Williams Aviation Consultants

Williams Aviation Consultants, Inc (Williams) has been retained by Development Partners to review the proposed Troutdale Energy Center project located north of the Portland-Troutdale Airport (TTD) in Troutdale, OR. The purpose of the review was to analyze and determine the validity of objections raised by the Oregon Pilots Association (OPA) which claims the project will significantly impact aeronautical operations and flight safety.

The Federal Aviation Administration (FAA), which has been delegated by Congress with the exclusive authority to maintain the safe and efficient use of the navigable airspace, has also completed a thorough aeronautical study of the Troutdale Energy Project and determined the project would have no adverse impact on TTD operations. Williams has completed an independent aeronautical study based on Federal Aviation Regulation (FAR) Part 77 ***(Appendix 2)*** and reviewed and analyzed each of OPA's objections. Williams has concluded that the FAA analyzed the project correctly, the Troutdale Energy project will not adversely impact TTD operations and OPA's objections are not valid.

An in depth review of each of OPA's objections along with supporting graphics and references can be found in ***Appendix 1***. Below is a brief summary of each OPA objections and Williams' response.

> **OPA Objection** – The energy project will force a significant volume of aeronautical operations to significantly limit their use of Portland Troutdale airspace.
>
> > ***Williams Conclusion: The "use" of airspace is limited when a change to aeronautical procedures reduces the number of operations that can utilize that specific airspace. A study by the FAA as well as Williams' revealed that the Troutdale Energy project will have no impact on Visual Flight Rule (VFR) or Instrument Flight Rule (IFR) procedures. The VFR and IFR procedures are designed to ensure aircraft remain a safe distance from obstacles. Due to the height and location of the structures associated with the Troutdale Energy Project there is no requirement to modify procedures for VFR or IFR aircraft. The stack's plume is not defined by FAA as an obstacle and therefore does not necessitate the need to redesign VFR/IFR procedures.***

8490 South Power Road, Suite 105-181 ◆ Gilbert, AZ 85297 ◆ Office (480) 987-7823 ◆ Fax (602) 513-7388

OPA Objection – The energy project will force required changes to existing VFR arrivals and departures and pattern traffic.

> ***Williams Conclusion: as confirmed by the FAA's and Williams ' aeronautical study, the energy project is in complete compliance with guidelines used to design VFR arrivals, departures and traffic pattern airspace. No changes are necessary; in fact any changes to the procedures would result in the procedures no longer being compliant with the standards used for their design.***

OPA Objection – The energy project will require an alteration to, or the complete elimination of the existing Blue Lake Three Instrument Departure Procedure

> ***Williams Conclusion: as confirmed by the FAA's and Williams' aeronautical study, the energy project will have no impact on the Blue Lake Three Instrument Departure. Additionally, this specific IFR procedure requires aircraft to reach 1000' Above Mean Sea Level ("AMSL") before turning north. This altitude restriction ensures aircraft are never in proximity to the exhaust stack or its plume.***

OPA Objection – The energy project will result in limiting the capacity and efficiency of TTD

> ***Williams Conclusion: The "capacity" and "efficiency" of an airport is reduced when a change to aeronautical procedures reduces the number of operations that can utilize that airport. A study by the FAA as well as Williams' revealed that the Troutdale Energy project will have no impact on Visual Flight Rule (VFR) or Instrument Flight Rule (IFR) procedures. The VFR and IFR procedures are designed to ensure aircraft remain a safe distance from obstacles. Due to the height and location of the structures associated with the Troutdale Energy Project there is no requirement to modify procedures for VFR or IFR aircraft. The stack's plume is not considered an obstacle and therefore does not necessitate the need to redesign VFR/IFR procedures.***

OPA Objection – The energy project will increase safety risks for pilots from reduced visibility within the airspace and plume effects

> ***Williams Conclusion: CH2M Hill performed a CALPUFF modeling analysis of the "Typical and 95th Percentile Plume Dimensions" associated with the Troutdale Energy Center. The analysis revealed that fog created by the stacks, if any, would range in height from 75 to 100 meters (246 to 328 feet) above the stack, and from 100 to 200 meters (328 to 656 feet) laterally from the stack depending upon local wind and weather conditions. The Troutdale stacks are located approximately 3,000 feet north of runway centerline.***

Vertical movement of fog associated with the facility will therefore dissipate well below traffic pattern altitude of 1,000 feet. Lateral movement of fog will also dissipate well away from the runway.

OPA Objection – The energy project will put TTD traffic into conflict with Portland International Airport (PDX) traffic.

Williams Conclusion: ATC coordination between controllers at adjacent facilities is routine and common within the NAS. All air traffic controllers, including those at TTD, are able to allow aircraft under their control to enter adjacent airspace with proper coordination. OPA is incorrect its remarks concerning what TTD air traffic controllers are, or are not, able to do in regard to aircraft operating within the TTD traffic pattern.

Summary:

Both the FAA and Williams conclude that Troutdale Energy Center will not reduce access to the TTD airspace or the capacity or efficiency of TTD; force a change in either IFR or VFR procedures; create a safety risk for pilots; or cause a conflict with PDX traffic.

Response to issues and concerns raised by the Oregon Pilots Association in their Petition for Discretionary Review, dated April 3, 2012 concerning Case No. 2012-ANM-538-OE, 2012-ANM-542-OE, 2012-ANM-546-OE, 2012-ANM-547-OE "Combined Cycle Exhaust Stacks, Simple Cycle Exhaust Stacks, Troutdale, OR" Issued March 19, 2012

INTRODUCTION

A. Description of Petitioner

On April 3, 2012, the Oregon Pilots Association ("OPA") submitted to the Federal Aviation Administration ("FAA") a Petition for Discretionary Review in response to the FAA issuance of Determinations of No Hazard to Air Navigation in connection with the proposed Troutdale Energy Center, the power plant proposed by Troutdale Energy Center, LLC, to be constructed on property adjacent to and on the north boundary of the Portland-Troutdale Airport, currently owned by the Port of Portland." [1]. In their Petition, OPA stated that it was concerned "with the potential threat to the safety of pilot operations and the continued safe use of the Portland-Troutdale Airport (TTD) posed by the Energy Center.

B. Description of Most Effected Airport and Surrounding Airspace

The OPA, in describing the Portland-Troutdale Airport, asserted that "more than 130,000 operations are currently projected for the airport in 2012.

While OPA asserts that more than 130,000 operations are projected for the airport in 2012, they do not provide the source of their forecast. However, OPA's projection of future TTD operations is well in excess of that which is forecasted by the FAA, and which is published in the FAA Terminal Area Forecast (TAF) for the Portland-Troutdale Airport (TTD). Table 1 depicts the FAA TAF, issued January, 2012, for aircraft operations at TTD for the years 2012 through 2020.

[1] Oregon Pilots Association, Petition for Discretionary Review, INTRODUCTION, A. Description of Petitioner, April 3, 2012

APO TERMINAL AREA FORECAST DETAIL REPORT
Forecast Issued January 2012

TTD

	Enplanements			AIRCRAFT OPERATIONS Itinerant Operations					Local Operations					
Fiscal Year	Air Carrier	Commuter	Total	Air Carrier	Air Taxi & Commuter	GA	Military	Total	Civil	Military	Total	Total Ops	Total Tracon Ops	Based Aircraft
REGION:ANM **STATE:**OR **LOCID:**TTD **CITY:**PORTLAND **AIRPORT:**PORTLAND-TROUTDALE														
2012*	0	0	0	8	1.273	17.122	401	18.804	39.367	254	39.621	58.425	0	158
2013*	0	0	0	8	1.273	17.123	401	18.805	39.554	254	39.808	58.613	0	160
2014*	0	0	0	8	1.273	17.124	401	18.806	39.741	254	39.995	58.801	0	162
2015*	0	0	0	8	1.273	17.125	401	18.807	39.929	254	40.183	58.990	0	164
2016*	0	0	0	8	1.273	17.126	401	18.808	40.118	254	40.372	59.180	0	171
2017*	0	0	0	8	1.273	17.127	401	18.809	40.308	254	40.562	59.371	0	173
2018*	0	0	0	8	1.273	17.128	401	18.810	40.499	254	40.753	59.563	0	175
2019*	0	0	0	8	1.273	17.129	401	18.811	40.690	254	40.944	59.755	0	177
2020*	0	0	0	8	1.273	17.130	401	18.812	40.883	254	41.137	59.949	0	179

Table 1

As depicted in Table 1, the FAA projects only 58,425 total operations for 2012. In fact, the FAA forecasts a total of 59,949 total operations for 2020, only 1,524 more operations than in 2012.

The OPA also indicates that TTD operations "have increased by an average of 89% as compared to the previous year, with an increase of more than 100% for four of those six months."[3] It is the FAA which compiles operational traffic data at TDD and was therefore aware of this increase in TTD operations. Nevertheless, the FAA still forecasted TTD 2012 total operations to be limited to 58,425.

