1.751 1.735 2.239 2.727 3.214 3.702 4.190 4.678 7.116 9.554 11.993 14.431 16.870 19.308	ocities startir SingleStk VertVel(m/s) 51.34 39.00 26.66 25.67 10.53 6.83 5.26 5.30 4.42 3.90 3.55 3.29 3.09 2.94 2.46 2.20 2.02 1.90 1.80 1.80	g at end of Plume Temp(K) 352.48 321.41 307.36 307.70 299.43 294.41 291.02 288.61 288.64 285.49 281.94 285.49 281.94 285.50 279.77 279.34 279.77	f jet phase:	or z(m/above stack) = z(ft/above ground) = Jet Phase Eqs: Linearly interpolated from Stack Re Spillane Equations: V _{plune} ={(Va) _c ³ +0.12F _c](z-z _c) ² -(6.25D a = 0.16(z-z _c)	= 12.090 = 139.7 5 foot Intervals I.H to Top of Jet D-2,) ²) ^{3/3} / a 10 foot Intervals *a ²⁺ A ²))) Max<5.30 m/s
Table of Plume Top-Hat Diameters (2a) and Plu Height (feet) above ground Stack.Rel.Ht = 100.0 105.0 110.0 Top of jet = 110.4 120.0 130.0 140.0 Spillane 5.3 m/s Height = 139.7 150.0 160.0 170.0 180.0 190.0 250.0 300.0 400.0 50.0	Ime-Averaged (meters) above stack 0.00 1.52 3.05 3.17 6.10 9.14 12.19 12.29 15.24 18.29 21.34 24.38 27.43 30.48 45.72 60.96 76.20 91.44 106.68 121.92	Vertical Vel Plume Radius(m) 0.254 0.376 0.498 0.508 0.776 1.264 1.751 1.735 2.239 2.727 3.214 3.702 4.190 4.678 7.116 9.554 11.993 14.431 16.870 19.308	ocities startir SingleStk VertVel(m/s) 51.34 39.00 26.66 25.67 10.53 6.83 5.26 5.30 4.42 3.90 3.55 3.29 3.09 2.94 2.46 2.20 2.02 1.90 1.80 1.80	a at end of Plume Temp(K) 352.48 321.41 307.36 307.70 299.43 294.41 286.64 286.64 286.64 286.54 286.54 286.50 279.77 278.38	f jet phase:	or z(m/above stack) = z(ft/above ground) = Jet Phase Eqs: Linearly interpolated from Stack Re Spillane Equations: V _{plune} ={(Va) _c ³ +0.12F _c](z-z _c) ² -(6.25D a = 0.16(z-z _c)	= 12.090 = 139.7 5 foot Intervals I.H to Top of Jet D-2,) ²) ^{3/3} / a 10 foot Intervals *a ²⁺ A ²))) Max<5.30 m/s
Table of Plume Top-Hat Diameters (2a) and Plu Height (feet) above ground Stack.Rel.Ht = 100.0 105.0 110.0 Top of jet = 110.4 120.0 130.0 140.0 Spillane 5.3 m/s Height = 139.7 150.0 160.0 170.0 180.0	Ime-Averaged (meters) above stack 0.00 1.52 3.05 3.17 6.10 9.14 12.19 15.24 18.29 21.34 24.38 27.43 30.48 45.72 60.96 76.20 91.44 106.68 121.92 137.16	Vertical Vel Plume Radius(m) 0.254 0.376 0.498 0.508 0.776 1.264 1.751 1.735 2.239 2.727 3.214 3.702 4.190 4.678 7.116 9.554 11.993 14.431 16.870 19.308 21.746 26.623	ocities startir SingleStk VertVel(m/s) 51.34 39.00 26.66 25.67 10.53 6.83 5.26 5.30 4.42 3.90 3.55 3.29 2.94 2.94 2.94 2.94 2.20 2.02 1.90 1.80 1.71 1.65	352.48 321.41 307.36 307.70 299.43 294.41 291.02 288.61 288.61 288.64 285.49 281.94 280.50 279.77 279.34 279.77 279.34 279.77 278.89 278.76	f jet phase:	or z(m/above stack) = z(ft/above ground) = Jet Phase Eqs: Linearly interpolated from Stack Re Spillane Equations: V _{plune} ={(Va) _c ³ +0.12F _c](z-z _c) ² -(6.25D a = 0.16(z-z _c)	= 12.090 = 139.7 5 foot intervals st.Ht to Top of Jet 0 -2,) ²] ¹³ / a 10 foot intervals ra ² λ ²))) Max<5.30 m/s 50 foot intervals
Table of Plume Top-Hat Diameters (2a) and Plu Height (feet) above ground Stack.Rel.Ht = 100.0 105.0 110.0 Top of jet = 110.4 120.0 130.0 140.0 Spillane 5.3 m/s Height = 139.7 150.0 160.0 170.0 180.0 200.0 250.0 300.0 400.0 250.0 300.0 450.0 550.0 650.0	Ime-Averaged (meters) above stack 0.00 1.52 3.05 3.17 6.10 9.14 12.19 12.09 15.24 18.29 21.34 27.43 30.48 27.43 30.48 45.72 60.96 76.20 91.44 106.68 121.92 137.16 167.64	Vertical Vel Plume Radius(m) 0.254 0.376 0.498 0.508 0.776 1.264 1.751 1.735 2.239 2.727 3.214 3.702 4.190 4.678 7.116 9.554 11.993 14.431 16.870 19.308 21.746 26.623	ocities startir SingleStk VertVel(m/s) 51.34 39.00 26.66 25.67 10.53 6.83 5.26 5.30 4.42 3.90 3.55 3.29 2.94 2.46 2.20 2.02 1.90 1.80 1.71 1.65 1.54	g at end of Plume Temp(K) 352.48 321.41 307.36 307.70 299.43 294.41 291.02 288.61 286.84 281.94 281.94 280.50 279.77 279.34 279.34 279.77 278.88	f jet phase:	or z(m/above stack) = z(ft/above ground) = Jet Phase Eqs: Linearly interpolated from Stack Re Spillane Equations: V _{plune} ={(Va) _c ³ +0.12F _c](z-z _c) ² -(6.25D a = 0.16(z-z _c)	= 12.090 = 139.7 5 foot intervals st.Ht to Top of Jet 0 -2,) ²] ¹³ / a 10 foot intervals ra ² λ ²))) Max<5.30 m/s 50 foot intervals
Table of Plume Top-Hat Diameters (2a) and Plu Height (feet) above ground Stack.Rel.Ht = 100.0 105.0 110.0 Top of jet = 110.4 120.0 130.0 140.0 Spillane 5.3 m/s Height = 139.7 150.0 160.0 170.0 180.0 190.0 250.0 300.0 550.0 550.0 550.0 650.0 750.0	Ime-Averaged (meters) above stack 0.00 1.52 3.05 3.17 6.10 9.14 12.19 15.24 18.29 21.34 24.38 27.43 30.48 45.72 60.96 76.20 91.44 106.68 121.92 137.16 167.64 198.12	Vertical Vel Plume Radius(m) 0.254 0.376 0.498 0.508 0.776 1.264 1.751 1.735 2.239 2.727 3.214 3.702 4.190 4.678 7.116 9.554 11.993 14.431 16.870 19.308 21.746 26.623 31.500	ocities startir SingleStk VertVel(m/s) 51.34 39.00 26.66 25.67 10.53 6.83 5.26 5.30 4.42 3.90 4.42 3.90 2.94 2.46 2.20 2.02 1.90 1.80 1.71 1.65 1.54 1.45	g at end of Plume Temp(K) 352.48 321.41 307.36 299.43 294.41 291.02 288.61 288.61 286.84 285.49 281.94 285.49 281.94 285.49 281.94 285.49 283.48 279.07 278.38 278.76 278.58 278.48	f jet phase:	or z(m/above stack) = z(ft/above ground) = Jet Phase Eqs: Linearly interpolated from Stack Re Spillane Equations: V _{plune} ={(Va) _c ³ +0.12F _c](z-z _c) ² -(6.25D a = 0.16(z-z _c)	= 12.090 = 139.7 5 foot intervals st.Ht to Top of Jet 0 -2,) ²] ¹³ / a 10 foot intervals ra ² λ ²))) Max<5.30 m/s 50 foot intervals
Table of Plume Top-Hat Diameters (2a) and Plu Height (feet) above ground Stack.Rel.Ht = 100.0 105.0 110.0 Top of jet = 110.4 120.0 130.0 140.0 Spillane 5.3 m/s Height = 139.7 150.0 160.0 170.0 180.0 190.0 250.0 300.0 350.0 400.0 550.0 500.0	Ime-Averaged (meters) above stack 0.00 1.52 3.05 3.17 6.10 9.14 12.19 12.09 15.24 18.29 21.34 24.38 27.43 30.48 45.72 60.96 76.20 91.44 106.68 121.92 137.16 167.64 198.12 228.60	Vertical Vel Plume Radius(m) 0.254 0.376 0.498 0.508 0.776 1.264 1.751 1.735 2.239 2.727 3.214 3.702 4.190 4.678 7.116 9.554 11.993 14.431 16.870 19.308 21.746 26.623 31.500 36.377 41.254	ocities startii SingleStk VertVel(m/s) 51.34 39.00 26.66 25.67 10.53 6.83 5.26 5.30 4.42 3.90 3.55 3.29 3.09 2.94 2.46 2.20 2.02 2.02 1.90 1.80 1.71 1.65 1.54 4.45 3.15 3.29 3.09 2.94 2.94 2.46 2.20 2.02 2.02 1.90 1.80 1.80 1.71 1.80 1.80 1.71 1.80 1.80 1.71 1.80 1.80 1.80 1.80 1.80 1.80 1.80 1.8	g at end of Plume Temp(K) 352.48 321.41 307.36 307.70 299.43 294.41 286.64 286.64 286.549 281.94 280.50 279.77 279.34 280.50 279.77 279.34 278.07 278.89 278.78 278.89 278.78 278.78 278.89 278.76 279.77 279.34 279.77 279.34 279.77 279.34 279.77 279.34 279.77 279.34 279.77 279.34 279.77 279.34 279.77 279.34 279.77 279.34 279.77 279.34 279.77 279.34 279.77 279.34 279.77 279.34 279.77 279.34 279.77 279.34 279.77 279.34 279.77 279.34 278.89 278.76 278.76 278.89 278.76 278.89 278.76 278.89 278.76 278.89 278.76 278.89 278.76 278.76 278.89 278.76 278	f jet phase:	or z(m/above stack) = z(ft/above ground) = Jet Phase Eqs: Linearly interpolated from Stack Re Spillane Equations: V _{plune} ={(Va) _c ³ +0.12F _c](z-z _c) ² -(6.25D a = 0.16(z-z _c)	= 12.090 = 139.7 5 foot intervals st.Ht to Top of Jet 0 -2,) ²] ¹³ / a 10 foot intervals ra ² λ ²))) Max<5.30 m/s 50 foot intervals
Table of Plume Top-Hat Diameters (2a) and Plu Height (feet) above ground Stack.Rel.Ht = 100.0 105.0 110.0 Top of jet = 110.4 120.0 130.0 140.0 Spillane 5.3 m/s Height = 139.7 150.0 160.0 170.0 180.0 180.0 190.0 200.0 250.0 300.0 450.0 550.0 650.0 650.0 650.0 650.0 650.0 650.0 650.0 650.0	Ime-Averaged (meters) above stack 0.00 1.52 3.05 3.17 6.10 9.14 12.19 12.09 15.24 18.29 21.34 24.38 27.43 30.48 45.72 60.96 76.20 91.44 106.68 121.92 137.16 167.64 198.12 228.60 259.08	Vertical Vel Plume Radius(m) 0.254 0.376 0.498 0.508 0.776 1.264 1.751 1.735 2.239 2.727 3.214 3.702 4.190 4.678 7.116 9.554 11.993 14.431 16.870 19.308 21.746 26.623 31.500 36.377 41.254	ocities startir SingleStk VertVel(m/s) 51.34 39.00 26.66 25.67 10.53 6.83 5.26 5.30 4.42 3.90 3.55 3.29 3.09 2.94 2.46 2.20 2.02 2.02 2.02 2.04 1.90 1.80 1.71 1.65 1.54 1.45 1.38 1.33 1.28	a stend of Plume Temp(K) 352.48 321.41 307.36 307.70 299.43 294.41 294.41 298.61 288.61 288.64 288.64 288.99 281.94 280.50 279.77 279.34 279.34 279.36 278.58 278.48 278.48 278.41 278.56	f jet phase:	or z(m/above stack) = z(ft/above ground) = Jet Phase Eqs: Linearly interpolated from Stack Re Spillane Equations: V _{plune} ={(Va) _c ³ +0.12F _c](z-z _c) ² -(6.25D a = 0.16(z-z _c)	= 12.090 = 139.7 5 foot intervals st.Ht to Top of Jet 0 -2,) ²] ¹³ / a 10 foot intervals ra ² λ ²))) Max<5.30 m/s 50 foot intervals
Table of Plume Top-Hat Diameters (2a) and Plu Height (feet) above ground Stack.Rel.Ht = 100.0 105.0 110.0 Top of jet = 110.4 120.0 130.0 140.0 Spillane 5.3 m/s Height = 139.7 150.0 160.0 170.0 180.0 200.0 250.0 300.0 450.0 550.0 350.0 650.0 650.0 650.0 650.0 650.0 650.0 950.0 1050.0	Ime-Averaged (meters) above stack 0.00 1.52 3.05 3.17 6.10 9.14 12.19 15.24 18.29 21.34 24.38 27.43 30.48 45.72 60.96 76.20 91.44 106.68 121.92 137.16 167.64 198.12 228.60 259.08 289.56	Vertical Vel Plume Radius(m) 0.254 0.376 0.498 0.508 0.776 1.264 1.264 1.264 2.239 2.727 3.214 3.702 4.190 4.678 7.116 9.554 11.993 14.431 16.870 19.308 21.746 26.623 31.500 36.377 41.254	ocities startir SingleStk VertVel(m/s) 51.34 39.00 26.66 25.67 10.53 6.83 5.26 5.30 4.42 3.90 3.09 2.94 2.46 2.20 2.02 1.90 1.80 1.80 1.71 1.65 1.54 1.45 1.38 1.33 1.28	a stend of Plume Temp(K) 352.48 321.41 307.36 307.70 299.43 294.41 280.50 279.43 284.84 285.49 281.94 280.50 279.77 279.34 279.07 278.89 278.76 278.58 278.48 278.48 278.48 278.48 278.48 278.48 278.48 278.48 278.48	f jet phase:	or z(m/above stack) = z(ft/above ground) = Jet Phase Eqs: Linearly interpolated from Stack Re Spillane Equations: V _{plune} ={(Va) _c ³ +0.12F _c](z-z _c) ² -(6.25D a = 0.16(z-z _c)	= 12.090 = 139.7 5 foot intervals st.Ht to Top of Jet 0 -2,) ²] ¹³ / a 10 foot intervals ra ² λ ²))) Max<5.30 m/s 50 foot intervals
Table of Plume Top-Hat Diameters (2a) and Plu Height (feet) above ground Stack.Rel.Ht = 100.0 105.0 110.0 Top of jet = 110.4 120.0 130.0 140.0 Spillane 5.3 m/s Height = 139.7 150.0 160.0 170.0 180.0 180.0 200.0 250.0 300.0 450.0 550.0 650.0 550.0 650.0 750.0 850.0 950.0 105.0 1150.0	Ime-Averaged (meters) above stack 0.00 1.52 3.05 3.17 6.10 9.14 12.19 15.24 18.29 21.34 24.38 27.43 30.48 45.72 60.96 76.20 91.44 106.68 121.92 137.16 167.64 198.12 228.60 259.08 289.56 320.04	Vertical Vel Plume Radius(m) 0.254 0.376 0.498 0.508 0.776 1.264 1.264 1.264 2.239 2.727 3.214 3.702 4.190 4.678 7.116 9.554 11.993 14.431 16.870 19.308 21.746 26.623 31.500 36.377 41.254	ocities startir SingleStk VertVel(m/s) 51.34 39.00 26.66 25.67 10.53 6.83 5.26 5.30 4.42 3.90 3.55 3.29 2.94 2.246 2.20 2.02 2.02 1.90 1.80 1.71 1.65 1.54 1.45 1.38 1.33 1.28 1.24	g at end of Plume Temp(K) 352.48 321.41 307.36 307.70 299.43 294.41 291.02 288.61 288.61 288.64 285.49 281.94 280.50 279.77 279.34 279.34 279.36 278.76 278.89 278.76 278.88 278.48 278.41 278.30	f jet phase:	or z(m/above stack) = z(ft/above ground) = Jet Phase Eqs: Linearly interpolated from Stack Re Spillane Equations: V _{plune} ={(Va) _c ³ +0.12F _c](z-z _c) ² -(6.25D a = 0.16(z-z _c)	= 12.090 = 139.7 5 foot intervals st.Ht to Top of Jet 0 -2,) ²] ¹³ / a 10 foot intervals ra ² λ ²))) Max<5.30 m/s 50 foot intervals
Table of Plume Top-Hat Diameters (2a) and Plu Height (feet) above ground Stack.Rel.Ht = 100.0 105.0 110.0 Top of jet = 110.4 120.0 130.0 140.0 Spillane 5.3 m/s Height = 139.7 150.0 160.0 170.0 180.0 200.0 250.0 300.0 250.0 300.0 250.0 300.0 250.0 300.0 250.0 300.0 250.0 300.0 250.0 300.0 250.0 300.0 250.0 300.0 250.0 300.0 250.0 300.0 250.0 300.0 250.0 300.0 350.0 400.0 550.0 650.0	Ime-Averaged (meters) above stack 0.00 1.52 3.05 3.17 6.10 9.14 12.19 12.29 15.24 18.29 21.34 27.43 30.48 27.43 30.48 45.72 60.96 76.20 91.44 106.68 121.92 137.16 167.64 198.12 228.60 259.08 229.56 320.04 350.52	Vertical Vel Plume Radius(m) 0.254 0.376 0.498 0.508 0.776 1.264 1.751 1.735 2.239 2.727 3.214 3.702 4.190 4.678 7.116 9.554 11.993 14.431 16.870 19.308 21.746 26.623 31.500 36.377 41.254 46.130 51.007 55.884	ocities startir SingleStk VertVel(m/s) 51.34 39.00 26.66 25.67 10.53 6.83 5.26 5.30 4.42 3.90 3.55 3.29 2.94 2.94 2.46 2.20 2.02 1.90 1.80 1.71 1.65 1.54 1.45 1.38 1.28 1.24 1.20	g at end of Plume Temp(K) 352.48 321.41 307.36 307.70 299.43 294.41 291.02 288.61 288.64 288.64 281.94 280.50 279.77 279.34 279.34 279.07 278.89 278.76 278.88 278.48 278.48 278.44 278.49 278.30 278.28	f jet phase:	or z(m/above stack) = z(ft/above ground) = Jet Phase Eqs: Linearly interpolated from Stack Re Spillane Equations: V _{plune} ={(Va) _c ³ +0.12F _c](z-z _c) ² -(6.25D a = 0.16(z-z _c)	= 12.090 = 139.7 5 foot intervals st.Ht to Top of Jet 0 -2,) ²] ¹³ / a 10 foot intervals ra ² λ ²))) Max<5.30 m/s 50 foot intervals
Table of Plume Top-Hat Diameters (2a) and Plu Height (feet) above ground Stack.Rel.Ht = 100.0 105.0 110.0 Top of jet = 110.4 120.0 130.0 140.0 Spillane 5.3 m/s Height = 139.7 150.0 160.0 170.0 180.0 200.0 250.0 300.0 350.0 650.0 750.0 850.0 950.0 150.0 150.0	Ime-Averaged (meters) above stack 0.00 1.52 3.05 3.17 6.10 9.14 12.19 12.09 15.24 18.29 21.34 24.38 27.43 30.48 45.72 60.96 76.20 91.44 106.68 121.92 137.16 167.64 198.12 228.60 259.08 289.56 320.04 350.52 381.00	Vertical Vel Plume Radius(m) 0.254 0.376 0.498 0.508 0.776 1.264 1.751 1.735 2.239 2.727 3.214 3.702 4.190 4.678 7.116 9.554 11.993 14.431 16.870 19.308 21.746 26.623 31.500 36.377 41.254 46.130 55.884 60.761	ocities startir SingleStk VertVel(m/s) 51.34 39.00 26.66 25.67 10.53 6.83 5.26 5.30 4.42 3.90 4.42 3.90 2.94 2.94 2.20 2.02 1.90 1.80 1.71 1.65 1.54 1.45 1.38 1.28 1.28 1.20 1.20 1.71	g at end of Plume Temp(K) 352.48 321.41 307.36 299.43 294.41 291.02 288.61 288.61 288.61 288.64 281.94 281.94 281.94 281.94 281.94 285.99 278.76 278.38 278.36 278.38 278.36 278.32 278.30 278.28	f jet phase:	or z(m/above stack) = z(ft/above ground) = Jet Phase Eqs: Linearly interpolated from Stack Re Spillane Equations: V _{plune} ={(Va) _c ³ +0.12F _c](z-z _c) ² -(6.25D a = 0.16(z-z _c)	= 12.090 = 139.7 5 foot intervals st.Ht to Top of Jet 0 -2,) ²] ¹³ / a 10 foot intervals ra ² λ ²))) Max<5.30 m/s 50 foot intervals
Table of Plume Top-Hat Diameters (2a) and Plu Height (feet) above ground Stack.Rel.Ht = 100.0 105.0 110.0 Top of jet = 110.4 120.0 130.0 140.0 Spillane 5.3 m/s Height = 139.7 150.0 160.0 170.0 180.0 190.0 200.0 190.0 200.0 190.0 200.0 190.0 200.0 190.0 200.0 200.0 190.0 200.0 190.0 200.0 190.0 200.0 200.0 200.0 200.0 190.0 200.0 300.0 350.0 400.0 450.0 550.0 650.0 750.0 850.0 950.0 1050.0 150.0	Ime-Averaged (meters) above stack 0.00 1.52 3.05 3.17 6.10 9.14 12.19 12.09 15.24 18.29 21.34 24.38 27.43 30.48 45.72 60.96 76.20 91.44 106.68 121.92 137.16 167.64 198.12 228.60 259.08 229.04 320.04 330.52 381.00 411.48	Vertical Vel Plume Radius(m) 0.254 0.376 0.498 0.508 0.776 1.264 1.751 1.735 2.239 2.727 3.214 3.702 4.190 4.678 7.116 9.554 11.993 14.431 16.870 19.308 21.746 26.623 31.500 36.377 41.254 46.130 51.007 55.884 60.761 65.638	ocities startir SingleStk VertVel(m/s) 51.34 39.00 26.66 25.67 10.53 6.83 5.26 5.30 4.42 3.90 3.55 3.29 3.09 2.94 2.46 2.20 2.02 2.02 1.90 1.80 1.71 1.65 1.54 1.45 1.54 1.45 1.58 1.33 1.28 1.24 1.24 1.24	g at end of Plume Temp(K) 352.48 321.41 307.60 299.43 294.41 291.02 288.61 286.84 280.50 279.77 279.34 280.50 279.77 279.34 289.27 278.89 278.68 278.48 278.48 278.30 278.28 278.32 278.30 278.28	f jet phase:	or z(m/above stack) = z(ft/above ground) = Jet Phase Eqs: Linearly interpolated from Stack Re Spillane Equations: V _{plune} ={(Va) _c ³ +0.12F _c](z-z _c) ² -(6.25D a = 0.16(z-z _c)	= 12.090 = 139.7 5 foot intervals st.Ht to Top of Jet 0 -2,) ²] ¹³ / a 10 foot intervals ra ² λ ²))) Max<5.30 m/s 50 foot intervals
Table of Plume Top-Hat Diameters (2a) and Plu Height (feet) above ground Stack.Rel.Ht = 100.0 105.0 110.0 Top of jet = 110.4 120.0 130.0 140.0 Spillane 5.3 m/s Height = 139.7 150.0 160.0 170.0 180.0 190.0 200.0 250.0 300.0 450.0 550.0 650.0 750.0 105.0 1150.0 1150.0 1150.0 1150.0 1150.0 1150.0	Ime-Averaged (meters) above stack 0.00 1.52 3.05 3.17 6.10 9.14 12.19 12.09 15.24 18.29 21.34 24.38 27.43 30.48 45.72 60.96 76.20 91.44 106.68 121.92 137.16 167.64 198.12 228.60 259.08 229.56 320.04 411.48 441.96	Vertical Vel Plume Radius(m) 0.254 0.376 0.498 0.508 0.776 1.264 1.751 1.735 2.239 2.727 3.214 3.702 4.190 4.678 7.116 9.554 11.993 14.431 16.870 19.308 21.746 26.623 31.500 36.377 41.254 46.130 51.007 55.884 60.761 65.638 70.514 75.391	ocities startir SingleStk VertVel(m/s) 51.34 39.00 26.66 25.67 10.53 6.83 5.26 5.30 4.42 3.90 3.55 3.29 3.09 2.94 2.46 2.20 2.02 2.02 2.02 2.04 1.90 1.80 1.71 1.65 1.54 1.45 1.38 1.28 1.28 1.28 1.28 1.24 1.20 1.14 1.11	a stend of Plume Temp(K) 352.48 321.41 307.36 307.70 299.43 294.41 299.43 294.41 298.61 288.61 288.61 288.64 285.49 281.94 288.65 278.34 279.77 279.34 279.77 279.34 279.77 279.34 278.58 278.48 278.48 278.48 278.30 278.28 278.30 278.28 278.24	f jet phase:	or z(m/above stack) = z(ft/above ground) = Jet Phase Eqs: Linearly interpolated from Stack Re Spillane Equations: V _{plune} ={(Va) _c ³ +0.12F _c](z-z _c) ² -(6.25D a = 0.16(z-z _c)	= 12.090 = 139.7 5 foot intervals st.Ht to Top of Jet 0 -2,) ²] ¹³ / a 10 foot intervals ra ² λ ²))) Max<5.30 m/s 50 foot intervals
Table of Plume Top-Hat Diameters (2a) and Plu Height (feet) above ground Stack.Rel.Ht = 100.0 105.0 110.0 Top of jet = 110.4 120.0 130.0 140.0 Spillane 5.3 m/s Height = 139.7 150.0 160.0 170.0 180.0 200.0 250.0 300.0 250.0 300.0 250.0 300.0 250.0 300.0 250.0 300.0 250.0 300.0 250.0 300.0 250.0 300.0 250.0 300.0 250.0 300.0 250.0 300.0 250.0 300.0 250.0 300.0 250.0 300.0 250.0 350.0	Ime-Averaged (meters) above stack 0.00 1.52 3.05 3.17 6.10 9.14 12.19 12.09 15.24 18.29 21.34 24.38 27.43 30.48 45.72 60.96 76.20 91.44 106.68 121.92 137.16 167.64 198.12 228.60 259.08 229.56 320.04 350.52 381.00 411.48 441.96 472.44 502.92 533.40	Vertical Vel Plume Radius(m) 0.254 0.376 0.498 0.508 0.776 1.264 1.264 1.264 1.264 1.264 1.263 2.239 2.727 3.214 3.702 4.190 4.678 7.116 9.554 11.993 14.431 16.870 19.308 21.746 26.623 31.500 36.377 41.254 46.130 51.007 55.884 60.761 65.638 70.514 75.391 80.268 85.145	ocities startir SingleStk VertVel(m/s) 51.34 39.00 26.66 25.67 10.53 6.83 5.26 5.30 4.42 3.90 2.94 2.46 2.20 2.02 1.90 1.80 1.80 1.71 1.65 1.54 1.45 1.54 1.45 1.38 1.33 1.28 1.24 1.20 1.17 1.14 1.11 1.08	g at end of Plume Temp(K) 352.48 321.41 307.36 307.70 299.43 294.41 291.02 288.61 288.61 288.64 285.49 281.94 280.50 279.37 279.34 279.34 279.37 279.34 279.34 279.36 278.76 278.89 278.76 278.89 278.76 278.89 278.76 278.89 278.76 278.82 278.30 278.26 278.22 278.21	f jet phase:	or z(m/above stack) = z(ft/above ground) = Jet Phase Eqs: Linearly interpolated from Stack Re Spillane Equations: V _{plune} ={(Va) _c ³ +0.12F _c](z-z _c) ² -(6.25D a = 0.16(z-z _c)	= 12.090 = 139.7 5 foot intervals st.Ht to Top of Jet 0 -2,) ²] ¹³ / a 10 foot intervals ra ² λ ²))) Max<5.30 m/s 50 foot intervals
Table of Plume Top-Hat Diameters (2a) and Plu Height (feet) above ground Stack.Rel.Ht = 100.0 105.0 110.0 Top of jet = 110.4 120.0 130.0 140.0 Spillane 5.3 m/s Height = 139.7 150.0 160.0 170.0 180.0 250.0 300.0 250.0 300.0 250.0 300.0 250.0 300.0 250.0 300.0 250.0 300.0 250.0 300.0 250.0 300.0 250.0 300.0 250.0 300.0 250.0 300.0 250.0 300.0 250.0 300.0 250.0 300.0 250.0 300.0 350.0 150.0 150.0	Ime-Averaged (meters) above stack 0.00 1.52 3.05 3.17 6.10 9.14 12.19 12.09 15.24 18.29 21.34 24.38 27.43 30.48 45.72 60.96 76.20 91.44 106.68 121.92 137.16 167.64 198.12 228.60 259.08 289.56 320.04 350.52 381.00 411.48 441.96	Vertical Vel Plume Radius(m) 0.254 0.376 0.498 0.508 0.776 1.264 1.751 1.735 2.239 2.727 3.214 3.702 4.190 4.678 7.116 9.554 11.993 14.431 16.870 19.308 21.746 26.623 31.500 36.377 41.254 46.130 51.007 55.884 60.761 65.638 70.514 65.638 70.514 85.145 90.022	ocities startir SingleStk VertVel(m/s) 51.34 39.00 26.66 25.67 10.53 6.83 5.26 5.30 4.42 3.90 2.94 2.94 2.94 2.94 2.94 2.94 2.94 2.94	g at end of Plume Temp(K) 352.48 321.41 307.36 299.43 294.41 291.02 288.61 288.61 288.61 288.64 281.94 281.94 281.94 281.94 285.49 281.94 285.49 281.94 278.76 278.36 278.76 278.38 278.48 278.41 278.36 278.26 278.26 278.26 278.22 278.21 278.24 278.23	f jet phase:	or z(m/above stack) = z(ft/above ground) = Jet Phase Eqs: Linearly interpolated from Stack Re Spillane Equations: V _{plune} ={(Va) _c ³ +0.12F _c](z-z _c) ² -(6.25D a = 0.16(z-z _c)	= 12.090 = 139.7 5 foot intervals st.Ht to Top of Jet 0 -2,) ²] ¹³ / a 10 foot intervals ra ² λ ²))) Max<5.30 m/s 50 foot intervals
Table of Plume Top-Hat Diameters (2a) and Plu Height (feet) above ground Stack.Rel.Ht = 100.0 105.0 110.0 Top of jet = 110.4 120.0 130.0 140.0 Spillane 5.3 m/s Height = 139.7 150.0 160.0 170.0 180.0 200.0 250.0 300.0 250.0 300.0 250.0 300.0 250.0 300.0 250.0 300.0 250.0 300.0 250.0 300.0 250.0 300.0 250.0 300.0 250.0 300.0 250.0 300.0 250.0 300.0 250.0 300.0 250.0 300.0 250.0 350.0	Ime-Averaged (meters) above stack 0.00 1.52 3.05 3.17 6.10 9.14 12.19 12.29 15.24 18.29 21.34 24.38 27.43 30.48 45.72 60.96 76.20 91.44 106.68 121.92 137.16 167.64 198.12 228.60 259.08 289.56 320.04 411.48 441.96 472.44 502.52 381.00 411.48 441.96 472.44 502.92 533.40 533.40 563.88 594.36	Vertical Vel Plume Radius(m) 0.254 0.376 0.498 0.508 0.776 1.264 1.751 1.735 2.239 2.727 3.214 3.702 4.190 4.678 7.116 9.554 11.993 14.431 16.870 19.308 21.746 26.623 31.500 36.377 41.254 46.130 55.884 60.761 65.638 70.514 75.391 80.268 85.145 90.022 94.898	ocities startir SingleStk VertVel(m/s) 51.34 39.00 26.66 25.67 10.53 6.83 5.26 5.30 4.42 3.90 3.55 3.29 3.09 2.94 2.46 2.20 2.02 2.02 1.90 1.80 1.71 1.65 1.54 1.45 1.54 1.45 1.58 1.33 1.28 1.34 1.33 1.28 1.33 1.28 1.33 1.28 1.33 1.28 1.33 1.28 1.33 1.28 1.33 1.28 1.33 1.28 1.33 1.28 1.33 1.28 1.34 1.33 1.28 1.34 1.33	g at end of Plume Temp(K) 352.48 321.41 307.36 307.70 299.43 294.41 299.43 294.41 299.43 294.41 298.61 288.61 288.61 288.64 286.50 278.74 279.34 278.36 278.58 278.48 278.48 278.48 278.30 278.27 278.28 278.29 278.22 278.29 278.22 278.21 278.22 278.21 278.22 278.21 278.22 278.21 278.22 278.21 278.22 278.21 278.22 278.21 278.22 278.21 278.22 278.21 278.22 278.21 278.22 278.21 278.	f jet phase:	or z(m/above stack) = z(ft/above ground) = Jet Phase Eqs: Linearly interpolated from Stack Re Spillane Equations: V _{plune} ={(Va) _c ³ +0.12F _c](z-z _c) ² -(6.25D a = 0.16(z-z _c)	= 12.090 = 139.7 5 foot intervals st.Ht to Top of Jet 0 -2,) ²] ¹³ / a 10 foot intervals ra ² λ ²))) Max<5.30 m/s 50 foot intervals