Table 2 depicts the FAA Operations Network (OPSNET) report of TTD actual airport operations for the years 2007 through 2011. OPSNET is the FAA official source of air traffic operations reporting.

[3] Oregon Pilots Association, Petition for Discretionary Review, INTRODUCTION, B. Description of Most Effected Airport and Surrounding Airspace, April 3, 2012.

OPSNET : Airport Operations : Standard Report

From 01/2007 To 12/2011 | Facility=TTD

		Itinerant					Local			
Calendar Year	Facility	Air Carrier	Air Taxi	General Aviation	Military	Total	Civil	Military	Total	Total Operations
2007	TTD	11	4,474	30,992	699	36,176	51,192	172	51,364	87,540
2008	TTD	11	2,907	26,286	247	29,451	66,681	32	66,713	96,164
2009	TTD	4	1,275	20,864	235	22,378	46,400	47	46,447	68,825
2010	TTD	0	1,041	19,371	144	20,556	32,760	58	32,818	53,374
2011	TTD	8	1,323	20,159	451	21,941	43,814	338	44,152	66,093
Sub-Total for TTD		34	11,020	117,672	1,776	130,502	240,847	647	241,494	371,996
Total:		**34**	**11,020**	**117,672**	**1,776**	**130,502**	**240,847**	**647**	**241,494**	**371,996**

Report created on Mon Apr 30 11:26:10 EDT 2012
Sources: The Operations Network (OPSNET)

Table 2

As depicted in Table 2, TTD total operations were 66,093 for the year 2011. Considering the FAA forecast of 58,425 operations for 2012, it is clear that the FAA is expecting a decline, rather than an increase in TTD operations for 2012 and subsequent years.

Additionally, in 2011 local aircraft operations outnumbered itinerant operations by a ratio of over 2:1. This indicates that the level of Troutdale operations is highly dependent upon local flight school business and not upon Troutdale as a popular "destination airport."

BASIS FOR PETITION

1. The Determination

On March 12, 2012, the FAA's Obstruction Evaluation Service (OES) issued Determinations of No Hazard to Air Navigation for Aeronautical Studies 2012-ANM-538-OE, 2012-ANM-542-OE, 2012-ANM-546-OE and 2012-ANM-547-OE.[4]

The FAA is the sole entity charged by the United States Congress with the responsibility for insuring the safety of the National Airspace System (NAS). As such, in the United States the FAA is the sole determiner of safety and regulatory issues associated with activities carried out in the NAS.

[4] Oregon Pilots Association, Petition for Discretionary Review, Basis for Petition, 1. Determination, April 3, 2012

One of the means by which the FAA carries out their responsibility is through the administration of the provisions of Title 14 of the Code of Federal Regulations, 14 (CFR) Part 77, *Objects Affecting Navigable Airspace* (FAR Part 77). FAR Part 77 *e*stablishes standards for determining obstructions in the navigable airspace, sets forth the requirements for providing notice to the FAA when a project proponent desires to erect a structure and provides for aeronautical studies of those structures in order to determine their effect on the safe and efficient use of the national airspace.[5]

Notification

The construction and erection of tall structures in the vicinity of airports (and other areas) has the potential to negatively impact the safety of the NAS. Therefore, in order to protect pilots from encountering unexpected structures, the FAA requires proponents of such projects to notify the FAA of such proposed construction.

The FAA requires that notification of off-airport projects such as the proposed Troutdale Energy Center be made to the FAA's Obstruction Evaluation Service (OES) which administers obstruction evaluation studies with the assistance of the Airports Division, Technical Operations Services, Frequency Management, Flight Standards Division, Flight Procedures Office and military representatives.[6]

Aeronautical Study

After receiving notification, the FAA conducts an aeronautical study in which they undertake a study of the effect of the proposal upon the operation of air navigation facilities and the safe and efficient utilization of the navigable airspace.[7] In conducting its aeronautical study, the FAA will make a determination as to whether or not the proposed structure meets the definition of an "Obstruction" by evaluating its position and height against one or more of a complex structure of imaginary surfaces established under FAR Part 77 in relation to each runway at civil airports.[8] The size of each imaginary surface is based on the category of each runway according to the type of instrument approach available or planned for that runway.

FAA Order 7400.*2, Procedures for Handling Airspace Matters* makes clear the fact that the FAA's obstruction evaluation program is a multi-disciplinary effort which transcends organizational lines. In order to determine the effect of a proposed structure on the navigable airspace, the OES distributes the proposal to other FAA offices that then perform their own evaluation of the proposed structure.[9] Areas of responsibility are delegated as follows:

---

[5] FAR Part 77.1 Scope
[6] FAA Order 7400.2 *Procedures for Handling Airspace Matters*, paragraph 5-2-2 Processing
[7] FAR Part 77.35 (a) Aeronautical Studies
[8] FAR Part 77.25 Civil Airport Imaginary Surfaces
[9] FAA Order 7400.2 *Procedures for Handling Airspace Matters*, paragraph 6-3-6 Responsibility

Air Traffic Services has the responsibility for identifying the effect of the proposed structure on existing and planned aeronautical operations, air traffic control procedures and airport traffic patterns, makes recommendations for mitigating adverse effect including marking and lighting recommendations and issues the final Determination.

The **Airports Division** evaluates the effect of the structure on the physical airport in regard to airport design criteria and determines the effect on the efficient use of airports and the safety of persons or property on the ground. The Airports Division also evaluates the proposed structure in light of its effect on planned or future airport development programs.

The **Flight Standards Division** identifies the effect of the proposed structure on terminal operations and other concentrations of VFR traffic.

The **Flight Procedures Office** identifies the effect on Terminal Instrument Procedures by performing an evaluation under the provisions of the U. S. Standard for Terminal Instrument Operations (TERPS). In addition to the imaginary surfaces specified under Part 77, TERPS specifies an additional array of complex imaginary surfaces which serve as obstruction clearance buffers for pilots executing Instrument Approach Procedures (IAP) to airports such as the NDB or GPSA IAP at Portland-Troutdale Airport.

The **Technical Operations Service** identifies any electromagnetic and/or physical effect on air navigation and communications facilities. One example is the current proliferation of wind turbine construction projects. As part of the FAA aeronautical study, the Technical Operations Service investigates any proposed wind turbines in regard to possible interference with FAA and military RADAR installations.

Military personnel are responsible for evaluating the structures effect on the airspace and routes used by the military.

Issuing Determinations

Once all FAA offices have completed their portions of the aeronautical study, the OES issues a determination as to whether or not the structure constitutes a "Hazard to Air Navigation." In formulating and issuing determinations, the OES considers all known facts revealed in the aeronautical study. The final Determination is a composite of all comments and findings received from the other FAA offices.[10]

Troutdale Energy Center Determinations of No Hazard to Air Navigation

On **March 19, 2012**, Troutdale Energy Center, LLC received Determinations of No Hazard to Air Navigation from the FAA in response to the Notice of Proposed Construction or Alteration

[10] FAA Order 7400.2 *Procedures for Handling Airspace Matters*, paragraph 7-1-1 Policy

previously submitted to the FAA in accordance with the notification requirements set forth in FAR Part 77. The Determination of No Hazard to Air Navigation specified that the FAA had conducted an aeronautical study on the proposed structure and exhaust stack and cooling structures, and that the study revealed that the structure **does not exceed obstruction standards and would not be a hazard to air navigation.**[11]

Note: Not only did the proposed structure not pose a hazard to Visual Flight Rules (VFR) operations on and in the vicinity of Troutdale Airport, but neither did it pose a hazard to Instrument Flight Rules (IFR) operations being conducted on the NDB or GPS-A Instrument Approach Procedure.

2. OES' Failure to Evaluate Effect of Plant Operations

Issue 1: The OPA states "Significantly, no consideration was given to the unpredictable clear-air turbulence and super-heated high-velocity exhaust gasses that will, by definition and design, penetrate well beyond Part 77 surfaces vertically and laterally into heavily used navigable airspace…"[12]

While the FAA Determinations of No Hazard to Air Navigation do not specifically address the thermal plume associated with the Troutdale Energy Center stack, the FAA is fully aware of the effects of industrial thermal plumes and has, therefore, given the effects of the plume full consideration. In January, 2006, the FAA completed a Safety Risk Analysis of Industrial Exhaust Plumes. The results of that study are as follows:

Safety Risk Analysis of Aircraft Over flight of Industrial Exhaust Plumes (DOT-FAA-AFS-420-06-1) January, 2006

For the purposes of this Study, the FAA was tasked with performing a Safety Risk Analysis of over flights of vertical exhaust plumes. The FAA formed a team of FAA subject matter experts from various disciplines, including aviation safety, risk analysis/assessment, human factors, aeronautical engineering, air traffic control, statistical analysis and military/civil and commercial aviation, each providing a high level of expertise and experience to examine the issue.

The team determined that the FAA Safety Risk Management methodology contained in the FAA Safety Management System Manual would be an appropriate vehicle to perform their analysis. The FAA Safety Management System Manual was formulated under guidance from the International Civil Aviation Organization (ICAO).[13] Therefore, the FAA Safety Risk Analysis

---

[11] FAA Determinations of No Hazard to Air Navigation, 2012-ANM-538-OE, 2012-ANM-542-OE, 2012-ANM-546-OE, 2012-ANM-547-OE

[12] Oregon Pilots Association, Petition for Discretionary Review, Basis for Petition, 2. OES' Failure to Evaluate Effect of Plant Operations, April 3, 2012

[13] ICAO, composed on 190 member states (including the United States) is a major agency of the United Nations which codifies the principles and techniques of international air navigation. ICAO issues Standards and Recognized

methodology and process meets all established federal and international aviation norms as to hazard determination and Safety risk Analysis.

Methodology

ICAO Annex 11 requires that member States develop safety programs and ICAO Doc 9859 is the ICAO *Safety Management Manual.* The United States, as a member State, subsequently issued the FAA SMS Manual which complies with ICAO Standards and Recommended Practices, including the provision for Safety Risk Analyses, the methodology utilized by the FAA team in their Safety Risk Analysis of the MEP effluent plumes. Therefore, it should be noted that the methodology employed by the FAA was in compliance with not only their own directives, but also with the international standards and practices established by ICAO, the recognized international aviation body.

Discussion

The Analysis Team reviewed safety data and associated literature:

- NASA Aviation Safety reporting System
- FAA National Accident/Incident Data System
- NTSB Aviation Database & Synopsis
- Aeronautical Information Manual
- FAR Part 77, *Objects Affecting Navigable Airspace*
- FAR Part 91, *Careless or Reckless Operation* and *Minimum Safe Altitudes*
- FAA Safety Management System Manual
- Australian Government Civil Aviation Authority Advisory Circular AC-139-05, *Guidelines for Conducting Plume Rise Assessments*

Identified Potential Hazards[14]

The underlying presumption of the Analysis was that high efflux temperature or velocity from industrial facilities may cause air disturbances via exhaust plumes.[15] As such, two potential hazards were identified for the purposes of the Safety Risk Analysis.

The first potential hazard was turbulence that may be associated with plumes that could result in possible airframe damage and/or negative effects on aircraft stability.

Practices (SARP) for all world-wide civil aviation interests and each member state agrees to conform to SARPs issued by ICAO.

[14] FAA Safety Risk Analysis of Aircraft Over flight of Industrial Exhaust Plumes, Section 2, January, 2006
[15] FAA Safety Risk Analysis of Aircraft Over flight of Industrial Exhaust Plumes, Executive Summary, iii, January, 2006

The second potential hazard was the possible adverse effect of high levels of water vapor, engine/aircraft contaminants, icing, and restricted visibilities produced by the plumes.

At the completion of the Safety Risk Analysis, the Team concluded that the current likelihood of an accident or incident caused by an over flight of an exhaust plume is acceptably small, without further mitigation."[16] Therefore, the precise concerns raised by the OPA in regard to the proposed Troutdale Energy Center have been thoroughly investigated, analyzed and discounted by the FAA.

Safety

Safety is defined as "the state of being safe; freedom from the occurrence or risk of injury, danger, or loss"[17]. Every day pilots engage in activities which carry with them some degree of risk such as mechanical or structural failure. To assure such risks are at an acceptability low level, the FAA determines what the acceptable level of risk is for any given issue and establishes parameters which assure, through inspection and repair if appropriate, continued low risk operation. When aircraft age/operating hours are high enough to generate safety/reliability concerns and repair is not feasible, the FAA will permanently ground an aircraft if operational safety cannot be assured.

Probability of an Accident Occurring Involving the Over flight of an Exhaust Plume

A Safety Risk Assessment specifies that statistical analysis be performed in which a "target level of safety" is derived. In attempting to derive a target level of safety for over flight of exhaust plumes, one difficulty was that accidents and incidents have been non-existent.[18] Therefore the FAA determined that a target level of safety for general aviation would be specified which included incidents per flight hour and fatal accidents per flight hour as the units in the development of the target level of safety.[19]

- The target level of safety was determined to be 1 chance in 10 million of a general aviation incident or fatal accident occurring.
- The accident/incident rate for over flights of exhaust plumes was determined to be 1 chance in 1 billion or less.

Since the target level of safety was determined to be 1 chance in 10 million and the accident/incident rate for over flights of exhaust plumes was determined to be 1 chance in 1 billion or less, or **100 times safer** than that specified in the target level of safety, the FAA

[16] FAA Safety Risk Analysis of Aircraft Over flight of Industrial Exhaust Plumes, Conclusions, January, 2006
[17] Dictionary.com. July 13, 2012
[18] FAA Safety Risk Analysis of Aircraft Over flight of Industrial Exhaust Plumes, Section 3, January, 2006
[19] FAA Safety Risk Analysis of Aircraft Over flight of Industrial Exhaust Plumes, Section 3, January, 2006

concluded that the probability of an accident or incident from over flight of an exhaust plume is extremely low.[20]

The Safety Analysis team concluded not so much that plumes were not hazards or that they present zero risk, but that pilots operating within the NAS have been and will continue to apply prudence and common sense skills to constantly "see and avoid" any potential hazard. These mitigating techniques are employed every day by pilots throughout the NAS.[21]

Human Factors Assessment

The FAA concluded that any plume encounter would be a relatively benign event. The pilot's mental and/or physical resources would not be so task-overloaded as to preclude a safe maneuver out of and away from the condition.[22]

Summary of Team Deliberations[23]

- Hazards associated with plume over flight represent an extremely low risk to aviation and the flying public
- Plume over flight at an altitude of less than 1,000 feet above the source could possibly result in aircraft upset and a resultant incident or accident
- Low, close-in operations to small to medium size airports by General Aviation aircraft under 12,500 lbs. and those in the light Sport category would be of greatest potential concern
- Plume effects on aircraft, engine component function and/or corrosion were deemed inconsequential.
- The Australian Government Civil Aviation Safety Authority flight restriction of 4.3 m/s above OLS or 110 meters AGL was less restrictive than the FAR Part 91 restrictions previously mentioned.

Conclusions from the Safety Risk Analysis [24]

- The likelihood of an accident or incident caused by an over flight of an exhaust plume is acceptably small.
- Current regulations and advisories as well as the present Notice to Airmen (NOTAM) and Temporary Flight Restrictions (TFR) should preclude prudent pilots from flying through or near plumes, thereby making the aviation risk **essentially zero.**

---

[20] FAA Safety Risk Analysis of Aircraft Over flight of Industrial Exhaust Plumes, Sections 3,5, January, 2006

[21] FAA Safety Risk Analysis of Aircraft Over flight of Industrial Exhaust Plumes, Section 5, January, 2006

[22] FAA Safety Risk Analysis of Aircraft Over flight of Industrial Exhaust Plumes, Human Factors Assessment, January, 2006

[23] FAA Safety Risk Analysis of Aircraft Over flight of Industrial Exhaust Plumes, Section 4, January, 2006

[24] FAA Safety Risk Analysis of Aircraft Over flight of Industrial Exhaust Plumes, Conclusions, January, 2006

- Flight over or around plume generating facilities should be avoided as there is the **potential** (however low) for aircraft upset at close proximity to high velocity plumes.

Recommendations from the Safety Risk Analysis

Given the extremely low risk these plumes present, **further mitigation is not required.** However, the risk assessment team recommended that the FAA continue to enhance pilot awareness programs such as pilot education programs, communication, and advisement and avoidance strategies.[25]

The FAA recommended the following:[26]

- Amend the Aeronautical Information Manual (AIM) with wording to the effect that over flight at less than 1,000 feet vertically of plume generating industrial sites should be avoided.
- Publish the position and nature of power plants located near public airports in the Airport/Facility Directory and issue a Notice to Airmen (NOTAM) when operationally necessary.
- Make the current Temporary Flight Restriction (TFR) that includes the over flight of power plants (for national security purposes) a permanent flight restriction where operationally feasible.
- Internal FAA orders and advisory Circulars should be amended to address exhaust plume issues.

Issue 2: The OPA states "Significantly, no consideration was given to the unpredictable clear-air turbulence and super-heated high-velocity exhaust gasses that will, by definition and design, penetrate well beyond Part 77 surfaces vertically and laterally into heavily used navigable airspace, **located directly beneath the TTD north downwind pattern** used by all fixed wing aircraft at 1000 feet AMSL and helicopters at 550 feet AMSL."[27]

Troutdale airport is equipped with a part time Airport Traffic Control Tower (ATCT). The ATCT is in operation from 0700-2200 daily and during the time when the ATCT is operational, air traffic controllers organize and direct airport arrivals, departures, and VFR traffic pattern operations.