SINGLE Plume Average Vertical Velocities for SVY03A Large Emer.Gen Engine, 100% Load, and Maximum Stack Height - Winter Min*

*Winter Min = Monthly Mean of Minimum Daily Temperatures for 1971-2000 (Lowest in December)

NOAA Sources: Climatography of the United States No.81 "Monthly Station Normals of Temperatures, Precipitation, and Heating and Cooling Degree Days, 1971-2000 California" and Climatography of the United States No. 20 "Monthly Station Climate Summaries, 1971-2000 California"

SINGLE Plume Average Vertical Velocities for	Single SVY03. "Aviation Sat	-	-			ack Height - Summer Max*	
		-				Various Heights in the Plume	9
			•	•		d, Australia ," Dr. K.T. Spillar	
Ambient Conditions:						neutral conditions (d0/dz=0 or	
Ambient Potential Temp θ _a	302.21	Kelvins	84.3			18 meters/feet	u 0,
Plume Exit Conditions:					Gravity g 9.8	31 m/s ²	
Maximum Stack Height h	30.48	meters	100	feet-inches	λ 1.1	11	
Stack Diameter D	0.5080	meters	20	inches	λ _o ~1	.0	
Stack Velocity V _{exil}	51.34	m/s	168.45	ft/sec			
Volumetric Flow		cu.m/sec	22,050		πV _{exit} D²/4		Sect.2/¶1
Stack Potential Temp θ _e		Kelvins	896	°F	2		
Initial Stack Buoyancy Flux F					• • • • • • •	Vol.Flow(g/ π)(1- θ_a/θ_s)	Sect.2/¶1
Plume Buoyancy Flux F		m ⁴ /s ³		4 000	• • • •	V, θ_p at plume height (see below 0.25)	ow)
No.of Stacks N	1			1.000	Multiple Stack Multip	lication Factor (No.20)	
Conditions at End (Top) of Jet Phase:							
Height above Stack z _{iel}	3 175	meters*	10.4	feet*	z = 6 25D meters*	=meters above stack top	Sect.3/¶1
Height above Ground z _{iet} +h _s		meters	110.4		zjet 0.202, motoro		"
Vertical Velocity V _{iel}				ft/sec	V _{jet} = 0.5V _{exit} = V _{exit} /2		
Plume Top-Hat Diameter 2a _{ie}		meters		feet	2a _{iet} = 2D	Conservation of momentum	n "
					<u>jor</u>		
Spillane Methodology - Analytical Solutions for	r Calm Condit	ions for Plur	ne Heights ab	ove Jet Ph	ase		
Single Plume-averaged Vertical Velocity V			-			ions below:	
Plume Top-Hat Radius a	5	Solutions in	Table Below		0.16(z-z _v), or linear i	ncrease with height	Sect.2/Eq.6
Virtual Source Height z	1.164	meters*	3.8	feet*	$6.25D[1-(\theta_e/\theta_s)^{1/2}], m$	eters*=meters above stack top	Sect.2/Eq.6
Height above Ground z _v +h _s	31.644	meters	103.8	feet		where $(\theta_a/\theta_s)^{1/2} = (\theta_e/\theta_s)^{1/2}$	= 0.6335
Vertical Velocity V		Solutions in	Table Below			z _v) ² - (6.25D-z _v) ²]} ^(1/3) / a	Sect.2.1(6)
Product (Va)	8.260	m²/s			$V_{exit}D/2(\theta_e/\theta_s)^{1/2}$		
Solve for plume-averaged vertical vel					meters above groun	d (z'+h _s)	
Gives the following Height above Stack z		meters*	100.0				
Plume Top-Hat Diameter 2a		meters	30.8		2a'=2*0.16(z'-z _v)	0 (10)	Sect.2/Eq.6
Vertical Velocity V	2.917	m/s	9.57	ft/sec	V={(Va) _o ³ +0.12F _o [(z·	z _v) ² -(6.25D-z _v) ²]} ^(1/3) /(2a'/2)	Sect.2/Eq.6
						• // · · ·	
Solve for Height of CASC critical vertical			-	-	Solve for y=(7,7) or		VV > Top of Jet (Spillane)
Find Height above Stack z _{cri}		meters	40.4			nultaneously in both eqs. (i.e.,	
Height above Ground z _{crit} +h _s	42.788	meters	140.4	leet		the cubic equation ax^3+bx^2+cx	
Interpolated Height of critical vertical v	alocity in let P	haco.				$(0, \text{ and } b = -(0.12F_0)/(4.3^30.16^3)$	
Find Height above Stack z _{cri}	-	meters	#N/A	foot	and d=[0.12F	(6.25D-z _v) ² -(Va)₀ ³]/(4.3 ³ 0.16 ³)	= -908.09 p://www.1728.org/cubic.htm
•		meters	#IN/A	ieel		ing	
	#NI/A	motore	#NI/A	foot		i_{1} is the real solution $x = 7.7$	- 11 1446
Height above Ground z _{crit} +h _s	#N/A	meters	#N/A	feet	ę	gives the real solution $x = z - zv$	
Height above Ground Z _{orit} +h _s	#N/A	meters	#N/A	feet	S	or z(m/above stack)	= 12.308
							= 12.308
Height above Ground 2 _{crit} +h _s Table of Plume Top-Hat Diameters (2a) and Pl Height (feet)			ocities startir		f jet phase:	or z(m/above stack)	= 12.308
Table of Plume Top-Hat Diameters (2a) and Pl	ume-Averaged (meters)	l Vertical Vel Plume	ocities startir	ng at end of	f jet phase:	or z(m/above stack)	= 12.308
Table of Plume Top-Hat Diameters (2a) and Pl Height (feet)	ume-Averaged (meters)	l Vertical Vel Plume	ocities startir SingleStk VertVel(m/s)	ig at end of Plume	f jet phase:	or z(m/above stack)	= 12.308
Table of Plume Top-Hat Diameters (2a) and Pl Height (feet) above ground	ume-Averaged (meters) above stack <i>0.00</i>	l Vertical Vel Plume Radius(m) 0.254	ocities startir SingleStk VertVel(m/s) 51.34	ig at end of Plume	f jet phase:	or z(m/above stack)	= 12.308
Table of Plume Top-Hat Diameters (2a) and Pl Height (feet) above ground <u>Stack.Rel.Ht = 100.0</u>	ume-Averaged (meters) above stack <u>0.00</u> 1.52	l Vertical Vel Plume Radius(m) 0.254 0.376	ocities startir SingleStk VertVel(m/s) <mark>51.34</mark> 39.00	ig at end of Plume	f jet phase:	or z(m/above stack) z(ft/above ground)	= 12.308 = 140.4 5 foot intervals
Table of Plume Top-Hat Diameters (2a) and Pl Height (feet) above ground <u>Stack.Rel.Ht = 100.0</u> 105.0	ume-Averaged (meters) above stack <u>0.00</u> 1.52	l Vertical Vel Plume Radius(m) 0.254 0.376	ocities startir SingleStk VertVel(m/s) 51.34 39.00	ig at end of Plume	f jet phase:	or z(m/above stack) z(ft/above ground) Jet Phase Eqs:	= 12.308 = 140.4 5 foot intervals
Table of Plume Top-Hat Diameters (2a) and Pl Height (feet) above ground <u>Stack.Rel.Ht = 100.0</u> 105.0 110.0	ume-Averaged (meters) above stack 0.00 1.52 3.05 3.17	I Vertical Vel Plume Radius(m) 0.254 0.376 0.498	ocities startir SingleStk VertVel(m/s) 51.34 39.00 26.66 25.67	ig at end of Plume	f jet phase:	or z(m/above stack) z(ft/above ground) Jet Phase Eqs: Linearly interpolated from Stack R	= 12.308 = 140.4 5 foot Intervals el.Ht to Top of Jet
Table of Plume Top-Hat Diameters (2a) and Pl Height (feet) above ground Stack.Rel.Ht = 100.0 105.0 110.0 Top of jet = 110.4	ume-Averaged (meters) above stack 0.00 1.52 3.05 3.17 6.10	I Vertical Vel Plume Radius(m) 0.254 0.376 0.498 0.508 0.789	ocities startir SingleStk VertVel(m/s) 51.34 39.00 26.66 25.67 10.75	ng at end of Plume Temp(K)	f jet phase:	or z(m/above stack) z(ft/above ground) Jet Phase Eqs: Linearly interpolated from Stack R Spillane Equations:	= 12.308 = 140.4 5 foot Intervals el.Ht to Top of Jet
Table of Plume Top-Hat Diameters (2a) and Pl Height (feet) above ground Stack.Rel.Ht = 100.0 105.0 110.0 Top of jet = 110.4 122.0 130.0 140.0	ume-Averaged (meters) above stack 0.00 1.52 3.05 3.17 6.10 9.14 12.19	I Vertical Vel Plume Radius(m) 0.254 0.376 0.498 0.508 0.789 1.277 1.765	ocities startir SingleStk VertVe((m/s) 51.34 39.00 26.66 25.67 10.75 6.96 5.34	ng at end of Plume Temp(K) 374.85 345.06 331.45	f jet phase:	or z(m/above stack) z(ft/above ground) Jet Phase Eqs: Linearly interpolated from Stack R Spillane Equations: $V_{plume}={(Va)_o}^3+0.12F_d(z-z_v)^2(6.25)$	= 12.308 = 140.4 el.Ht to Top of Jet D-z., ²]) ^{1/2} / a 10 foot Intervals
Table of Plume Top-Hat Diameters (2a) and Pl Height (feet) above ground Stack.Rel.Ht = 100.0 105.0 110.0 Top of jet = 110.4 120.0 130.0 140.0 Spillane 5.3 m/s Height = 140.4	ume-Averaged (meters) above stack 0.00 1.52 3.05 3.17 6.10 9.14 12.19 12.31	I Vertical Vel Plume Radius(m) 0.254 0.376 0.498 0.508 0.789 1.277 1.765 1.783	ocities startir SingleStk VertVel(m/s) 51.34 39.00 26.66 25.67 10.75 6.96 5.34 5.34	ag at end of Plume Temp(K) 374.85 345.06 331.45 331.08	f jet phase:	or z(m/above stack) z(ft/above ground) Jet Phase Eqs: Linearly interpolated from Stack R Spillane Equations: $V_{plume}=\{(Va)_o^3+0.12F_o[(z-z_o)^2-(6.25a=0.16(z-z_o)))$	= 12.308 = 140.4 el.Ht to Top of Jet D-z., ²]) ^{1/2} / a 10 foot Intervals
Table of Plume Top-Hat Diameters (2a) and Pl Height (feet) above ground Stack.Rel.Ht = 100.0 105.0 110.0 Top of jet = 110.4 120.0 130.0 140.0 Spillane 5.3 m/s Height = 140.4	ume-Averaged (meters) above stack 0.00 1.52 3.05 3.17 6.10 9.14 12.19 12.31 15.24	I Vertical Vel Plume Radius(m) 0.254 0.376 0.498 0.508 0.789 1.277 1.765 1.783 2.252	ocities startir SingleStk VertVel(m/s) 51.34 39.00 26.66 25.67 10.75 6.96 5.34 5.30 4.46	ng at end of Plume Temp(K) 374.85 345.06 331.45 331.08 323.69	f jet phase:	or z(m/above stack) z(ft/above ground) Jet Phase Eqs: Linearly interpolated from Stack R Spillane Equations: $V_{plume}=\{(Va)_o^3+0.12F_o[(z-z_o)^2-(6.25a=0.16(z-z_o)))$	= 12.308 = 140.4 el.Ht to Top of Jet D-z., ²]) ^{1/2} / a 10 foot Intervals
Table of Plume Top-Hat Diameters (2a) and Pl Height (feet) above ground Stack.Rel.Ht = 100.0 105.0 110.0 Top of jet = 110.4 120.0 130.0 Spillane 5.3 m/s Height = 140.4 150.0 160.0	ume-Averaged (meters) above stack 0.00 1.52 3.05 3.17 6.10 9.14 12.19 12.31 15.24 18.29	I Vertical Vel Plume Radius(m) 0.254 0.376 0.498 0.508 0.789 1.277 1.765 1.765 1.783 2.252 2.740	ocities startir SingleStk VertVel(m/s) 51.34 39.00 26.66 25.67 10.75 6.96 5.34 5.34 5.30 4.46 3.92	g at end of Plume Temp(K) 374.855 345.06 331.45 331.08 323.69 318.74	f jet phase:	or z(m/above stack) z(ft/above ground) Jet Phase Eqs: Linearly interpolated from Stack R Spillane Equations: $V_{plume}=\{(Va)_o^3+0.12F_o[(z-z_o)^2-(6.25a=0.16(z-z_o)))$	= 12.308 = 140.4 5 foot intervals el.Ht to Top of Jet D -2,) ²] ^{1/3} / a 10 foot intervals *a ² *A ²)))
Table of Plume Top-Hat Diameters (2a) and Pl Height (feet) above ground Stack.Rel.Ht = 100.0 110.0 Top of jet = 110.4 120.0 130.0 Spillane 5.3 m/s Height = 140.4 150.0 160.0 170.0	ume-Averaged (meters) above stack 0.00 1.52 3.05 3.17 6.10 9.14 12.19 12.31 15.24 18.29 21.34	I Vertical Vel Plume Radius(m) 0.254 0.376 0.498 0.508 0.789 1.277 1.765 1.783 2.252 2.740 3.228	ocities startir SingleStk VertVel(m/s) 51.34 39.00 26.66 25.67 10.75 6.96 5.34 5.30 4.46 3.92 3.55	g at end of Plume Temp(K) 374.85 345.06 331.45 331.08 323.69 318.74 315.36	f jet phase:	or z(m/above stack) z(ft/above ground) Jet Phase Eqs: Linearly interpolated from Stack R Spillane Equations: $V_{plume}=\{(Va)_o^3+0.12F_o[(z-z_o)^2-(6.25a=0.16(z-z_o)))$	= 12.308 = 140.4 el.Ht to Top of Jet D-z., ²]) ^{1/2} / a 10 foot Intervals
Table of Plume Top-Hat Diameters (2a) and Pl Height (feet) above ground Stack.Rel.Ht = 100.0 105.0 110.0 Top of jet = 110.4 120.0 130.0 140.0 Spillane 5.3 m/s Height = 140.4 150.0 160.0 170.0	ume-Averaged (meters) above stack 0.00 1.52 3.05 3.17 6.10 9.14 12.19 12.31 15.24 18.29 21.34 24.38	I Vertical Vel Plume Radius(m) 0.254 0.376 0.498 0.508 0.789 1.277 1.765 1.783 2.252 2.740 3.228 3.715	ocities startir SingleStk VertVel(m/s) 51.34 39.00 26.66 25.67 10.75 6.96 5.34 5.30 4.46 3.92 3.55 3.28	g at end of Plume Temp(K) 374.85 345.06 331.45 331.08 323.69 318.74 315.36 312.95	f jet phase:	or z(m/above stack) z(ft/above ground) Jet Phase Eqs: Linearly interpolated from Stack R Spillane Equations: $V_{plume}=\{(Va)_o^3+0.12F_o[(z-z_o)^2-(6.25a=0.16(z-z_o)))$	= 12.308 = 140.4 5 foot intervals el.Ht to Top of Jet D -2,) ²] ^{1/3} / a 10 foot intervals *a ² *A ²)))
Table of Plume Top-Hat Diameters (2a) and Pl Height (feet) above ground Stack.Rel.Ht = 100.0 105.0 110.0 Top of jet = 110.4 120.0 130.0 140.0 Spillane 5.3 m/s Height = 140.4 150.0 170.0 180.0 190.0	ume-Averaged (meters) above stack 0.00 1.52 3.05 3.17 6.10 9.14 12.19 12.31 15.24 18.29 21.34 24.38 27.43	I Vertical Vel Plume Radius(m) 0.254 0.376 0.498 0.508 0.789 1.277 1.765 1.783 2.252 2.740 3.228 3.715 4.203	ocities startin SingleStk VertVel(m/s) 51.34 39.00 26.66 25.67 10.75 6.96 5.34 5.30 4.46 3.92 3.55 3.28 3.08	g at end of Plume Temp(K) 374.85 345.06 331.45 331.08 323.69 318.74 315.36 312.95 311.16	f jet phase:	or z(m/above stack) z(ft/above ground) Jet Phase Eqs: Linearly interpolated from Stack R Spillane Equations: $V_{plume}=\{(Va)_o^3+0.12F_o[(z-z_o)^2-(6.25a=0.16(z-z_o)))$	= 12.308 = 140.4 5 foot intervals el.Ht to Top of Jet D -2,) ²] ^{1/3} / a 10 foot intervals *a ² *A ²)))
Table of Plume Top-Hat Diameters (2a) and Pl Height (feet) above ground Stack.Rel.Ht = 100.0 105.0 110.0 Top of jet = 110.4 120.0 140.0 Spillane 5.3 m/s Height = 140.4 150.0 170.0 180.0 190.0 200.0	ume-Averaged (meters) above stack 0.00 1.52 3.05 3.17 6.10 9.14 12.19 12.31 15.24 18.29 21.34 24.38 27.43 30.48	I Vertical Vel Plume Radius(m) 0.254 0.376 0.498 0.508 0.789 1.277 1.765 1.783 2.252 2.740 3.228 3.715 4.203 4.691	ocities startir SingleStk VertVel(m/s) 51.34 39.00 26.66 25.67 10.75 6.96 5.34 5.30 4.46 3.92 3.55 3.28 3.28 3.28	ar at end of Plume Temp(K) 374.85 345.06 331.45 331.08 323.69 318.74 312.95 311.16 309.79	f jet phase:	or z(m/above stack) z(ft/above ground) Jet Phase Eqs: Linearly interpolated from Stack R Spillane Equations: $V_{plume}=\{(Va)_o^3+0.12F_o[(z-z_o)^2-(6.25a=0.16(z-z_o)))$	= 12.308 = 140.4 5 foot intervals eLH to Top of Jet D-z,y ²) ¹⁰⁷ / a 10 foot intervals *a ² +λ ²))) Max<5.30 m/s
Table of Plume Top-Hat Diameters (2a) and Pl Height (feet) above ground Stack.Rel.Ht = 100.0 105.0 110.0 Top of jet = 110.4 120.0 130.0 140.0 Spillane 5.3 m/s Height = 140.4 150.0 180.0 180.0 200.0 250.0	ume-Averaged (meters) above stack 0.00 1.52 3.05 3.17 6.10 9.14 12.19 12.31 15.24 18.29 21.34 24.38 27.43 30.48 45.72	I Vertical Vel Plume Radius(m) 0.254 0.376 0.498 0.508 0.789 1.277 1.765 1.783 2.252 2.740 3.228 3.715 4.203 4.691 7.129	ocities startir SingleStk VertVel(m/s) 51.34 39.00 26.66 25.67 10.75 6.96 5.34 5.30 4.46 3.92 3.55 3.28 3.08 3.08 2.92 2.43	ar end of Plume Temp(K) 374.85 345.06 331.45 331.08 323.69 318.74 315.36 312.95 311.16 309.79 306.15	f jet phase:	or z(m/above stack) z(ft/above ground) Jet Phase Eqs: Linearly interpolated from Stack R Spillane Equations: $V_{plume}=\{(Va)_o^3+0.12F_o[(z-z_o)^2-(6.25a=0.16(z-z_o)))$	= 12.308 = 140.4 5 foot intervals el.Ht to Top of Jet D -2,) ²] ^{1/3} / a 10 foot intervals *a ² *A ²)))
Table of Plume Top-Hat Diameters (2a) and Pl Height (feet) above ground Stack.Rel.Ht = 100.0 105.0 110.0 Top of jet = 110.4 120.0 130.0 140.0 Spillane 5.3 m/s Height = 140.4 150.0 160.0 170.0 180.0 200.0 200.0 200.0 250.0 300.0	ume-Averaged (meters) above stack 0.00 1.52 3.05 3.17 6.10 9.14 12.19 12.31 15.24 18.29 21.34 24.38 27.43 30.48 45.72 60.96	Vertical Vel Plume Radius(m) 0.254 0.376 0.498 0.508 0.789 1.277 1.765 1.783 2.252 2.740 3.228 3.715 4.203 4.691 7.129 9.567	ocities startir SingleStk VertVel(m/s) 51.34 39.00 26.66 25.67 10.75 6.96 5.34 5.34 5.30 4.46 3.92 3.55 3.28 3.08 2.92 2.43 2.17	g at end of Plume Temp(K) 345.06 331.45 331.08 323.69 318.74 315.36 312.95 311.16 309.79 306.15 304.66	f jet phase:	or z(m/above stack) z(ft/above ground) Jet Phase Eqs: Linearly interpolated from Stack R Spillane Equations: $V_{plume}=\{(Va)_o^3+0.12F_o[(z-z_o)^2-(6.25a=0.16(z-z_o)))$	= 12.308 = 140.4 5 foot intervals eLH to Top of Jet D-z,y ²) ¹⁰⁷ / a 10 foot intervals *a ² +λ ²))) Max<5.30 m/s
Table of Plume Top-Hat Diameters (2a) and Pl Height (feet) above ground Stack.Rel.Ht = 100.0 105.0 110.0 Top of jet = 110.4 120.0 130.0 140.0 Spillane 5.3 m/s Height = 140.4 150.0 160.0 170.0 180.0 190.0 250.0 300.0 350.0	ume-Averaged (meters) above stack 0.00 1.52 3.05 3.17 6.10 9.14 12.19 12.31 15.24 18.29 21.34 24.38 27.43 30.48 45.72 60.96 76.20	I Vertical Vel Plume Radius(m) 0.254 0.376 0.498 0.508 0.789 1.277 1.765 1.765 1.765 1.765 1.765 1.763 3.228 3.715 4.203 4.691 7.129 9.567 12.006	ocities startir SingleStk VertVel(m/s) 51.34 39.00 26.66 25.67 10.75 6.96 5.34 5.30 4.46 3.92 3.55 3.28 3.08 2.92 2.43 2.17 1.99	g at end of Plume Temp(K) 374.855 345.06 331.45 331.08 323.69 318.74 315.36 312.95 311.16 309.79 306.15 304.66 303.90	f jet phase:	or z(m/above stack) z(ft/above ground) Jet Phase Eqs: Linearly interpolated from Stack R Spillane Equations: $V_{plume}=\{(Va)_o^3+0.12F_o[(z-z_o)^2-(6.25a=0.16(z-z_o)))$	= 12.308 = 140.4 5 foot intervals eLH to Top of Jet D-z,y ²) ¹⁰⁷ / a 10 foot intervals *a ² +λ ²))) Max<5.30 m/s
Table of Plume Top-Hat Diameters (2a) and Pl Height (feet) above ground Stack.Rel.Ht = 100.0 105.0 110.0 Top of jet = 110.4 120.0 130.0 140.0 Spillane 5.3 m/s Height = 140.4 150.0 160.0 170.0 180.0 190.0 2000.0 350.0 350.0 350.0 350.0 350.0 350.0 350.0	ume-Averaged (meters) above stack 0.00 1.52 3.05 3.17 6.10 9.14 12.19 12.31 15.24 18.29 21.34 24.38 27.43 30.48 45.72 60.96 76.20 91.44	l Vertical Vel Plume Radius(m) 0.254 0.376 0.498 0.508 0.789 1.277 1.765 1.783 2.252 2.740 3.228 3.715 4.203 4.691 7.129 9.567 12.006 14.444	ocities startin SingleStk VertVel(m/s) 51.34 39.00 26.66 25.67 10.75 6.96 5.34 5.30 4.46 3.92 3.55 3.28 3.08 2.92 2.43 2.17 1.99 1.87	g at end of Plume Temp(K) 374.85 345.06 331.45 331.08 323.89 318.74 315.36 312.95 311.16 309.79 306.15 304.66 303.90 303.46	f jet phase:	or z(m/above stack) z(ft/above ground) Jet Phase Eqs: Linearly interpolated from Stack R Spillane Equations: $V_{plume}=\{(Va)_o^3+0.12F_o[(z-z_o)^2-(6.25a=0.16(z-z_o)))$	= 12.308 = 140.4 5 foot intervals eLH to Top of Jet D-z,y ²) ¹⁰⁷ / a 10 foot intervals *a ² +λ ²))) Max<5.30 m/s
Table of Plume Top-Hat Diameters (2a) and Pl Height (feet) above ground Stack.Rel.Ht = 100.0 105.0 110.0 Top of jet = 110.4 120.0 130.0 140.0 Spillane 5.3 m/s Height = 140.4 150.0 160.0 170.0 180.0 190.0 200.0 250.0 300.0 350.0 400.0 450.0	ume-Averaged (meters) above stack 0.00 1.52 3.05 3.17 6.10 9.14 12.19 12.31 15.24 18.29 21.34 24.38 27.43 30.48 45.72 60.96 76.20 91.44 106.68	I Vertical Vel Plume Radius(m) 0.254 0.376 0.498 0.508 0.789 1.277 1.765 1.783 2.252 2.740 3.228 3.715 4.203 4.691 7.129 9.567 12.006 14.444 16.883	ocities startir SingleStk VertVel(m/s) 51.34 39.00 26.66 25.67 10.75 6.96 5.34 4.46 3.92 3.55 3.28 3.08 2.92 2.43 2.17 1.99 1.87 1.77	g at end of Plume Temp(K) 374.85 345.06 331.45 331.08 323.69 318.74 315.36 312.95 311.16 309.79 306.15 304.66 303.80 303.46 303.80	f jet phase:	or z(m/above stack) z(ft/above ground) Jet Phase Eqs: Linearly interpolated from Stack R Spillane Equations: $V_{plume}=\{(Va)_o^3+0.12F_o[(z-z_o)^2-(6.25a=0.16(z-z_o)))$	= 12.308 = 140.4 5 foot intervals eLH to Top of Jet D-z,y ²) ¹⁰⁷ / a 10 foot intervals *a ² +λ ²))) Max<5.30 m/s
Table of Plume Top-Hat Diameters (2a) and Pl Height (feet) above ground Stack.Rel.Ht = 100.0 105.0 110.0 Top of jet = 110.4 120.0 130.0 140.0 Spillane 5.3 m/s Height = 140.4 150.0 160.0 170.0 200.0 250.0 300.0 250.0 300.0 400.0 250.0 300.0 450.0 450.0	ume-Averaged (meters) above stack 0.00 1.52 3.05 3.17 6.10 9.14 12.19 12.31 15.24 18.29 21.34 24.38 27.43 30.48 45.72 60.96 76.20 91.44 106.68 121.92	I Vertical Vel Plume Radius(m) 0.254 0.376 0.498 0.508 0.789 1.277 1.765 1.783 2.252 2.740 3.228 3.715 4.203 4.691 7.129 9.567 12.006 14.444 16.883 19.321	ocities startir SingleStk VertVel(m/s) 51.34 39.00 26.66 25.67 10.75 6.96 5.34 5.30 4.46 3.92 3.55 3.28 3.08 2.92 2.43 2.17 1.99 1.87 1.77	ar end of Plume Temp(K) 374.85 345.06 331.45 331.08 323.69 318.74 312.95 311.16 309.79 306.15 304.66 303.90 303.46 303.90 303.48 302.98	f jet phase:	or z(m/above stack) z(ft/above ground) Jet Phase Eqs: Linearly interpolated from Stack R Spillane Equations: $V_{plume}=\{(Va)_o^3+0.12F_o[(z-z_o)^2-(6.25a=0.16(z-z_o)))$	= 12.308 = 140.4 5 foot intervals eLH to Top of Jet D-z,y ²) ¹⁰⁷ / a 10 foot intervals *a ² +λ ²))) Max<5.30 m/s
Table of Plume Top-Hat Diameters (2a) and Pl Height (feet) above ground Stack.Rel.Ht = 100.0 105.0 110.0 Top of jet = 110.4 120.0 130.0 140.0 Spillane 5.3 m/s Height = 140.4 150.0 180.0 200.0 250.0 300.0 180.0 200.0 250.0 300.0 450.0 500.0 500.0	ume-Averaged (meters) above stack 0.00 1.52 3.05 3.17 6.10 9.14 12.19 12.31 15.24 18.29 21.34 24.38 27.43 30.48 45.72 60.96 76.20 91.44 106.68 121.92 137.16	I Vertical Vel Plume Radius(m) 0.254 0.376 0.498 0.508 0.789 1.277 1.765 1.783 2.252 2.740 3.228 3.715 4.203 4.691 7.129 9.567 12.006 14.444 16.883 19.321 21.759	ocities startir SingleStk VertVel(m/s) 51.34 39.00 26.66 25.67 10.75 6.96 5.34 5.30 4.46 3.92 3.55 3.28 3.08 3.08 2.92 2.43 2.17 1.99 1.87 1.77 1.79	g at end of Plume Temp(K) 345.06 331.45 331.08 323.69 318.74 315.36 311.16 309.79 306.15 304.66 303.90 303.46 303.90 303.46 303.92 84 302.88	f jet phase:	or z(m/above stack) z(ft/above ground) Jet Phase Eqs: Linearly interpolated from Stack R Spillane Equations: $V_{plume}=\{(Va)_o^3+0.12F_o[(z-z_o)^2-(6.25a=0.16(z-z_o)))$	= 12.308 = 140.4 5 foot Intervals el.Ht to Top of Jet D-z,y ²) ^{1/4} / a 10 foot Intervals *a ² λ ²))) Max<5.30 m/s 50 foot Intervals
Table of Plume Top-Hat Diameters (2a) and Pl Height (feet) above ground Stack.Rel.Ht = 100.0 105.0 110.0 Top of jet = 110.4 120.0 130.0 140.0 Spillane 5.3 m/s Height = 140.4 150.0 160.0 170.0 180.0 200.0 250.0 300.0 250.0 350.0 400.0 250.0 350.0 400.0 250.0 350.0 400.0 400.0 450.0 550.0 650.0	ume-Averaged (meters) above stack 0.00 1.52 3.05 3.17 6.10 9.14 12.19 12.31 15.24 18.29 21.34 24.38 27.43 30.48 45.72 60.96 76.20 91.44 106.68 121.92 137.16 167.64	Vertical Vel Plume Radius(m) 0.254 0.376 0.498 0.508 0.789 1.277 1.765 1.783 2.252 2.740 3.228 3.715 4.203 4.691 7.129 9.567 12.006 14.444 16.883 19.321 21.759 26.636	ocities startir SingleStk VertVel(m/s) 51.34 39.00 26.66 25.67 10.75 6.96 5.34 5.34 4.46 3.92 3.55 3.28 3.08 2.92 2.43 2.17 1.99 1.87 1.77 1.69 1.62	g at end of Plume Temp(K) 345.06 331.45 331.08 323.69 318.74 315.36 312.95 311.16 303.79 306.15 304.66 303.90 303.46 303.80 303.46 303.18 302.84 302.84 302.66	f jet phase:	or z(m/above stack) z(ft/above ground) Jet Phase Eqs: Linearly interpolated from Stack R Spillane Equations: $V_{plume}=\{(Va)_o^3+0.12F_o[(z-z_o)^2-(6.25a=0.16(z-z_o)))$	= 12.308 = 140.4 5 foot intervals eLH to Top of Jet D-z,y ²) ¹⁰⁷ / a 10 foot intervals *a ² +λ ²))) Max<5.30 m/s
Table of Plume Top-Hat Diameters (2a) and Pl Height (feet) above ground Stack.Rel.Ht = 100.0 105.0 110.0 Top of jet = 110.4 120.0 130.0 140.0 Spillane 5.3 m/s Height = 140.4 150.0 180.0 200.0 250.0 300.0 180.0 200.0 250.0 300.0 450.0 500.0 500.0	ume-Averaged (meters) above stack 0.00 1.52 3.05 3.17 6.10 9.14 12.19 12.31 15.24 18.29 21.34 24.38 27.43 30.48 45.72 60.96 76.20 91.44 106.68 121.92 137.16 167.64 198.12	Vertical Vel Plume Radius(m) 0.254 0.376 0.498 0.508 0.789 1.277 1.765 1.765 1.765 1.765 1.765 1.270 3.228 3.715 4.203 4.691 7.129 9.567 12.006 14.444 16.883 19.321 21.759 26.636 31.513	ocities startir SingleStk VertVel(m/s) 51.34 39.00 26.66 25.67 10.75 6.96 5.34 4.46 3.92 3.55 3.28 3.08 2.92 2.43 2.17 1.99 1.87 1.77 1.69 1.62 1.51	g at end of Plume Temp(K) 345.06 331.45 331.08 323.69 318.74 315.36 311.16 309.79 306.15 304.66 303.90 303.46 303.90 303.46 303.92 84 302.88	f jet phase:	or z(m/above stack) z(ft/above ground) Jet Phase Eqs: Linearly interpolated from Stack R Spillane Equations: $V_{plume}=\{(Va)_o^3+0.12F_o[(z-z_o)^2-(6.25a=0.16(z-z_o)))$	= 12.308 = 140.4 5 foot Intervals el.Ht to Top of Jet D-z,y ²) ^{1/4} / a 10 foot Intervals *a ² λ ²))) Max<5.30 m/s 50 foot Intervals
Table of Plume Top-Hat Diameters (2a) and Pl Height (feet) above ground Stack.Rel.Ht = 100.0 105.0 110.0 Top of jet = 110.4 120.0 130.0 140.0 Spillane 5.3 m/s Height = 140.4 150.0 160.0 170.0 180.0 190.0 200.0 250.0 300.0 350.0 400.0 250.0 350.0 400.0 250.0 350.0 400.0 450.0 550.0 650.0 750.0	ume-Averaged (meters) above stack 0.00 1.52 3.05 3.17 6.10 9.14 12.19 12.31 15.24 18.29 21.34 24.38 27.43 30.48 45.72 60.96 76.20 91.44 106.68 121.92 137.16 167.64 198.12 228.60	l Vertical Vel Plume Radius(m) 0.254 0.376 0.498 0.508 0.789 1.277 1.765 1.783 2.252 2.740 3.228 3.715 4.203 4.691 7.129 9.567 12.006 14.444 16.883 19.321 21.759 26.636 31.513 36.390	ocities startir SingleStk VertVel(m/s) 51.34 39.00 26.66 25.67 10.75 6.96 5.34 4.66 3.92 3.55 3.28 3.08 2.92 2.43 2.17 1.99 1.87 1.77 1.69 6.96 5.34 4.46 3.92 2.43 2.17 1.99 1.87 1.77 1.69 1.62 1.51	g at end of Plume Temp(K) 345.06 331.45 331.08 323.69 318.74 315.36 312.95 311.16 309.79 306.15 304.66 303.90 303.46 303.90 303.46 303.18 302.98 302.84 302.66 302.55	f jet phase:	or z(m/above stack) z(ft/above ground) Jet Phase Eqs: Linearly interpolated from Stack R Spillane Equations: $V_{plume}=\{(Va)_o^3+0.12F_o[(z-z_o)^2-(6.25a=0.16(z-z_o)))$	= 12.308 = 140.4 5 foot Intervals el.Ht to Top of Jet D-z,y ²) ^{1/4} / a 10 foot Intervals *a ² λ ²))) Max<5.30 m/s 50 foot Intervals
Table of Plume Top-Hat Diameters (2a) and Pl Height (feet) above ground Stack.Rel.Ht = 100.0 105.0 110.0 Top of jet = 110.4 120.0 130.0 140.0 Spillane 5.3 m/s Height = 140.4 150.0 160.0 170.0 200.0 250.0 300.0 450.0 250.0 300.0 450.0 550.0 650.0	ume-Averaged (meters) above stack 0.00 1.52 3.05 3.17 6.10 9.14 12.19 12.31 15.24 18.29 21.34 24.38 27.43 30.48 45.72 60.96 76.20 91.44 106.68 121.92 137.16 167.64 198.12 228.60 259.08	I Vertical Vel Plume Radius(m) 0.254 0.376 0.498 0.508 0.789 1.277 1.765 1.783 2.252 2.740 3.228 3.715 4.203 4.691 7.129 9.567 12.006 14.444 16.883 19.321 21.759 26.636 31.513 36.390 41.267	ocities startir SingleStk VertVel(m/s) 51.34 39.00 26.66 25.67 10.75 6.96 5.34 5.30 4.46 3.92 3.55 3.28 3.08 2.92 2.43 2.17 1.99 1.87 1.77 1.69 1.62 1.51 1.43 3.136	g at end of Plume Temp(K) 374.85 345.06 331.45 331.08 323.69 318.74 315.36 312.95 311.16 309.79 306.15 304.66 303.90 303.46 303.48 302.84 302.84 302.84 302.25 302.48	f jet phase:	or z(m/above stack) z(ft/above ground) Jet Phase Eqs: Linearly interpolated from Stack R Spillane Equations: $V_{plume}=\{(Va)_o^3+0.12F_o[(z-z_o)^2-(6.25a=0.16(z-z_o)))$	= 12.308 = 140.4 5 foot Intervals el.Ht to Top of Jet D-z,y ²) ^{1/4} / a 10 foot Intervals *a ² λ ²))) Max<5.30 m/s 50 foot Intervals
Table of Plume Top-Hat Diameters (2a) and Pl Height (feet) above ground Stack.Rel.Ht = 100.0 105.0 110.0 Top of jet = 110.4 120.0 130.0 140.0 Spillane 5.3 m/s Height = 140.4 150.0 160.0 170.0 180.0 190.0 200.0	ume-Averaged (meters) above stack 0.00 1.52 3.05 3.17 6.10 9.14 12.19 12.31 15.24 18.29 21.34 24.38 27.43 30.48 45.72 60.96 76.20 91.44 106.68 121.92 137.16 167.64 198.12 228.60 259.08 289.56	I Vertical Vel Plume Radius(m) 0.254 0.376 0.498 0.508 0.789 1.277 1.765 1.783 2.252 2.740 3.228 3.715 4.203 4.691 7.129 9.567 12.006 14.444 16.883 19.321 21.759 26.636 31.513 36.390 41.267 46.143	ocities startir SingleStk VertVel(m/s) 51.34 39.00 26.66 25.67 10.75 6.96 5.34 5.30 4.46 3.92 3.55 3.28 3.08 2.92 2.43 2.17 1.99 1.87 1.77 1.69 1.62 1.51 1.43 3.136 4.30 1.26	ar at end of Plume Temp(K) 345.06 331.45 345.06 331.45 331.08 323.69 318.74 312.95 311.16 309.79 306.15 304.66 303.96 303.46 303.18 302.98 302.84 302.84 302.66 302.55 302.48 302.48	f jet phase:	or z(m/above stack) z(ft/above ground) Jet Phase Eqs: Linearly interpolated from Stack R Spillane Equations: $V_{plume}=\{(Va)_o^3+0.12F_o[(z-z_o)^2-(6.25a=0.16(z-z_o)))$	= 12.308 = 140.4 5 foot Intervals el.Ht to Top of Jet D-z,y ²) ^{1/4} / a 10 foot Intervals *a ² λ ²))) Max<5.30 m/s 50 foot Intervals
Table of Plume Top-Hat Diameters (2a) and Pl Height (feet) above ground Stack.Rel.Ht = 100.0 105.0 110.0 Top of jet = 110.4 120.0 130.0 140.0 Spillane 5.3 m/s Height = 140.4 150.0 160.0 170.0 180.0 100.0 100.0 100.0 100.0 100.0	ume-Averaged (meters) above stack 0.00 1.52 3.05 3.17 6.10 9.14 12.19 12.31 15.24 18.29 21.34 24.38 27.43 30.48 45.72 60.96 76.20 91.44 106.68 121.92 137.16 167.64 198.12 228.60 259.08 289.56 320.04	Vertical Vel Plume Radius(m) 0.254 0.376 0.498 0.508 0.789 1.277 1.765 1.783 2.252 2.740 3.228 3.715 4.203 4.691 7.129 9.567 12.006 14.444 16.883 19.321 21.759 26.636 31.513 36.390 41.267 46.143 51.020	ocities startir SingleStk VertVel(m/s) 51.34 39.00 26.66 25.67 10.75 6.96 5.34 4.46 3.92 3.55 3.28 3.28 3.28 3.28 3.28 3.28 3.28 1.77 1.99 1.87 1.77 1.79 1.69 1.62 1.51 1.43 1.36 1.30 1.26 1.21	ar end of Plume Temp(K) 345.06 331.45 331.08 323.69 318.74 315.36 311.95 311.16 309.79 306.15 304.66 303.90 303.46 303.18 302.84 302.84 302.66 302.84 302.65 302.48 302.43 302.39	f jet phase:	or z(m/above stack) z(ft/above ground) Jet Phase Eqs: Linearly interpolated from Stack R Spillane Equations: $V_{plume}=\{(Va)_o^3+0.12F_o[(z-z_o)^2-(6.25a=0.16(z-z_o)))$	= 12.308 = 140.4 5 foot Intervals el.Ht to Top of Jet D-z,y ²) ^{1/4} / a 10 foot Intervals *a ² λ ²))) Max<5.30 m/s 50 foot Intervals
Table of Plume Top-Hat Diameters (2a) and Pl Height (feet) above ground Stack.Rel.Ht = 100.0 105.0 110.0 Top of jet = 110.4 120.0 130.0 130.0 130.0 140.0 Spillane 5.3 m/s Height = 140.4 150.0 180.0 200.0 250.0 300.0 180.0 180.0 200.0 250.0 300.0 350.0 400.0 250.0 300.0 350.0 400.0 550.0 650.0 750.0 850.0 950.0 1050.0 1150.0	ume-Averaged (meters) above stack 0.00 1.52 3.05 3.17 6.10 9.14 12.19 12.31 15.24 18.29 21.34 24.38 27.43 30.48 27.43 30.48 45.72 60.96 76.20 91.44 106.68 121.92 137.16 167.64 198.12 228.60 2259.08 289.56 320.04 350.52	Vertical Vel Plume Radius(m) 0.254 0.376 0.498 0.508 0.789 1.277 1.765 1.783 2.252 2.740 3.228 3.715 4.203 4.691 7.129 9.567 12.006 14.444 16.883 19.321 21.759 26.636 31.513 36.390 41.267 46.143 51.020 55.897	ocities startir SingleStk VertVel(m/s) 51.34 39.00 26.66 25.67 10.75 6.96 5.34 5.34 4.46 3.92 3.55 3.28 3.08 2.92 2.43 2.17 1.99 1.87 1.77 1.69 1.62 1.51 1.43 1.36 1.30 1.26 1.21	g at end of Plume Temp(K) 345.06 331.45 331.08 323.69 318.74 315.36 311.16 309.79 306.15 304.66 303.46 303.46 303.46 303.46 303.46 303.46 303.46 303.46 303.46 302.48 303.48 302.48 302.	f jet phase:	or z(m/above stack) z(ft/above ground) Jet Phase Eqs: Linearly interpolated from Stack R Spillane Equations: $V_{plume}=\{(Va)_o^3+0.12F_o[(z-z_o)^2-(6.25a=0.16(z-z_o)))$	= 12.308 = 140.4 5 foot Intervals el.Ht to Top of Jet D-z,y ²) ^{1/4} / a 10 foot Intervals *a ² λ ²))) Max<5.30 m/s 50 foot Intervals