---

[25] FAA Safety Risk Analysis of Aircraft Over flight of Industrial Exhaust Plumes, Recommendations, January, 2006
[26] FAA Safety Risk Analysis of Aircraft Over flight of Industrial Exhaust Plumes, Recommendations, January, 2006
[27] Oregon Pilots Association, Petition for Discretionary Review, Basis for Petition, 2. OES' Failure to Evaluate Effect of Plant Operations, April 3, 2012

During the hours in which the ATCT is not operational, VFR pilots adhere to the provisions of FAA Advisory Circular AC 90-66A, *Recommended Standard Traffic Patterns and Practices for Aeronautical Operations at Airports without Operating Control Towers.*

FAA Advisory Circular AC 90-66A, *Recommended Standard Traffic Patterns and Practices for Aeronautical Operations at Airports without Operating Control Towers*

At all non-towered airports, as well as when the TTD ATCT is not operational, the FAA, by means of Advisory Circular AC 90-66A prescribes and recommends traffic patterns and operational procedures for aircraft, lighter than air, glider, parachute, helicopters and ultra-light aircraft..

All student pilots, as an element of their flight training receive instruction in regard to the provisions contained in AC 90-66A. In order to obtain a Private Pilot license, student pilots must demonstrate knowledge of and proficiency in the performance of the practices recommended in this Advisory Circular before an FAA examiner.

Portland-Troutdale Airport (TTD) Runway 7/25 VFR Traffic Pattern Location

TTD has a standard VFR traffic pattern, meaning that both Runway 7 and Runway 25 have left traffic patterns. Therefore, the Runway 7/25 traffic patterns are located both to the north and to the south of the runway.

TTD Runway 7/25 Fixed Wing Traffic Pattern Altitude and Width

AC 90-66A recommends that aircraft observe a 1,000 foot above ground level (AGL) traffic pattern altitude. This is the case at TTD. Pilots may vary the size of the traffic pattern depending on the aircraft's performance characteristics.[28]

Although traffic pattern widths vary with aircraft performance characteristics, aircraft normally remain within ¾ to 1 mile of the runway. Flight track data revealed the average TTD downwind leg is located approximately .8 nautical miles from the runway. Since the Troutdale Energy Center is located about ½ miles from the runway, aircraft operating in the Runway 7/25 fixed wing traffic pattern will remain at least 1/4 mile laterally and 860' vertically from the Troutdale Energy Center.

TTD Runway 7/25 Rotary Wing Traffic Pattern Altitude and Width

Helicopter traffic patterns are located closer to the runway and also to the north and south of the field at either 550 AMSL or 800 AMSL.

---

[28] FAA Advisory Circular AC 90-66A, *Recommended Standard Traffic Patterns and Practices for Aeronautical Operations at Airports without Operating Control Towers,* Recommended Standard Traffic Pattern

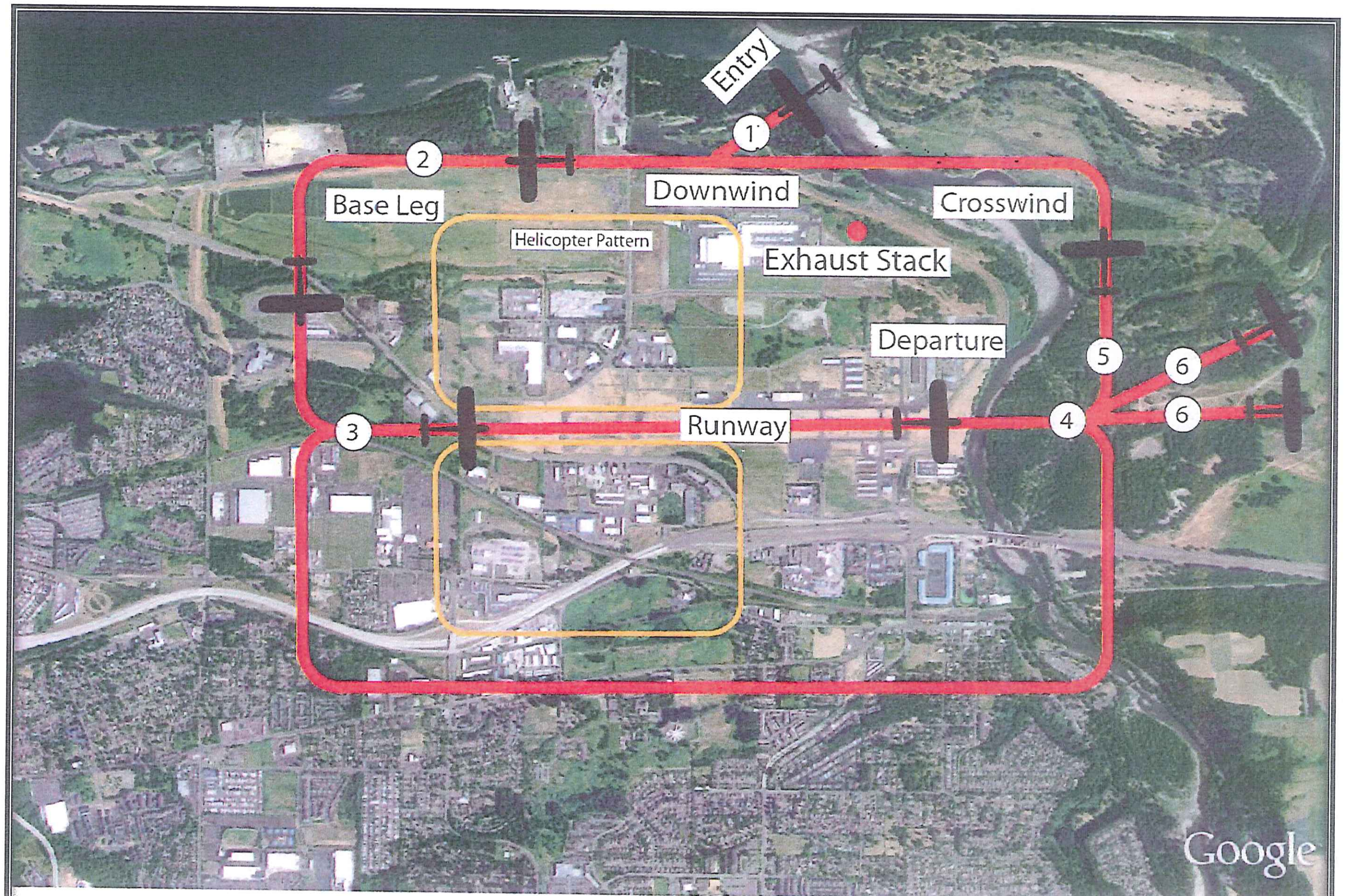
AC 90-66A Prescribed Traffic Pattern Entry Procedure

The FAA recommends that arriving aircraft should be at the appropriate traffic pattern altitude before entering the traffic pattern, and that entry to the downwind leg of the traffic pattern should be at a 45 degree angle abeam the midpoint of the runway.[29]

Troutdale Energy Center location in regard to the "45" Entry to Runway 7/25

Pilots operating in compliance with the FAA recommended practice for traffic pattern entry will enter the downwind leg of the Runway 7/25 traffic pattern at a 45 degree angle abeam the midpoint of the runway. The ground track of these aircraft does not pass over the Troutdale Energy Center location, and it would not be necessary for a pilot to overfly the facility.

[29] FAA Advisory Circular AC 90-66A, *Recommended Standard Traffic Patterns and Practices for Aeronautical Operations at Airports without Operating Control Towers,* Recommended Standard Traffic Pattern



1. Enter pattern in level flight, abeam the midpoint of the runway, at pattern altitude. (1,000' AGL is recommended pattern altitude unless established other
2. Maintain pattern altitude until abeam approach end of the landing runway on downwind leg.
3. Complete turn to final at least ¼ miles from the runway.
4. Continue straight ahead until beyond departure end of runway.
5. If remaining in the traffic pattern, commence turn to crosswind leg beyond the departure end of the runway within 300 feet of pattern altitude.
6. If departing the traffic pattern, continue straight out, or exit with a 45 degree turn (to the left when in a left-hand traffic patter; to the right when in a right traffic pattern) beyond the departure end of the runway, after reaching pattern altitude.

Exhibit 1 – TTD VFR Traffic Pattern

Troutdale Energy Center Location in Regard to the North Downwind Traffic Pattern

As depicted in *Exhibit 1* contrary to the assertion of the OPA, the Troutdale Energy Center is not located beneath the north downwind pattern of either fixed wing or helicopter type aircraft.

Aircraft Accidents Related to Turbulence

It is the extreme turbulence associated with thunderstorm clouds that is the cause of turbulence related accidents. Light turbulence does not cause aircraft accidents, and pilots are neither surprised nor startled and do not lose control of aircraft (even temporarily) in light turbulence.

The turbulence an aircraft would experience while inadvertently flying over an exhaust plume would be classified as "light turbulence" and would be felt as a slight "bump." The "bump" would not only be classified as "light," but would be of less than one second in duration , be generated by a rising air current and would cause, at the most, a momentary and slight increase in altitude. An aircraft encountering such a 'bump" would be in absolutely no danger of crashing. In the extreme, these aircraft would actually experience an increase in altitude of only a few feet.