Table of Plume Top-Hat Diameters (2a) and Pl Height (feet) above ground Stack.Rel.Ht = 100.0 105.0 110.0 Top of jet = 110.4 120.0 130.0 140.0 Spillane 5.3 m/s Height = 140.4 150.0 160.0 170.0 180.0 200.0 250.0 300.0 250.0 300.0 250.0 300.0 250.0 300.0 250.0 300.0 250.0 300.0 250.0 300.0 250.0 300.0 250.0 300.0 350.0 400.0 400.0 450.0 650.0 750.0 850.0 950.0 1050.0 1150.0 1250.0	ume-Averaged (meters) above stack 0.00 1.52 3.05 3.17 6.10 9.14 12.19 12.31 15.24 18.29 21.34 24.38 27.43 30.48 45.72 60.96 76.20 91.44 106.68 121.92 137.16 167.64 198.12 228.60 259.08 320.04 350.52 381.00	Vertical Vel Plume Radius(m) 0.254 0.376 0.498 0.508 0.789 1.277 1.765 1.783 2.252 2.740 3.228 3.715 4.203 4.691 7.129 9.567 12.006 14.444 16.883 19.321 21.759 26.636 31.513 36.390 41.267 46.143 51.020 55.897 60.774	ocities startir SingleStk VertVel(m/s) 51.34 39.00 26.66 25.67 10.75 6.96 5.34 4.46 3.92 3.55 3.28 3.08 2.92 2.92 2.92 2.92 2.92 2.92 2.92 2.9	g at end of Plume Temp(K) 345.06 331.45 331.08 323.69 318.74 315.36 312.95 311.16 303.79 306.15 304.66 303.90 303.46 303.90 303.46 303.18 302.84 302.84 302.65 302.48 302.43 302.48 302.43 302.34	f jet phase:	or z(m/above stack) z(ft/above ground) Jet Phase Eqs: Linearly interpolated from Stack R Spillane Equations: $V_{plume}=\{(Va)_o^3+0.12F_o[(z-z_o)^2-(6.25a=0.16(z-z_o)))$	= 12.308 = 140.4 5 foot Intervals el.Ht to Top of Jet D-z,y ²) ^{1/4} / a 10 foot Intervals *a ² λ ²))) Max<5.30 m/s 50 foot Intervals
Table of Plume Top-Hat Diameters (2a) and Pl Height (feet) above ground Stack.Rel.Ht = 100.0 105.0 110.0 Top of jet = 110.4 120.0 130.0 140.0 Spillane 5.3 m/s Height = 140.4 150.0 160.0 170.0 180.0 190.0 200.0 200.0 200.0 190.0 200.0 200.0 200.0 200.0 200.0 200.0 200.0 200.0 200.0 200.0 200.0 200.0 250.0 350.0 650.0 750.0 850.0 950.0 1050.0 1150.0 1150.0 1150.0 1150.0 1150.0 1150.0 1150.0 </td <td>ume-Averaged (meters) above stack 0.00 1.52 3.05 3.17 6.10 9.14 12.19 12.31 15.24 18.29 21.34 24.38 27.43 30.48 45.72 60.96 76.20 91.44 106.68 121.92 137.16 167.64 198.12 228.60 259.08 229.06 320.04 350.52 381.00 411.48</td> <td>l Vertical Vel Plume Radius(m) 0.254 0.376 0.498 0.508 0.789 1.277 1.765 1.765 1.765 1.765 1.765 1.270 3.228 3.715 4.203 4.691 7.129 9.567 12.006 14.444 16.883 19.321 21.759 26.636 31.513 36.390 41.267 46.143 35.1020 55.897 60.774 65.651</td> <td>ocities startir SingleStk VertVel(m/s) 51.34 39.00 26.66 25.67 10.75 6.96 5.34 4.46 3.92 3.55 3.28 3.08 2.92 2.43 2.17 1.99 1.87 1.77 1.69 1.62 1.51 1.43 1.36 1.30 1.26 1.21 1.18</td> <td>g at end of Plume Temp(K) 345.06 331.45 331.08 323.69 318.74 315.36 312.95 311.16 303.90 306.15 304.66 303.90 303.46 303.90 303.46 302.84 302.84 302.66 302.55 302.48 302.43 302.32</td> <td>f jet phase:</td> <td>or z(m/above stack) z(ft/above ground) Jet Phase Eqs: Linearly interpolated from Stack R Spillane Equations: $V_{plume}=\{(Va)_o^3+0.12F_o[(z-z_o)^2-(6.25a=0.16(z-z_o)))$</td> <td>= 12.308 = 140.4 5 foot Intervals el.Ht to Top of Jet D-z,y²)^{1/4} / a 10 foot Intervals *a²λ²))) Max<5.30 m/s 50 foot Intervals</td>	ume-Averaged (meters) above stack 0.00 1.52 3.05 3.17 6.10 9.14 12.19 12.31 15.24 18.29 21.34 24.38 27.43 30.48 45.72 60.96 76.20 91.44 106.68 121.92 137.16 167.64 198.12 228.60 259.08 229.06 320.04 350.52 381.00 411.48	l Vertical Vel Plume Radius(m) 0.254 0.376 0.498 0.508 0.789 1.277 1.765 1.765 1.765 1.765 1.765 1.270 3.228 3.715 4.203 4.691 7.129 9.567 12.006 14.444 16.883 19.321 21.759 26.636 31.513 36.390 41.267 46.143 35.1020 55.897 60.774 65.651	ocities startir SingleStk VertVel(m/s) 51.34 39.00 26.66 25.67 10.75 6.96 5.34 4.46 3.92 3.55 3.28 3.08 2.92 2.43 2.17 1.99 1.87 1.77 1.69 1.62 1.51 1.43 1.36 1.30 1.26 1.21 1.18	g at end of Plume Temp(K) 345.06 331.45 331.08 323.69 318.74 315.36 312.95 311.16 303.90 306.15 304.66 303.90 303.46 303.90 303.46 302.84 302.84 302.66 302.55 302.48 302.43 302.32	f jet phase:	or z(m/above stack) z(ft/above ground) Jet Phase Eqs: Linearly interpolated from Stack R Spillane Equations: $V_{plume}=\{(Va)_o^3+0.12F_o[(z-z_o)^2-(6.25a=0.16(z-z_o)))$	= 12.308 = 140.4 5 foot Intervals el.Ht to Top of Jet D-z,y ²) ^{1/4} / a 10 foot Intervals *a ² λ ²))) Max<5.30 m/s 50 foot Intervals
Table of Plume Top-Hat Diameters (2a) and Pl Height (feet) above ground Stack.Rel.Ht = 100.0 105.0 110.0 Top of jet = 110.4 120.0 130.0 140.0 Spillane 5.3 m/s Height = 140.4 150.0 160.0 170.0 180.0 190.0 200.0 250.0 300.0 350.0 400.0 450.0 550.0 1550.0 1550.0 1550.0 1550.0 1550.0 1550.0 1550.0 1550.0 1150.0 1150.0 1250.0	ume-Averaged (meters) above stack 0.00 1.52 3.05 3.17 6.10 9.14 12.19 12.31 15.24 18.29 21.34 24.38 27.43 30.48 45.72 60.96 76.20 91.44 106.68 121.92 137.16 167.64 198.12 228.60 259.08 289.56 320.04 411.48	I Vertical Vel Plume Radius(m) 0.254 0.376 0.498 0.508 0.789 1.277 1.765 1.783 2.252 2.740 3.228 3.715 4.203 4.691 7.129 9.567 12.006 14.444 16.883 19.321 21.759 26.636 31.513 36.390 41.267 46.143 51.020 55.897 60.774 65.651 70.527	ocities startir SingleStk VertVel(m/s) 51.34 39.00 26.66 25.67 10.75 6.96 5.34 5.30 4.46 3.92 3.55 3.28 3.08 2.92 2.43 2.17 1.99 1.87 1.77 1.69 1.62 1.51 1.43 1.36 1.30 1.26 1.21 1.18	g at end of Plume Temp(K) 374.855 345.06 331.45 331.08 323.69 318.74 315.36 312.95 311.16 309.79 306.15 304.66 303.90 303.46 303.18 302.43 302.24 302.43 302.24 302.31	f jet phase:	or z(m/above stack) z(ft/above ground) Jet Phase Eqs: Linearly interpolated from Stack R Spillane Equations: $V_{plume}=\{(Va)_o^3+0.12F_o[(z-z_o)^2-(6.25a=0.16(z-z_o)))$	= 12.308 = 140.4 5 foot Intervals el.Ht to Top of Jet D-z,y ²) ^{1/4} / a 10 foot Intervals *a ² λ ²))) Max<5.30 m/s 50 foot Intervals
Table of Plume Top-Hat Diameters (2a) and Pl Height (feet) above ground Stack.Rel.Ht = 100.0 105.0 110.0 Top of jet = 110.4 1200.0 140.0 Spillane 5.3 m/s Height = 140.4 150.0 160.0 170.0 180.0 190.0 200.0 250.0 300.0 190.0 200.0 250.0 300.0 190.0 200.0 250.0 300.0 190.0 200.0 250.0 300.0 300.0 300.0 350.0 650.0 750.0 1050.0 1150.0 1250.0 1350.0 1450.0 1450.0	ume-Averaged (meters) above stack 0.00 1.52 3.05 3.17 6.10 9.14 12.19 12.31 15.24 18.29 21.34 24.38 27.43 30.48 45.72 60.96 76.20 91.44 106.68 121.92 137.16 167.64 198.12 228.60 259.08 289.56 320.04 350.52 381.00 411.48 441.96	Vertical Vel Plume Radius(m) 0.254 0.376 0.498 0.508 0.789 1.277 1.765 1.783 2.252 2.740 3.228 3.715 4.203 4.691 7.129 9.567 12.006 14.444 16.883 19.321 21.759 26.636 31.513 36.390 41.267 46.143 51.020 55.897 60.774 46.5651 70.527 75.404	ocities startir SingleStk VertVel(m/s) 51.34 39.00 26.66 25.67 10.75 6.96 5.34 5.30 4.46 3.92 3.55 3.28 3.08 2.92 2.43 2.17 1.99 1.87 1.77 1.69 1.62 1.51 1.43 1.36 1.30 1.26 1.21 1.12 1.12	ar at end of Plume Temp(K) 345.06 331.45 345.06 331.45 331.08 323.69 318.74 312.95 311.16 309.79 306.15 304.66 303.96 303.94 303.46 303.98 302.84 302.84 302.66 302.55 302.48 302.43 302.30 302.34 302.34 302.34	f jet phase:	or z(m/above stack) z(ft/above ground) Jet Phase Eqs: Linearly interpolated from Stack R Spillane Equations: $V_{plume}=\{(Va)_o^3+0.12F_o[(z-z_o)^2-(6.25a=0.16(z-z_o)))$	= 12.308 = 140.4 5 foot Intervals el.Ht to Top of Jet D-z,y ²) ^{1/4} / a 10 foot Intervals *a ² λ ²))) Max<5.30 m/s 50 foot Intervals
Table of Plume Top-Hat Diameters (2a) and Pl Height (feet) above ground Stack.Rel.Ht = 100.0 105.0 110.0 Top of jet = 110.4 120.0 130.0 140.0 Spillane 5.3 m/s Height = 140.4 150.0 160.0 170.0 180.0 180.0 180.0 180.0 180.0 180.0 180.0 180.0 180.0 180.0 180.0 190.0 200.0 250.0 300.0 350.0 650.0 750.0 1050.0 1150.0 1150.0 1150.0 1150.0 1150.0 1150.0 1150.0 1450.0 1550.0	ume-Averaged (meters) above stack 0.00 1.52 3.05 3.17 6.10 9.14 12.19 12.31 15.24 18.29 21.34 24.38 27.43 30.48 45.72 60.96 76.20 91.44 106.68 121.92 137.16 167.64 198.12 228.60 259.08 289.56 320.04 350.52 381.00 411.48 441.96	Vertical Vel Plume Radius(m) 0.254 0.376 0.498 0.508 0.789 1.277 1.765 1.783 2.252 2.740 3.228 3.715 4.203 4.691 7.129 9.567 12.006 14.444 16.883 19.321 21.759 26.636 31.513 36.390 41.267 46.143 51.020 55.897 60.774 46.5651 70.527 75.404 80.281	ocities startir SingleStk VertVel(m/s) 51.34 39.00 26.66 25.67 10.75 6.96 5.34 5.30 4.46 3.92 3.55 3.28 3.28 3.28 3.28 3.28 3.28 3.28 3.28	a at end of Plume Temp(K) 345.06 331.45 331.08 323.69 318.74 315.36 311.95 301.16 309.79 306.15 304.66 303.90 303.46 303.18 302.98 302.84 302.66 302.29 302.84 302.23 302.34 302.32 302.34 302.32 302.34 302.32 302.34	f jet phase:	or z(m/above stack) z(ft/above ground) Jet Phase Eqs: Linearly interpolated from Stack R Spillane Equations: $V_{plume}=\{(Va)_o^3+0.12F_o[(z-z_o)^2-(6.25a=0.16(z-z_o)))$	= 12.308 = 140.4 5 foot Intervals el.Ht to Top of Jet D-z,y ²) ^{1/4} / a 10 foot Intervals *a ² λ ²))) Max<5.30 m/s 50 foot Intervals
Table of Plume Top-Hat Diameters (2a) and Pl Height (feet) above ground Stack.Rel.Ht = 100.0 105.0 110.0 Top of jet = 110.4 1200.0 130.0 130.0 130.0 130.0 130.0 140.0 Spillane 5.3 m/s Height = 140.4 150.0 160.0 170.0 180.0 200.0 250.0 300.0 180.0 180.0 180.0 190.0 250.0 300.0 250.0 300.0 250.0 300.0 250.0 300.0 250.0 300.0 250.0 300.0 250.0 300.0 350.0 450.0 1550.0 1550.0 1550.0 1550.0	ume-Averaged (meters) above stack 0.00 1.52 3.05 3.17 6.10 9.14 12.19 12.31 15.24 18.29 21.34 27.43 30.48 27.43 30.48 45.72 60.96 76.20 91.44 106.68 121.92 137.16 167.64 198.12 228.60 259.08 289.56 320.04 350.52 381.00 4411.48 441.96 472.44 502.92 533.40	Vertical Vel Plume Radius(m) 0.254 0.376 0.498 0.508 0.789 1.277 1.765 1.783 2.252 2.740 3.228 3.715 4.203 4.691 7.129 9.567 12.006 14.444 16.883 19.321 21.759 26.636 31.513 36.390 41.267 46.143 51.020 55.897 60.774 65.651 70.527 75.404 80.281 85.158	ocities startir SingleStk VertVel(m/s) 51.34 39.00 26.66 25.67 10.75 6.96 3.34 5.34 4.46 3.92 3.55 3.28 3.08 2.02 2.43 2.17 1.99 1.87 1.77 1.79 1.69 1.62 1.51 1.43 1.36 1.30 1.26 1.21 1.18 1.15 1.12 1.09	g at end of Plume Temp(K) 345.06 331.45 331.08 323.69 318.74 315.36 311.61 309.79 306.15 304.66 309.79 306.15 304.66 303.46 303.46 302.84 302.84 302.84 302.28 302.44 302.28 302.32 302.31 302.32 302.32 302.32 302.34 302.32 302.32 302.34 302.32 302.34 302.32 302.34 302.32 302.34 302.32 302.34 302.32 302.34 302.32 302.34 302.32 302.34 302.32 302.34 302.32 302.34 302.32 302.34 302.34 302.32 302.34 302.	f jet phase:	or z(m/above stack) z(ft/above ground) Jet Phase Eqs: Linearly interpolated from Stack R Spillane Equations: $V_{plume}=\{(Va)_o^3+0.12F_o[(z-z_o)^2-(6.25a=0.16(z-z_o)))$	= 12.308 = 140.4 5 foot Intervals el.Ht to Top of Jet D-z,y ²) ^{1/4} / a 10 foot Intervals *a ² λ ²))) Max<5.30 m/s 50 foot Intervals
Table of Plume Top-Hat Diameters (2a) and Pl Height (feet) above ground Stack.Rel.Ht = 100.0 105.0 110.0 Top of jet = 110.4 120.0 130.0 140.0 Spillane 5.3 m/s Height = 140.4 150.0 160.0 170.0 180.0 200.0 250.0 300.0 250.0 300.0 250.0 300.0 250.0 300.0 250.0 300.0 250.0 300.0 250.0 300.0 250.0 300.0 250.0 300.0 250.0 300.0 250.0 300.0 250.0 350.0 1050.0 1050.0 1150.0 1250.0 1350.0 1450.0 <td>ume-Averaged (meters) above stack 0.00 1.52 3.05 3.17 6.10 9.14 12.19 12.31 15.24 18.29 21.34 24.38 27.43 30.48 45.72 60.96 76.20 91.44 106.68 121.92 137.16 167.64 198.12 228.60 259.08 289.56 320.04 350.52 381.00 411.48 441.96 472.44 450.292 533.40</td> <td>Vertical Vel Plume Radius(m) 0.254 0.376 0.498 0.508 0.789 1.277 1.765 1.783 2.252 2.740 3.228 3.715 4.203 4.691 7.129 9.567 12.006 14.444 16.883 19.321 21.759 26.636 31.513 36.390 41.267 46.143 51.020 55.897 60.774 65.651 70.527 75.404 85.158 90.035</td> <td>ocities startir SingleStk VertVel(m/s) 51.34 39.00 26.66 25.67 10.75 6.96 5.34 4.46 3.92 3.55 3.28 3.08 3.08 2.92 2.43 2.17 1.99 1.87 1.77 1.69 1.62 1.51 1.43 1.36 1.20 1.21 1.18 1.12 1.19 1.07 1.07 1.07</td> <td>g at end of Plume Temp(K) 345.06 331.45 331.08 323.69 318.74 315.36 312.95 311.16 303.79 306.15 304.66 303.90 303.46 303.90 303.46 303.18 302.84 302.48 302.48 302.48 302.48 302.48 302.48 302.28 302.31 302.32 302.31 302.32 302.31 302.32 302.31 302.32 302.31 302.32 302.31 302.32 302.32 302.31 302.32 302.</td> <td>f jet phase:</td> <td>or z(m/above stack) z(ft/above ground) Jet Phase Eqs: Linearly interpolated from Stack R Spillane Equations: $V_{plume}=\{(Va)_o^3+0.12F_o[(z-z_o)^2-(6.25a=0.16(z-z_o)))$</td> <td>= 12.308 = 140.4 5 foot Intervals el.Ht to Top of Jet D-z,y²)^{1/4} / a 10 foot Intervals *a²λ²))) Max<5.30 m/s 50 foot Intervals</td>	ume-Averaged (meters) above stack 0.00 1.52 3.05 3.17 6.10 9.14 12.19 12.31 15.24 18.29 21.34 24.38 27.43 30.48 45.72 60.96 76.20 91.44 106.68 121.92 137.16 167.64 198.12 228.60 259.08 289.56 320.04 350.52 381.00 411.48 441.96 472.44 450.292 533.40	Vertical Vel Plume Radius(m) 0.254 0.376 0.498 0.508 0.789 1.277 1.765 1.783 2.252 2.740 3.228 3.715 4.203 4.691 7.129 9.567 12.006 14.444 16.883 19.321 21.759 26.636 31.513 36.390 41.267 46.143 51.020 55.897 60.774 65.651 70.527 75.404 85.158 90.035	ocities startir SingleStk VertVel(m/s) 51.34 39.00 26.66 25.67 10.75 6.96 5.34 4.46 3.92 3.55 3.28 3.08 3.08 2.92 2.43 2.17 1.99 1.87 1.77 1.69 1.62 1.51 1.43 1.36 1.20 1.21 1.18 1.12 1.19 1.07 1.07 1.07	g at end of Plume Temp(K) 345.06 331.45 331.08 323.69 318.74 315.36 312.95 311.16 303.79 306.15 304.66 303.90 303.46 303.90 303.46 303.18 302.84 302.48 302.48 302.48 302.48 302.48 302.48 302.28 302.31 302.32 302.31 302.32 302.31 302.32 302.31 302.32 302.31 302.32 302.31 302.32 302.32 302.31 302.32 302.	f jet phase:	or z(m/above stack) z(ft/above ground) Jet Phase Eqs: Linearly interpolated from Stack R Spillane Equations: $V_{plume}=\{(Va)_o^3+0.12F_o[(z-z_o)^2-(6.25a=0.16(z-z_o)))$	= 12.308 = 140.4 5 foot Intervals el.Ht to Top of Jet D-z,y ²) ^{1/4} / a 10 foot Intervals *a ² λ ²))) Max<5.30 m/s 50 foot Intervals