The FAA, in their Safety Risk Analysis of Aircraft Over flight of Industrial Exhaust Plums, stated "We would expect that any plume encounter would be a relatively benign event. The pilot's mental and/or physical resources would not be so task-overloaded as to preclude a safe maneuver out of and away from the condition."[30] This encounter would be benign to the extent that that this would be true for both the experienced and student pilot alike.

Helicopters, Sail planes (e.g. gliders) Ultra-light Aircraft

Since airport operators routinely establish local procedures for the operation of gliders, parachutists, helicopters and ultra-light aircraft, the FAA, in AC 90-66A also specifies recommended traffic patterns and practices for those aircraft.[31]

Since the speeds of gliders, helicopters and ultra-light aircraft are not compatible with fixed wing aircraft, the FAA recommends that the traffic patterns of these aircraft be segregated from the fixed wing traffic pattern.

Helicopters approaching to land are to avoid the flow of fixed wing aircraft, and are to fly a pattern similar to fixed wing aircraft but lower and closer to the runway.[32] Common practice is to enter the helicopter traffic pattern by approaching the airport midfield. Likewise, helicopters

[30] FAA Safety Risk Analysis of Aircraft Over flight of Industrial Exhaust Plums, P.11, January, 2006

[31] FAA Advisory Circular AC 90-66A, *Recommended Standard Traffic Patterns and Practices for Aeronautical Operations at Airports without Operating Control Towers,* Other Traffic Patterns page 3.

[32] *Ibid* page 3

generally depart the airport from a midfield position and exit perpendicular to the active runway. Utilizing these standard procedures will position an approaching or departing helicopter well clear of the Troutdale Energy Center.

Glider traffic patterns are also inside the pattern of fixed wing aircraft. A "Glider Operating Area" and glider operations have not been established at the Troutdale Airport.

Ultra-light aircraft, like helicopters are to fly a pattern similar to fixed wing aircraft but lower and closer to the runway.[33] In each case, none of these other aircraft will be required to overfly the Troutdale Energy Center (at any altitude) during their 45 degree traffic pattern entry procedure.

In summary, the Troutdale Energy Center will not impact fixed wing, helicopter, glider or ultra-light operations at the Troutdale Airport.

Careless Pilots

Some careless pilots may choose to operate their aircraft contrary to FAA safety recommendations, ignore current over-flight restrictions and choose to not only overfly an exhaust plume, but to do so at an extremely low altitude. Even in remote cases such as this, turbulence generated by the Troutdale Energy Center exhaust plume will have minimal effect on aircraft stability and controllability.

In the case of careless pilots who choose to operate their aircraft contrary to FAA safety recommendations, ignore current over-flight restrictions, exhibit no common sense and choose to not only overfly an exhaust plume, but to do so at an extremely low altitude, the effect of turbulence on their aircraft will be momentary and minimal.

Plume Velocity Study

A plume velocity study was completed by CH2M Hill to determine the extent to which exhaust leaving the gas powered turbines will affect changes to air velocity at a height 1,000 ft AGL which is the standard height of aircraft operating in the VFR Traffic pattern while in the downwind/upwind leg. ***Table 3*** and ***Table 4*** display the results of the Plume Velocity Study. Exhaust plume velocity at 1,000 ft AGL has been calculated to be less than 7.53 MPH.

[33] *Ibid* page 4

Mitsubishi Combined Cycle Turbine						
Case Number	Case 1	Case 5	Case 7	Case 8	Case 12	Case 14
Load	1x100% CTG	1x100% CTG	1x100% CTG	1x100% CTG	1x100% CTG	1x100% CTG
Ambient Temp/RH	0F/95%RH	59F/60%RH	108F/15%RH	0F/95%RH	59F/60%RH	108F/15%RH
Duct Firing?	Unfired	Unfired	Unfired	Fired	Fired	Fired
Fuel	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas
Stack Exit Temperature, F	198	195	191	191	187	183
Stack Diameter, ft	25	25	25	25	25	25
Stack Height (ft)	159	159	159	159	159	159
Stack Flow, acfm	1474130	1312248	1168974	1467025	1308136	1165327
Stack Exit Velocity, ft/s	52	46	41	52	46	41
Horizontal Wind Speed (m/sec)	0.5	0.5	0.5	0.5	0.5	0.5
Plume Velocity at 1000 ft AGL						
m/sec	3.05	2.47	1.77	3.00	2.33	1.69
mph	6.82	5.53	3.95	6.71	5.21	3.78

Table 3

GE LMS 100 Turbine (EACH)			
CH2M HILL Case Number	1	5	9
Kiewit Case Number	200	208	224
Ambient Conditions (F)	108	59	0
MMBtu/hr	816.53	844.97	822.72
Evap	EVAP	NONE	EVAP
Fuel	NG	NG	NG
Load	100	100	100
Stack Exit Temperature, F	798	784	753
Stack Height (ft)	90	90	90
Stack Diameter, ft	13.5	13.5	13.5
Stack Flow, lb/hr	1706400	1774440	1798920
Stack Flow, acfm	929026	954750	943472
Stack Exit Velocity, ft/s	108	111	110
Exit Velocity, m/sec	32.97	33.88	33.48
Horizontal Wind Speed (m/sec)	0.5	0.5	0.5
Plume Velocity at 1000 ft AGL			
m/sec	3.14	3.28	3.37
mph	7.02	7.34	7.53

Table 4

Table 5 depicts the classification of turbulence an aircraft could encounter during over flight of the proposed Troutdale Energy Center Exhaust Plume at 1,000 ft AGL based on the plume velocity studies. The change in air velocity resulting from the exhaust stack will result in no more than light turbulence.

Aviation Weather Turbulence Classifications*

		Velocity at 1000 ft AGL	Light Turbulence 3.4 MPH to 13.6 MPH	Moderate Turbulence 13.6 MPH to 23.9 MPH	Severe Turbulence 23.9 MPH to 34.1 MPH
Mitsubishi Combined					
	Case 1	6.82 MPH	---------^		
	Case 5	5.53 MPH	-----^		
	Case 7	3.95 MPH	-^		
	Case 8	6.71 MPH	---------^		
	Case 12	5.21 MPH	----^		
	Case 14	3.78 MPH	-^		
GE LMS 100 Turbine (EACH)					
	Case 1	7.02 MPH	----------^		
	Case 5	7.34 MPH	-----------^		
	Case 9	7.53 MPH	-----------^		

* Source: Aviation Weatther, Peter F Lester, Jeppesen Sanderson Training Products 1995

FAA Descriptions of Turbulence:

Light:	Causes slight, rapid and somewhat rhythmic bumpiness without appreciable changes in altitude or attitude. Occupants may feel a slight strain against seat belts or shoulder straps. Unsecured objects may be displaced slightly. No difficulty is encountered in walking.
Moderate	Changes in altitude and / or attitude occur but the aircraft remains in positive control at all times Occupants feel definite strains against the seat belts or shoulder straps. Unsecured objects are dislodged. Food service and walking are difficult.
Severe:	Causes large abrupt changes in altitude and / or attitude. Occupants are forced violently against seat belts or shoulder straps. Unsecured objects are tossed about. Food service and walking are impossible.

Table 5

An additional plume velocity study was completed by CH2M Hill to determine the type of turbulence aircraft would encounter while operating as much as 500 ft below the standard Traffic Pattern Altitude. ***Table 6*** and ***Table 7*** display the results of this plume velocity study. Exhaust plume velocity at 500 ft AGL has been calculated to be less than 11.22 MPH.

Mitsubishi Combined Cycle Turbine						
Case Number	Case 1	Case 5	Case 7	Case 8	Case 12	Case 14
Load	1x100% CTG	1x100% CTG	1x100% CTG	1x100% CTG	1x100% CTG	1x100% CTG
Ambient Temp/RH	0F/95%RH	59F/60%RH	108F/15%RH	0F/95%RH	59F/60%RH	108F/15%RH
Duct Firing?	Unfired	Unfired	Unfired	Fired	Fired	Fired
Fuel	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas
Stack Exit Temperature, F	198	195	191	191	187	183
Stack Diameter, ft	25	25	25	25	25	25
Stack Height (ft)	159	159	159	159	159	159
Stack Flow, acfm	1474130	1312248	1168974	1467025	1308136	1165327
Stack Exit Velocity, ft/s	52	46	41	52	46	41
Horizontal Wind Speed (m/sec)	0.5	0.5	0.5	0.5	0.5	0.5
Plume Velocity at 500 ft AGL						
m/sec	4.79	3.88	2.77	4.71	3.66	2.65
mph	10.71	8.69	6.20	10.54	8.19	5.93

Table 6

GE LMS 100 Turbine (EACH)			
CH2M HILL Case Number	**1**	**5**	**9**
Kiewit Case Number	200	208	224
Ambient Conditions (F)	108	59	0
MMBtu/hr	816.53	844.97	822.72
Evap	EVAP	NONE	EVAP
Fuel	NG	NG	NG
Load	100	100	100
Stack Exit Temperature, F	798	784	753
Stack Height (ft)	90	90	90
Stack Diameter, ft	13.5	13.5	13.5
Stack Flow, lb/hr	1706400	1774440	1798920
Stack Flow, acfm	929026	954750	943472
Stack Exit Velocity, ft/s	108	111	110
Exit Velocity, m/sec	32.97	33.88	33.48
Horizontal Wind Speed (m/sec)	0.5	0.5	0.5
Plume Velocity at 500 ft AGL			
m/sec	4.68	4.89	5.01
mph	10.46	10.93	11.22

Table 7

Table 8 depicts the classification of turbulence an aircraft could encounter during over flight of the proposed Troutdale Energy Center Exhaust Plume at 500 ft AGL based on the plume velocity studies. The change in air velocity resulting from the exhaust stack will result in no more than light turbulence.

Aviation Weather Turbulence Classifications*

		Velocity at 500 ft AGL	Light Turbulence 3.4 MPH to 13.6 MPH	Moderate Turbulence 13.6 MPH to 23.9 MPH	Severe Turbulence 23.9 MPH to 34.1 MPH
Mitsubishi Combined					
	Case 1	10.71 MPH	--------------------^		
	Case 5	8.69 MPH	---------------^		
	Case 7	6.20 MPH	-------^		
	Case 8	10.54 MPH	-------------------^		
	Case 12	8.19 MPH	-------------^		
	Case 14	5.93 MPH	------^		
GE LMS 100 Turbine (EACH)					
	Case 1	10.46 MPH	-------------------^		
	Case 5	10.93 MPH	--------------------^		
	Case 9	11.22 MPH	---------------------^		

* Source: Aviation Weatther, Peter F Lester, Jeppesen Sanderson Training Products 1995

FAA Descriptions of Turbulence:

Light: Causes slight, rapid and somewhat rhythmic bumpiness without appreciable changes in altitude or attitude.
Occupants may feel a slight strain against seat belts or shoulder straps.
Unsecured objects may be displaced slightly.
No difficulty is encountered in walking.

Moderate: Changes in altitude and / or attitude occur but the aircraft remains in positive control at all times.
Occupants feel definite strains against the seat belts or shoulder straps.
Unsecured objects are dislodged.
Food service and walking are difficult.

Severe: Causes large abrupt changes in altitude and / or attitude.
Occupants are forced violently against seat belts or shoulder straps.
Unsecured objects are tossed about.
Food service and walking are impossible.

Table 8

Summary

Turbulence associated with over flight of exhaust plumes is classified as light turbulence.

It is the extreme turbulence associated with thunderstorm clouds, and not light turbulence that is the cause of turbulence related accidents. Light turbulence does not cause aircraft accidents, and pilots do not lose control of aircraft (even temporarily) in light turbulence.

The turbulence an aircraft would experience while inadvertently flying over an exhaust plume would be felt as a slight "bump." The "bump" would not only be classified as "light," but would be of less than one second in duration, be generated by a rising air current and would cause, at the most, a momentary and slight increase in altitude. An aircraft encountering such a 'bump" would be in absolutely no danger of crashing.

The FAA, in their Safety Risk Analysis of Aircraft Over flight of Industrial Exhaust Plums, stated "We would expect that any plume encounter would be a relatively benign event. The pilot's mental and/or physical resources would not be so task-overloaded as to preclude a safe maneuver out of and away from the condition."[34]

This light turbulence encounter will be of less than one second in duration and would be benign to the extent that that this would be true for both the experienced and student pilot alike.

Plume gases and their associated temperatures and oxygen content at or above 500 feet AGL are not a factor in aircraft performance.

Gliders, Helicopters Ultra-light aircraft operate on traffic patterns which are segregated from fixed wing aircraft. They are either established on the same side of, or closer to Runway 5/23 as the fixed wing pattern, or established on the opposite side of the runway from the fixed wing traffic pattern. In either case these traffic patterns are well clear of the Troutdale Energy Center.

In the case of pilots who choose to operate their aircraft in violation of Federal Air Regulations, ignore current over-flight restrictions, exhibit no common sense and choose to not only overfly an exhaust plume, but to do so at an extremely low altitude, the effect of turbulence on their aircraft will be momentary (less than 1 second in duration) and minimal.

3. OES' Policy Mandates Compel Consideration of Effects Beyond Physical Structure

In their Petition for Review, the OPA states "Established policies and rationale behind Part 77 regulations compel a considered approach that gives due deference to the current FAA study, the expected amendments to the regulations and to a policy that places public safety and the integrity of the national aviation system above commercial expediency." In the same connection, they also state "[T}his is a sufficient basis to withhold approval until the findings of the current FAA plume study is issued."

The FAA is currently engaged in a study of industrial exhaust plumes, subsequent to their 2006 Safety Risk Analysis of Aircraft Over flight of Industrial Exhaust Plumes. This new study has not been completed and it is uncertain as to its draft findings, status or whether or not it will be published. Additionally, the FAA does not give deference to incomplete and unpublished studies. Neither does it act upon "expected amendments to the regulations..." OPA proposed justification for withholding approval is, therefore, unfounded.

4. Proper Consideration of the Mitigation Measures and Plume Effect

In their Petition for Review, the OPA asserted the following: " Pursuant to FAA's procedures and standards under 49 U.S.C. § 44718 and Title 14, Part 77 of the Code of Federal Regulations (Part 77 Regulations), the OES should have found that the Troutdale Energy Center Project is a hazard

---

[34] FAA Safety Risk Analysis of Aircraft Over flight of Industrial Exhaust Plums, P.11, January, 2006

to air navigation because the evidence before OES demonstrates convincingly that it would have a substantial adverse effect by: (1) forcing a significant volume of aeronautical operations to significantly limit their use of Portland-Troutdale airspace; (2) requiring changes to existing VFR arrivals and departures, and pattern traffic; (3) requiring an alteration to or the complete elimination of the existing Blue Lake Three instrument departure procedure where traffic may overfly the stack in the critical low-altitude takeoff portion of the flight; (4) by limiting the capacity and efficiency of TTD; (5) by increasing safety risks for pilots from reduced visibility within the airspace and plume effects, and (6) by putting TTD traffic into conflict with PDX traffic."[35]

A. In regard to (1), "**forcing a significant volume of aeronautical operations to significantly limit their use of Portland-Troutdale airspace**" OPA has not presented relevant justification for this assertion.

1. In support of this assertion, OPA references the Aeronautical Information Manual (AIM) paragraph 7-5-15 *Avoid Flight in the Vicinity of Thermal Plumes* and states the following: "The Airman's Information Manual (AIM) is considered to be the 'standard of care for all pilots' as legally determined in numerous court cases in which pilots were held legally accountable for accidents resulting from the pilot's failure to obey instructions in the AIM, where there was no direct violation of the FAR." OPA then cites a court case, supposedly in support of its assertion, and then states "the court ruled that the pilot's failure to *disobey* an ATC clearance to land in order to *obey* the instructions for wake turbulence avoidance as set forth in the AIM *made the pilot legally responsible for the ensuing fatal crash.*"[36]

The FAA, however, has made it clear that the AIM is NOT a regulatory document by stating "This publication, while not regulatory, provides information which reflects examples of operating techniques and procedures which may be requirements in other federal publications or regulations. It is made available solely to assist pilots in executing their responsibilities required by other publications."[37] The AIM is designed to provide the aviation community with basic flight information and ATC procedures for use in the National Airspace System (NAS) of the United States.[38] Rather than regulatory, the AIM is educational in nature and "contains the fundamentals required in order to fly in the United States NAS."[39]

---

[35] PETITION FOR DISCRETIONARY REVIEW; Mary Rosenblum, Oregon Pilots Association; 4. A Proper Consideration of the Mitigation Measures and Plume Effect
[36] PETITION FOR DISCRETIONARY REVIEW; Mary Rosenblum, Oregon Pilots Association; 5. Substantial Adverse Effect on Flight Operations
[37] AIM, Flight Information Publication Policy, d. 2/16/06
[38] AIM, Basic Flight Information and ATC Procedures, 2/16/06
[39] AIM, Basic Flight Information and ATC Procedures, 2/16/06

It is therefore important to note that the AIM provides pilots with RECOMMENDED actions, not with required actions and instructions as asserted by the OPA.

2. OPA goes on to state "Because pilots have been held legally responsible for compliance with all AIM instructions, this *requires* pilots to alter an assigned heading in order to fly upwind of the power plant." [40]

As stated above, the AIM is a non-regulatory, educational source of important information for pilots operating within the National Airspace System. As such, the AIM carries no authority to "require pilots to alter an assigned heading in order to fly upwind of the power plant." The AIM does, however, provide pilots with information which reflects examples of operating techniques and procedures which may be requirements in other federal publications or regulations. It is made available solely to assist pilots in executing their responsibilities required by other publications.