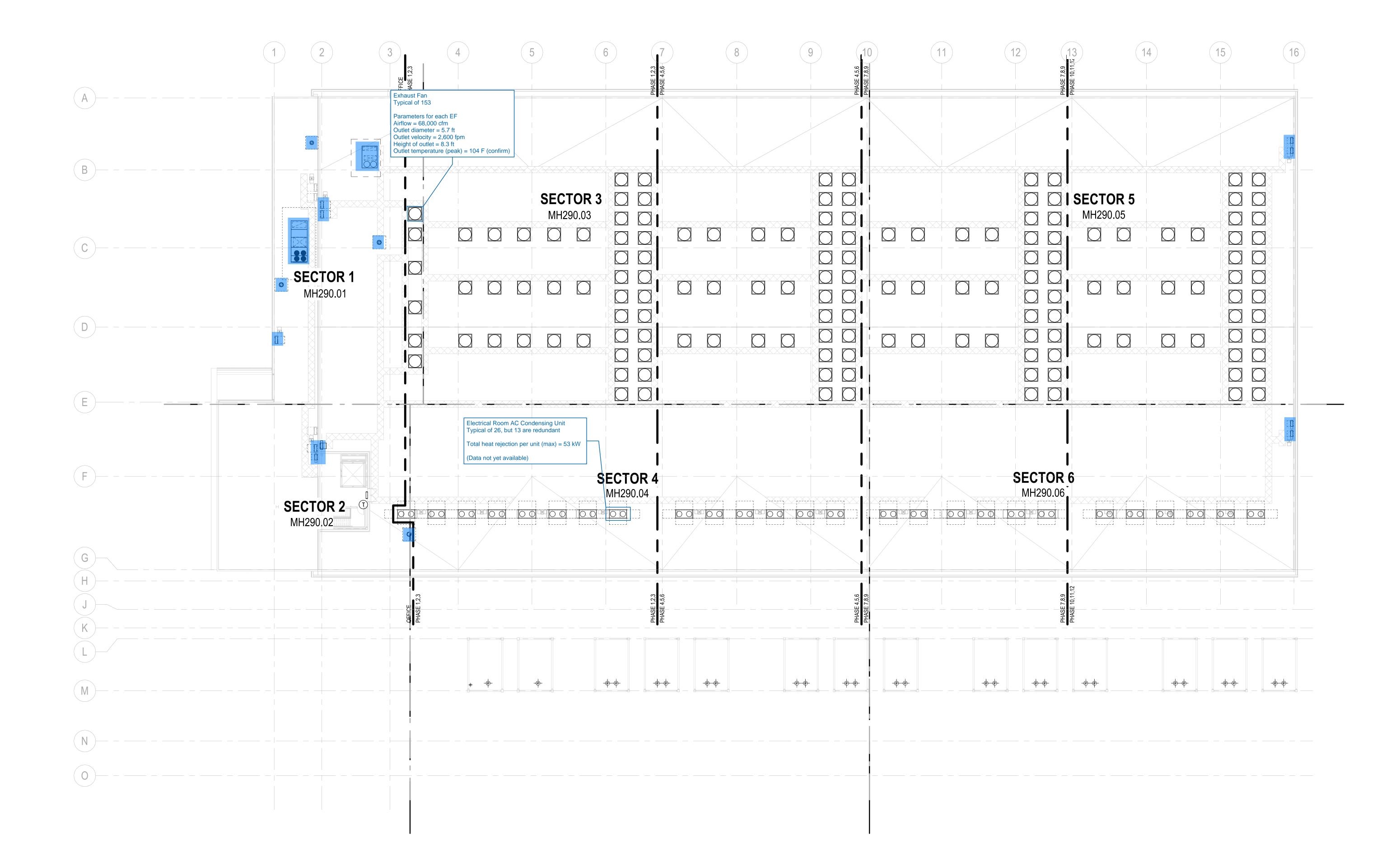
SINGLE Plume Average Vertical Velocities for Single SVY03A Large Emer.Gen Engine, 100% Load, and Maximum Stack Height - Summer Max*

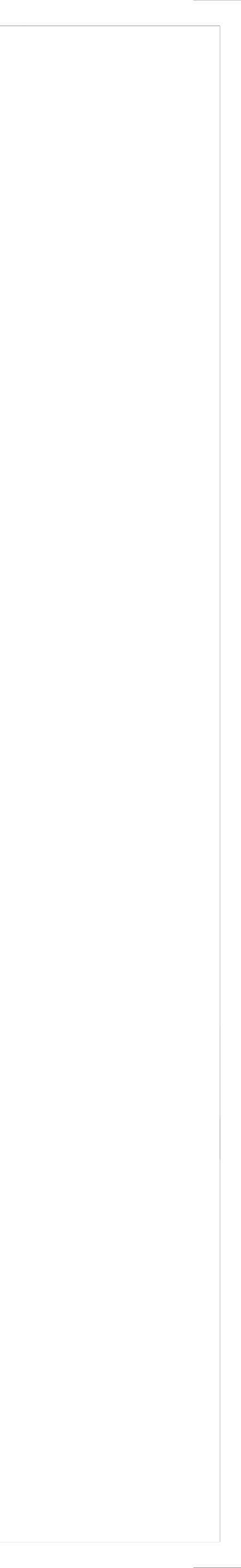
*Summer Max = Monthly Mean of Maximum Daily Temperatures for 1971-2000 (Highest in July) NOAA Sources: Climatography of the United States No.81 "Monthly Station Normals of Temperatures, Precipitation, and Heating and Cooling Degree Days, 1971-2000 California" and Climatography of the United States No. 20 "Monthly Station Climate Summaries, 1971-2000 California"