3. OPA continues… "Therefore, a pilot is instructed by the AIM to turn to a heading that will take the aircraft upwind of the stack emitting a thermal plume and continue on that heading until a safe distance is achieved. Since the AIM *fails to define a safe distance*, the resulting deviation from an assigned traffic pattern heading may take the aircraft directly over the airport and into the south downwind traffic pattern depending on wind direction and speed and the pilot's decision about a 'safe' distance from the stack. Alternately, a pilot who suddenly becomes aware that he/she will overfly the stack when the plume is not visible and thus has very little warning, may make an emergency deviation abruptly from his/her heading, thus unexpectedly intersecting the flight path of another aircraft.

This will result in confusion in a crowded and complex airspace, potentially resulting in loss of legal separation and even collision. The controllers at TTD are not able to instruct a deviating pilot to climb to a legal altitude above pattern traffic as the pilot deviates, since airspace above 1200 feet belongs to Portland International Airport (PDX) and is not available for use, and the Portland-Troutdale traffic pattern is established at 1000 feet."[41]

In order to justify its assertion, OPA engages in speculation as to what actions a pilot may take while in the vicinity of the Energy Center, and the result of those actions. OPA then speculates as to what action air traffic controllers are not able to take in connection with

[40] PETITION FOR DISCRETIONARY REVIEW; Mary Rosenblum, Oregon Pilots Association; 5. Substantial Adverse Effect on Flight Operations

[41] PETITION FOR DISCRETIONARY REVIEW; Mary Rosenblum, Oregon Pilots Association; 5. Substantial Adverse Effect on Flight Operations

their primary job function and finally includes a statement in regard to what OPA describe as a "legal altitude." According to OPA, this will result in 1) a deviation from an assigned traffic pattern heading, thereby taking the aircraft directly over the airport and into the south traffic pattern; 2) emergency deviations by pilots who "suddenly become aware that they may overfly the stack when the plume is not visible; and 3) loss of legal separation and even collision.

We will respond to these speculations one by one.

1) Notwithstanding the fact that the AIM does not have the authority to "instruct a pilot to turn to a heading that will take the aircraft upwind of the stack emitting a thermal plume and continue on that heading until a safe distance is achieved", Troutdale ATCT is designated a LEVEL 1 ATCT by the FAA. This designates TTD as a "VFR Tower" by the FAA and, as such, the TTD air traffic controllers do not have the authority to assign headings to aircraft operating within the airport traffic pattern. Since aircraft are not assigned headings in the traffic pattern, aircraft are in no danger of deviating from such an assigned heading.

2) Federal Air Regulations require that each pilot in command, before beginning a flight, to become familiar with all available information concerning that flight.[42] Therefore, any pilot operating at TTD is required by Federal Regulation to be familiar with the location of the Energy Center stack and therefore will not be "surprised" by its location and will not result in an "emergency" deviation.

3) OPA makes an inaccurate assertion in regard to the potential loss of "legal separation."

This assertion betrays a lack of understanding of ATC separation standards and routine air traffic control coordination procedures.

FAA separation standards are not applicable to airborne aircraft while operating within the VFR traffic pattern, but rather pertain only to aircraft while physically on the runway surface. Aircraft deviating around a thermal plume, while in the VFR traffic pattern, are therefore not in danger of encountering a "loss of legal separation" as asserted by OPA.

B. In regard to (2), **"requiring changes to existing VFR arrivals and departures, and pattern traffic;"** it has already been shown earlier in this Response that the Troutdale Energy Center will not conflict with VFR arrivals, or pattern traffic.

[42] FAR Part 91:103 Preflight Action

In regard to VFR departures, the following should be noted:

FAA AC 90-66A Prescribed Traffic Pattern Departure Procedure

The FAA recommends that when departing the traffic pattern, aircraft should continue straight out or exit with a 45 degree left turn (right turn for right traffic patterns) beyond the departure end of the runway and after reaching pattern altitude.[43]

Since TTD Runway 7 has a published left traffic pattern, the FAA recommended departure procedure is as follows: Depart straight out, or exit the traffic pattern straight out, then commence a 45 degree left turn after reaching pattern altitude (1000 feet AGL).

FAA Prescribed TTD Runway 7 Departure Procedure and Energy Center Location

Pilots operating in compliance with the FAA recommended practice for departing the TTD traffic pattern may depart straight out, in which case the aircraft ground track will pass well south of the Troutdale Energy Center. Other aircraft may elect to depart straight out, and then execute a left turn after reaching 1000 feet AGL. In this case, departing aircraft will again pass south of the Energy Center. In either case, it is not necessary for a pilot to overfly the Energy Center exhaust plumes and therefore changes to existing VFR arrivals and departures are not necessary.

C. In regard to (3), **"requiring an alteration to or the complete elimination of the existing Blue Lake Three instrument departure procedure where traffic may overfly the stack in the critical low-altitude takeoff portion of the flight;"**

Exhibit 2 displays the Blue Lake Three instrument departure procedure. ***Exhibit 3*** displays that flight track of aircraft utilizing the Blue Lake Three instrument departure. This specific IFR procedure requires aircraft to reach 1000' AMSL before turning north. This altitude restriction ensures aircraft are never in proximity to the exhaust stack or plume.

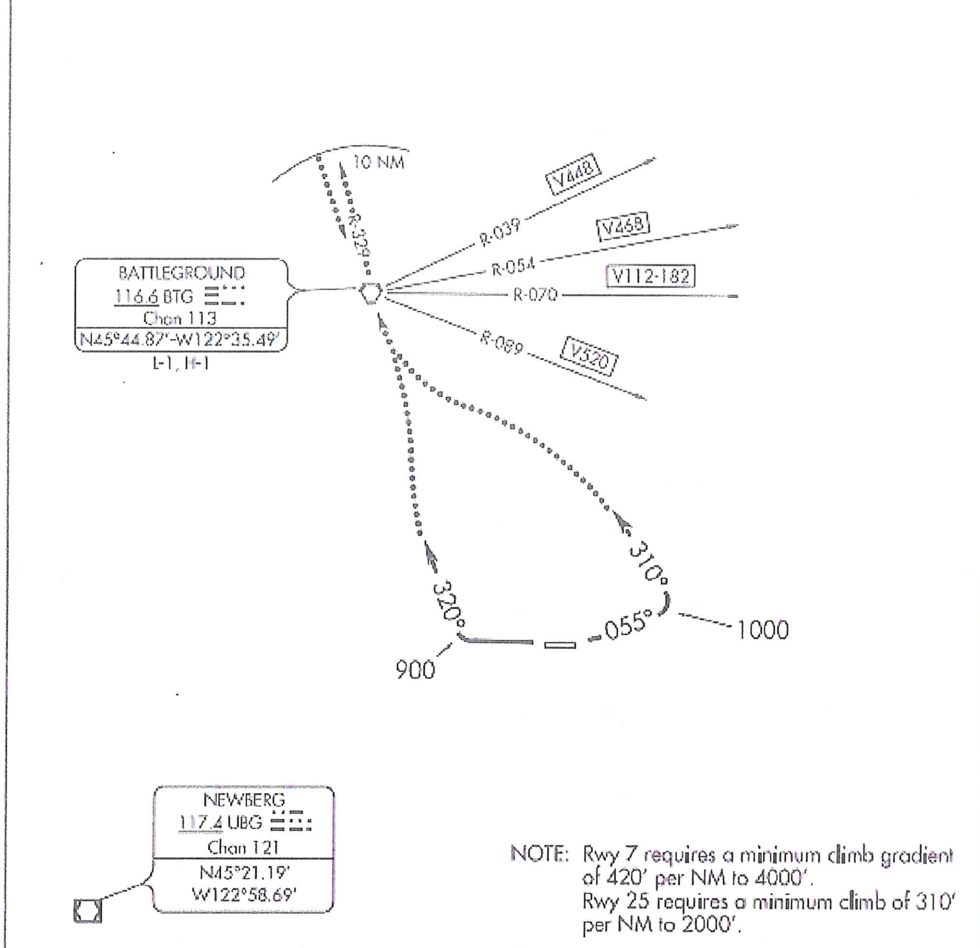
[43] FAA Advisory Circular AC 90-66A, *Recommended Standard Traffic Patterns and Practices for Aeronautical Operations at Airports without Operating Control Towers,* Recommended Standard Traffic Pattern

BLUE LAKE THREE DEPARTURE SL-649 (FAA)

PORTLAND-TROUTDALE (TTD)
PORTLAND, OREGON

NW-1, 03 MAY 2012 to 31 MAY 2012

CTAF 120.9



NOTE: Chart not to scale.

DEPARTURE ROUTE DESCRIPTION

TAKE-OFF RUNWAY 7: Climb via heading 055° to 1000', then turn left to 310° or as assigned.

TAKE-OFF RUNWAY 25: Climb runway heading to 900', then turn right to 320° or as assigned.