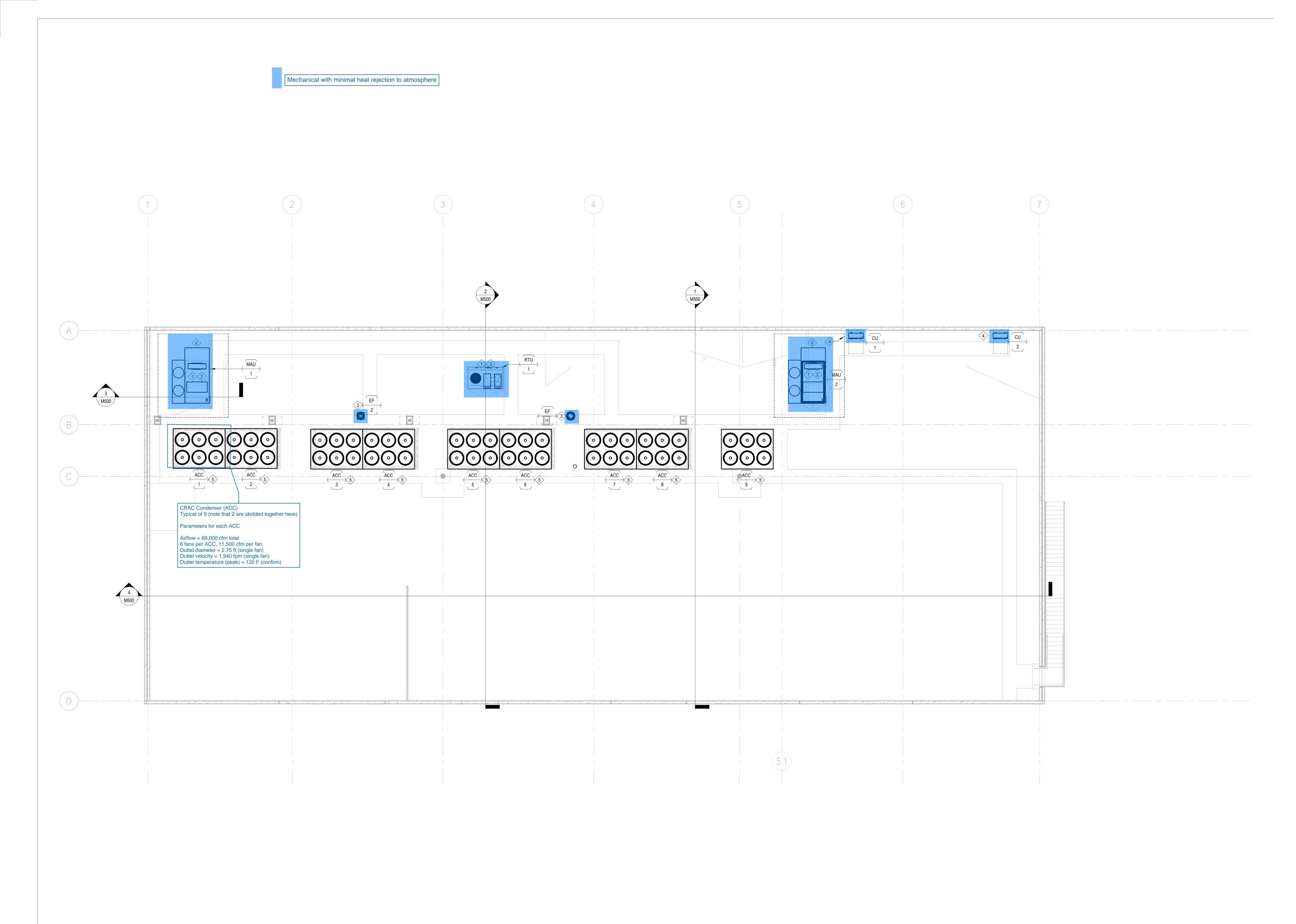
ATTACHMENT TRANS DR-34

Thermal Plume Schematic of Room Mounted Equipment

Mechanical with minimal heat rejection to atmosphere







1 MECHANICAL ROOF HVAC OVERALL PLAN MH203.00 1/8" = 1'-0"

ATTACHMENT TRANS DR-36

Revised Traffic Analysis

MEMORANDUM

То:	Transportation Division City of Hayward
From:	Anthony Vera, P.E. and Elizabeth Chau, P.E. Kimley-Horn and Associates, Inc.
Date:	January 26, 2024
Subject:	Traffic Evaluation Assumptions Memo for STACK Hayward Data Center

The purpose of this memorandum is to state the assumptions for project understanding and methodology in the analysis to identify potential traffic impacts for the proposed STACK Hayward data center (Project) in the City of Hayward (City).

Project Description

The Project is located at 3401-3475 Investment Boulevard in Hayward, California. The project consists of redeveloping the existing 205,556 square feet of industrial uses and constructing 336,164 square feet of data center use. Note that the proposed use consists of 318,700 square feet of data center with two supporting office buildings (14,500 square feet and 2,964 square feet). A site plan, dated August 2023, for the Project is included as **Attachment A**.

Similar to other data centers, the data center will be operational 24-hours, 7-days a week. **Table 1** summarizes the anticipated headcount of personnel and visitors that would be on-site throughout a typical day. It is anticipated that on an average day there will be approximately 45 people at the building throughout the day, with 7-38 people in the building at the same time.

Туре	Daily Persons	Persons Per Shift
Employees	25	3-22 ¹
Security	8	4
Visitors	12	0-12
Total	45	7-38

Table 1: Anticipated Average Daily Headcount

¹ Operational staff work in two shifts: day (22 employees) and graveyard (3 employees)

TRIP GENERATION

A trip generation analysis was conducted to determine the number of trips the Project would generate. The trip generation was determined based on average rates from Institute of Transportation Engineer's (ITE) publication, *Trip Generation, 11th Edition.*

For the existing land uses, ITE Land Use 130: Industrial Park was used to estimate the trip generation for the existing buildings part of the Eden Landing Business Park. Building sizes for the existing buildings part of the Eden Landing Business Park are provided in **Attachment B**. Note, **Attachment B** provides the size of the ground level floor area, whereas many existing buildings have a second level, therefore the sizes of the second level were estimated based on measurements made from aerial imagery.

For the proposed land use, ITE Land Use 160: Data Center for the data center building was used to estimate the trip generation. It is anticipated that the two on-site office spaces will have the same trip generation characteristics as the data center building and are included in the data center land use. **Table 2** presents the trip generation for the project. The project is expected to generate net -360 daily trips, net -33 trips in the AM peak hour, and net -40 trips in the PM peak hour.

Table 2: Project Trip Generation

ITE Land	d Use	Land Use	Size		Sizo		Daily		AM Peak	K		PM Peak	S
Cod	е	Lallu Use			Trips	Rate	In%	Out%	Rate	ln%	Out%		
130)	Industrial Park	1,000 Sq Ft		3.37	0.34	0.81	0.19	0.34	0.22	0.78		
160		Data Center	1,000 Sq Ft		0.99	0.11	0.55	0.45	0.09	0.30	0.70		
	ITE					AM Peak		PM Peak					
Scenario	Land Use Code	Land Use	Size	Units	Daily Trips	Total	In	Out	Total	In	Out		
Existing	130	Industrial Park	205.556	1,000 Sq Ft	693	70	57	13	70	15	55		
Proposed	160	Data Center	336.164	1,000 Sq Ft	333	37	20	17	30	9	21		
	Total	Net New Trips (Proposed -	- Existing)		-360	-33	-37	4	-40	-6	-34		

Source: ITE Trip Generation, 11th Edition

Note:

Existing square footage is based on combination of ground floor areas from existing plans and second level estimates from existing aerials. Proposed land use includes two (2) on-site office buildings.

Level of Transportation Analysis

As of July 1, 2020, the State of California has fully adopted a change in the California Environmental Quality Act (CEQA) significant impact methodology for transportation impacts to use vehicle miles traveled (VMT) as opposed to level of service (LOS) via State Bill 743 (SB 743). To address this change, the City developed and adopted the *City of Hayward Transportation Impact Analysis Guidelines* (TIA Guidelines) to provide screening criteria for determining the level of transportation analysis and requirements for a transportation impact analysis (TIA).

The TIA may consist of CEQA transportation analysis (CTA) and/or supplemental non-CEQA Local Transportation Analysis (LTA). The City's TIA Guidelines outlines criteria for determining the level of transportation analysis for a given project. **Table 3** shows that both CTA and LTA are not required for the Project based on City's TIA Guidelines thresholds. The follow sections describe the details of the screening process.

Analysis	Required?
CEQA Transportation Analysis (CTA)	No
Local Transportation Analysis (LTA)	No

Table 3: Transportation Analysis Requirement Summary

CEQA Transportation Analysis (CTA)

VMT SCREENING

The City's *Transportation Impact Analysis Guidelines* provides guidance on when a project may be exempt from performing CTA VMT analysis if the project meets at least one screening criteria based on:

- Small Infill Projects
- Local Serving Retail
- Local Serving Public Facilities
- Location-Based Screening for Residential Projects
- Location-Based Screening for Office Projects
- Location-Based Screening for Industrial Projects
- Location-Based Screening for Affordable Housing Projects

Project information was evaluated to determine if the Project would be exempt from a VMT analysis and is summarized in **Table 4**. Based on current project information given for this analysis, a VMT analysis **is not required** for the data center use. Detailed evaluation for each criterion is discussed in the following sections.

Table 4: Project CEQA Screening

CEQA Land Use Screening Criteria	Project Exempt?
Small Infill Projects	No
Local Serving Retail	N/A
Local Serving Public Facilities	N/A
Location-Based Screening for Residential Projects	N/A
Location-Based Screening for Office Projects	N/A
Location-Based Screening for Industrial Projects	Yes
Location-Based Screening for Affordable Housing Projects	N/A

Small Project

Small projects are defined as:

- New construction or conversion of small structures up to 10,000 square feet of office
- 15 single-family homes
- 25 multi-family homes
- Projects that generate fewer than 110 average daily trips for other land use.

The Project does not qualify as small project as the Project is converting more than 10,000 square feet of existing building and proposed use exceeds the 110 daily trips threshold.

Local Serving Retail Project

Local Serving Retail Projects are defined as projects that are of 50,000 square feet or less of retail land use. The project does not include any retail land uses; therefore, this criterion does not apply.

Local Serving Public Project

Local Serving Public Projects are projects such as fire stations, passive parks, public utilities, and other similar facilities. The project does not include any of these uses; therefore, this criterion does not apply.

Location-Based Screening for Residential, Office, Industrial, and Affordable Housing Projects

These four screening criteria assume projects in areas of low VMT and/or within a half mile of a major transit stop or corridor and includes low VMT-supporting features that will produce low VMT per capita or per employee. This screening may apply for the following project characteristics:

- Project located either:
 - Within ¹/₂-mile of an existing major transit stop
 - Residential or office projects in an area with low (below the threshold) VMT per capita or per employee and in an area with planned growth
 - Industrial projects in an area with below average VMT per employee and in an area with planned growth
- Density/FAR
 - \circ Office projects with a minimum gross floor area ratio (FAR) of 0.75
 - o Residential projects with a minimum density of 35 units/acre

Page 7

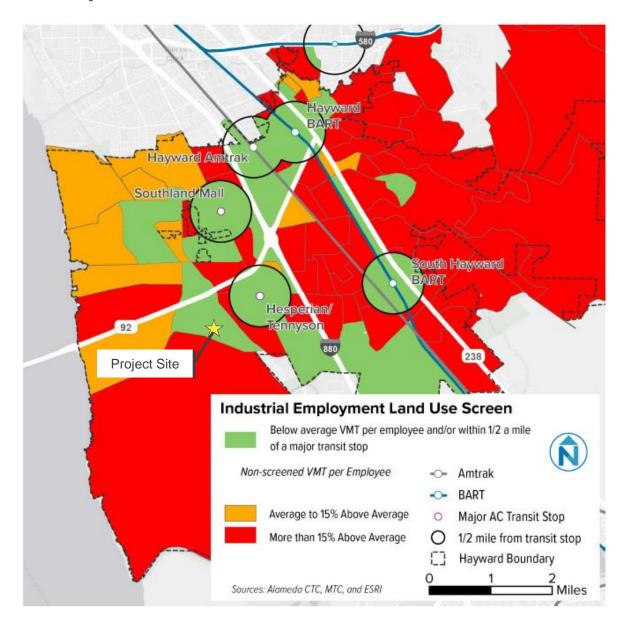


Figure 1: CEQA Transportation Screening Map for Industrial Projects (Figure 6 from City of Hayward Transportation Impact Analysis Guidelines)

Local Transportation Analysis

If deemed necessary, the City may require a local transportation analysis (LTA), to evaluate additional operational or site access analysis. The LTA may include the following analysis:

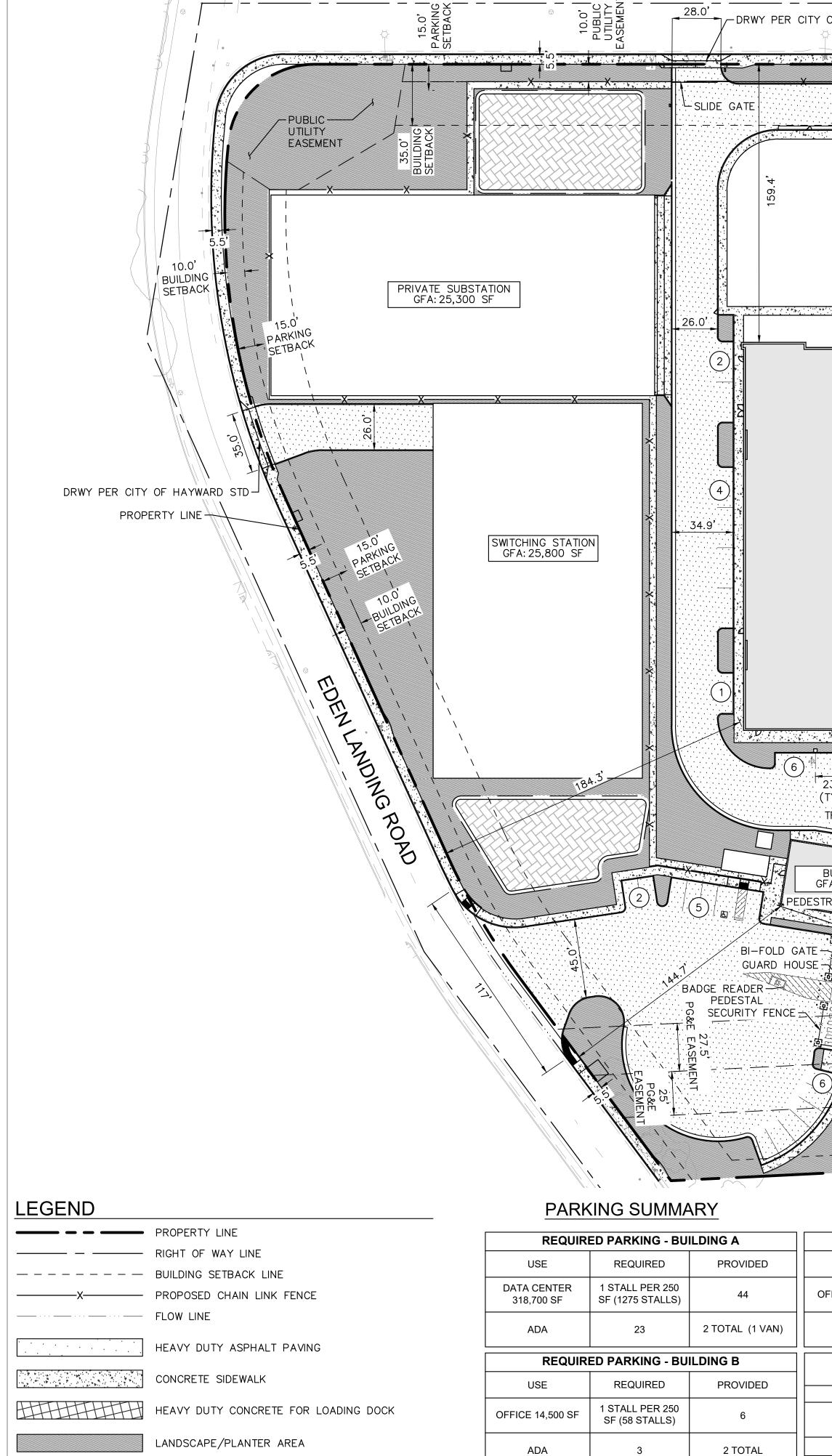
- Vehicle Operations
- Multimodal Operations
- Site Plan Access and Design Review

City staff reviewed Project trip generation, entitlement application, and site plan and determined that that an LTA is not required¹.

Attachment A – Site Plan Attachment B – Site Plan for Existing Building Attachment C – VMT Map

¹ Correspondence with City staff dated January 24, 2024.

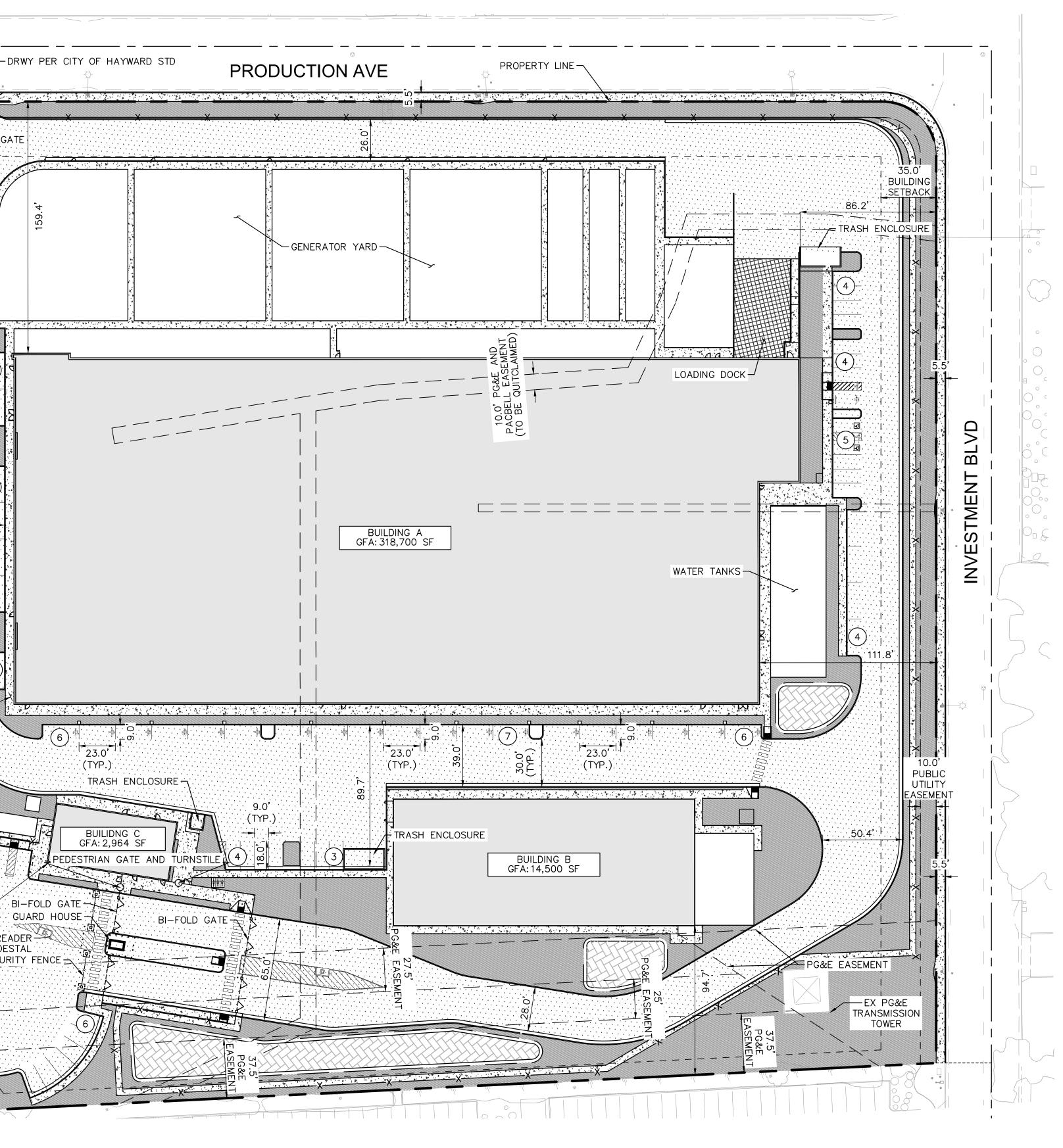
Attachment A – Site Plan



BIORETENTION AREA

 \mathbf{X}

PARKING COUNT



REQUIRED PARKING - BUILDING C						
USE	REQUIRED	PROVIDED				
OFFICE 2,964 SF	1 STALL PER 250 SF (12 STALLS)	13				
ADA 1 1 VAN						
CAL GREEN PARKING REQUIREMENTS (OVERALL CAMPUS)						

REQUIRED

2 TOTAL (1 VAN)

13

3

2

3

PROVIDED

2 TOTAL (1 VAN)

16

3

2

3

STALL TYPE

EV ADA STALL

EV STALL

EVCS STALL

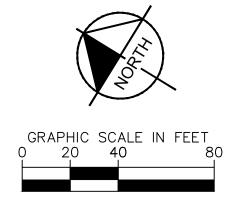
SHORT TERM BIKE

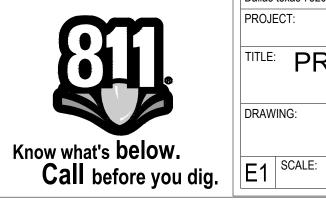
PARKING

LONG TERM BIKE PARKING

OVERALL CAMPUS PARKING SUMMARY

STALL TYPE	REQUIRED	PROVIDED
STANDARD PARKING STALL (9'X18')	1318	58
ADA PARKING	27	5 TOTAL (2 VAN)
TOTAL	1345	63





CONFIDENTIAL					
PRO	JECT ADDRES	S			
	203 PRO YWARI		FION AVE 94545		
PRO	JECT DELIVER	Y PACKAGE			
30)% DE	SIGN	N REVIEW		
SEA	AL/SIGNATURE				
	THESE	ALIATOR ARPROV	MAR AND NOTFORDIN MARKEN NO FRONTING INCOMPLETE CONSTRUCTION INCOMPLETE CONSTRUCTION INCOMPLETE CONSTRUCTION INCOMPLETE CONSTRUCTION		
THE LICENSED PROFESSIONAL SEAL AFFIXED TO THIS SHEET APPLIES ONLY TO THE MATERIAL AND ITEMS SHOWN ON THIS SHEET. ALL DRAWINGS, INSTRUMENTS OR OTHER DOCUMENTS NOT EXHIBITING THIS SEAL SHALL NOT BE CONSIDERED PREPARED BY THIS PROFESSIONAL, AND THIS PROFESSIONAL EXPRESSLY DISCLAIMS ANY AND ALL RESPONSIBILITY FOR SUCH PLAN, DRAWINGS OR DOCUMENTS NOT EXHIBITING THIS SEAL. ISSUE DATE: 14 AUG 2023 PROJECT NO: 25993.000 DESIGNED: HKS ARCHITECT: HKS MARK DATE					
CONFIDENTIAL INFORMATION. THIS DRAWING/DOCUMENT AND ALL DESIGNS, DETAILS, INVENTIONS OR DEVELOPMENTS COVERED OR DERIVED THEREBY ARE CONFIDENTIAL AND THE EXCLUSIVE PROPERTY OF THE OWNER (OR ITS AFFILIATES), WHICH RESERVE ALL RIGHTS IN THIS DRAWING/DOCUMENT. COPYING, REPRODUCTION, DUPLICATION, OR DISTRIBUTION TO A THIRD PARTY, IN WHOLE OR IN PART, IS FORBIDDEN UNLESS EXPRESSLY AUTHORIZED IN WRITING.					
MECHANICAL ENGINEER ESD GLOBAL MIKE YOUNG (312) 372-1200 233 South Wacker Drive Suite 5300 Chicago, Illinois 60606 CIVIL ENGINEER KIMLEY HORN ANTHONY VERA (925) 398-4840 4637 CHABOT DR#300 PLEASANTON, CA94588 ARCHITECT HKS		/e 0	ELECTRICAL ENGINEER ESD GLOBAL ADAM BRENDAMOUR (312) 372-1200 233 South Wacker Drive Suite 5300 Chicago, Illinois 60606 STRUCTURAL ENGINEER HKS DAN GETZ (214) 969-5599 One Dallas Center 350N. Saint Paul Street, Suite 100 Dallas texas 75201 PLUMBING ENGINEER ESD GLOBAL		
(214) 9 One D 350N. Dallas	DUTCH WICKES STEVE WUTHRICH (214) 969-5599 (312) 372-1200 One Dallas Center 233 South Wacker Drive 350N. Saint Paul Street, Suite 100 Dallas texas 75201 Chicago, Illinois 60606 PROJECT: BUILDING A TI				
DRAW	PRE	PL	ARY SITE AN		
		C-	200		

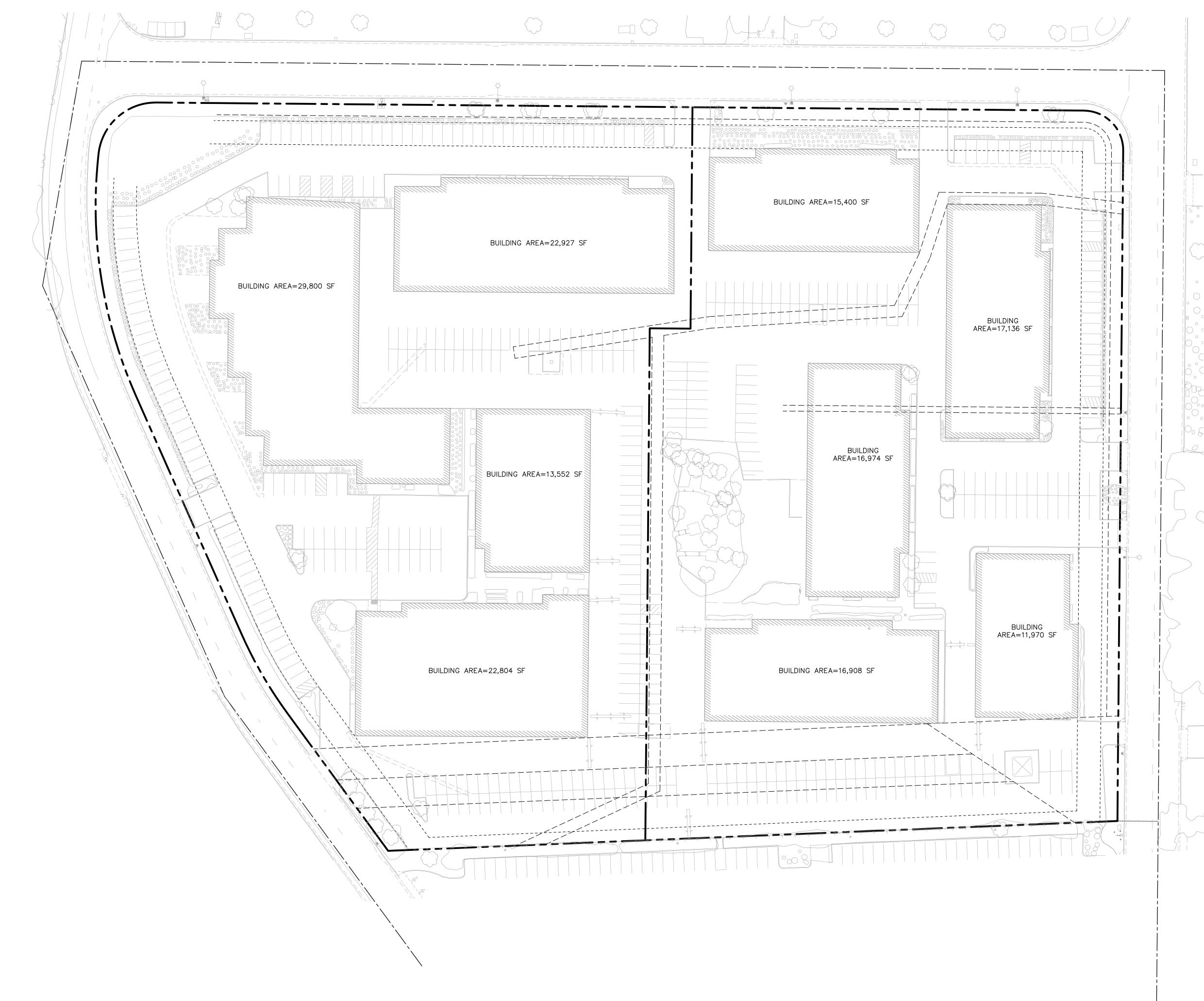
AGILE No:

REV:

Kimley *Whorn*

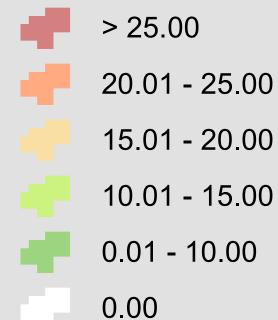
Attachment B – Site Plan for Existing Building

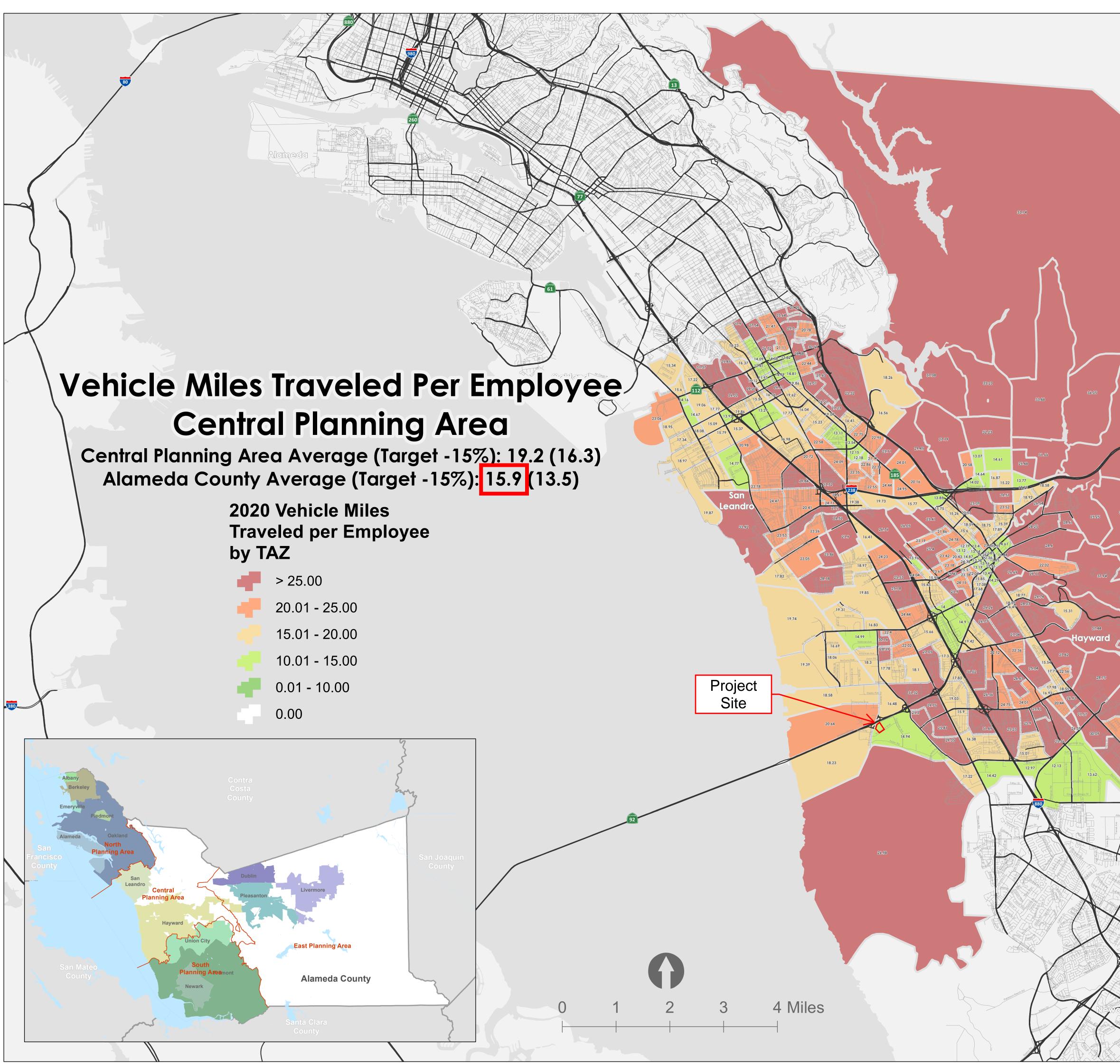
Page 10



Attachment C – VMT Map

Central Planning Area





Data Source: Alameda Countywide Travel Model, Plan Bay Area 2040 version, May 2019

Vehicle miles traveled (VMT) = home-based trips (home-based work, school, shopping/errands, social/recreation) at transportation analysis zone (TAZ) containing residence site

VMT also includes estimates of non-home trips generated by residents at the non-residential end of the homebased trip (e.g. lunch trips from workplace)

VMT per capita = home-based VMT at residence TAZ divided by total population in TAZ

VMT includes all travel within 9-county Bay Area plus San Joaquin County plus estimates of travel distances beyond the 10-county model area

ALAMEDA

County Transportation Commission

TAZs with zero values (white) did not have population in the 2020 model