LOST COMMUNICATIONS: Proceed direct to BTG VORTAC. Continue climb on the BTG R-329 within 10 NM to cross BTG VORTAC at or above: NE-bound V448, 9400'; NE-bound V468, 4500'; E-bound V112, V182, V520, 4700'; for non airways BTG R-355 CW BTG R-120, 8800'; all others, 2500'.

ALTERNATE LOST COMMUNICATIONS PROCEDURE: When BTG VORTAC is out of service: if no contact with ATC leaving 3000', continue climb to assigned altitude and proceed direct to UBG VOR/DME, thence via assigned route.

BLUE LAKE THREE DEPARTURE

11181

PORTLAND, OREGON
PORTLAND-TROUTDALE (TTD)

Exhibit 2

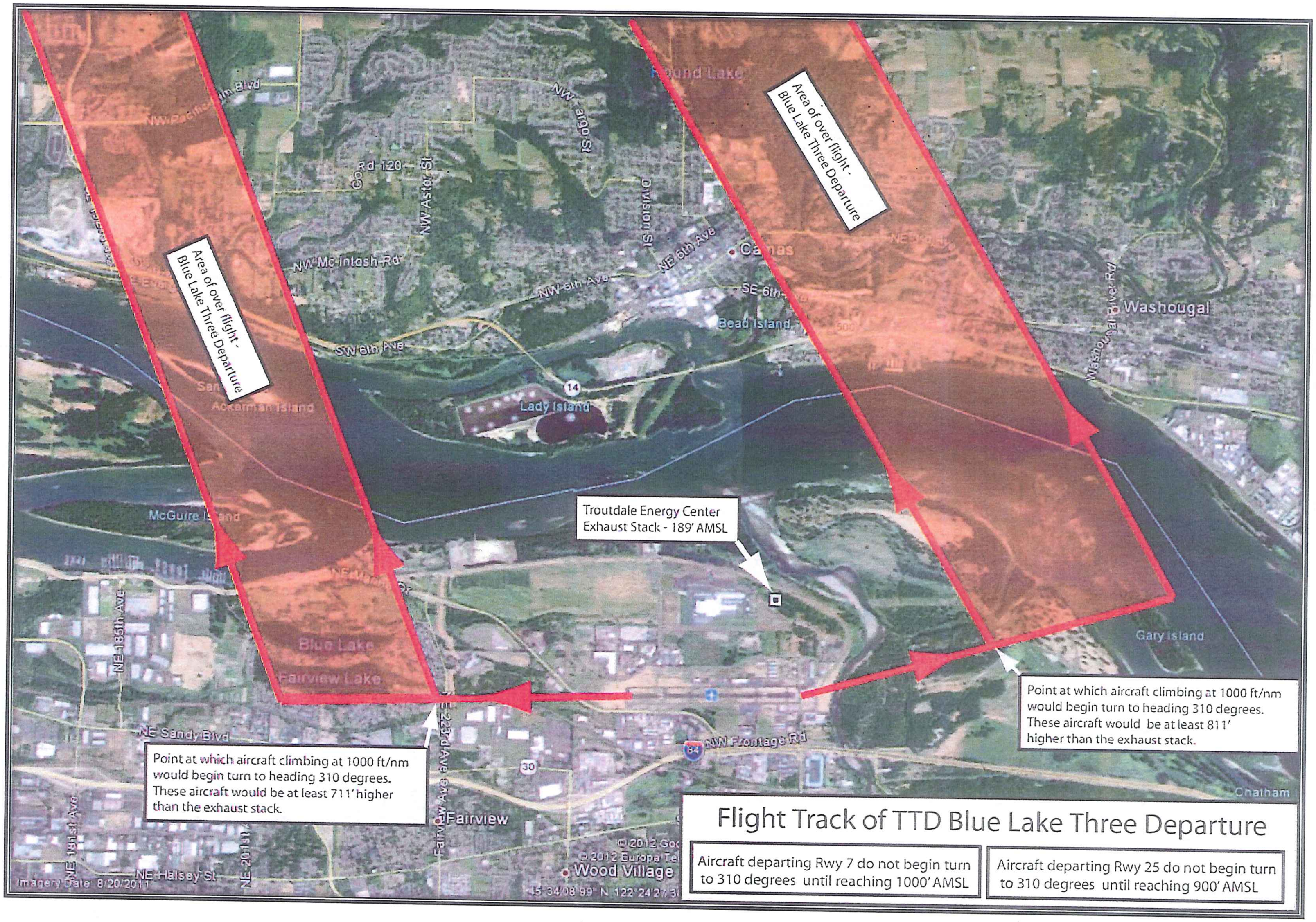


Exhibit 3 – Area of Over Flight - Blue Lake Three Departure

D. In regard to (4), **"by limiting the capacity and efficiency of TTD;"**

OPA makes this assertion without providing supporting data of any sort and in contravention of relevant analyses as provided above.

E. In regard to (5) **"by increasing safety risks for pilots from reduced visibility within the airspace and plume effects"**

CH2M Hill performed a CALPUFF modeling analysis of the "Typical and 95th Percentile Plume Dimensions" associated with the Troutdale Energy Center. The analysis revealed that fog height would range from 75 to 100 meters (246 to 328 feet) above the stack, and from 100 to 200 meters (328 to 656 feet) laterally from the stack depending upon local wind and weather conditions.[44] The Troutdale Energy Center stacks are located approximately 3,000 feet north of runway centerline.

Vertical movement of fog associated with the facility will therefore dissipate well below traffic pattern altitude of 1,000 feet. Lateral movement of fog will also dissipate well away from the runway.

1. OPA asserts the following: "Fog produced by the plant's cooling towers, even if it does not rise into the TTD navigable airspace, will obscure the 159 foot tall stack that generates the thermal plume. The plume itself may not be visible and therefore, pilots will not be able to avoid the plume by visual identification of either stack or plume."

Since the stack generating the thermal plume is immediately adjacent to the stack generating the fog, the visible fog will serve to identify the location of the thermal plume and pilots will therefore have no difficulty avoiding the thermal plume.

2. OPA asserts the following" "The cooling towers lie less than ¼ mile from the runway itself and the stack generating the high-velocity, high-temperature thermal plume lies directly under the north downwind leg of the TTD traffic pattern" and that "the fog will tend to circulate within the river basin where the Sandy River joins the Columbia, rather than blowing up or down the river and away from the airport. This will cause intermittent loss of legal VFR visibility, most often on the 25 approach end of the runway, the base leg of the north pattern, and on the final approach to 25 from either direction."

Response: Rather than less than 1/4 mile as asserted by OPA, the cooling towers are situated over ½ miles (approximately 3,000 feet) from the runway centerline. Additionally, it has already been shown earlier in this response that the stacks do not lie "directly beneath the north downwind leg of the TTD traffic pattern." As shown above, lateral movement of fog will dissipate well away from the runway and not obscure visibility as asserted by OPA.

[44] CH2M Hill Power Point Presentation, Troutdale Energy Center, AOPA, March 2012

3. OPA asserts the following: "Controllers will not be able to safely direct traffic to the north pattern when there is a risk that the pilot may not be able to safely avoid the thermal plume. Consequently, TTD traffic will be directed to the south pattern. The TTD tower manager is currently consulting with SERCO about concerns over controller liability."

Response: Federal Aviation Regulation (FAR) Part 91 specifies that pilots operating under Visual Flight Rules (VFR) are primarily responsible for navigation, obstacle clearance and maintaining separation from other aircraft using the *see-and-avoid* concept. To avoid collisions, the VFR pilot is expected to "see and avoid" obstacles and other aircraft. A pilot that was successful in visually acquiring the airfield for landing would have no difficulty seeing and safely avoiding the Troutdale Energy Center stacks. From an air traffic control standpoint, air traffic controllers will therefore not be required to direct aircraft solely to the south pattern.

4. OPA asserts the following: "At night, the unlighted and invisible thermal plume will be impossible for airmen to identify and avoid, and unable to exercise the caution that is *required* by the instructions in the AIM, all nighttime operations must be conducted in the south traffic pattern. Nighttime use of the south pattern increases risk of collision with terrain since an unlighted 720 foot bluff (Broughton Bluff) lies beneath the south downwind to base turn."

Response: Notwithstanding the fact that it has been previously established that the FAA does not consider recommendations contained in the AIM to be regulatory, FAR Part 91 requires pilots to be familiar will all aspects of their flight. This includes not only the Troutdale Energy Center stacks location but also the location of Broughton Bluff. Pilots conducting night operations are not exempt from this federal regulation and as such, must take necessary measures to conduct their flight in a safe manner. As stated earlier, the Energy Center is not located beneath the Troutdale traffic pattern. If pilots adhere to FAA guidelines for operating to, from and within the airport traffic pattern, they will not be in danger of overflying the stacks. As stated in the FAA Safety Risk Analysis, if a pilot inadvertently overflies the stacks, the effect on the aircraft would be a relatively benign event. The pilot's mental and/or physical resources would not be so task-overloaded as to preclude a safe maneuver out of and away from the condition.[45]

Colgan Air Incident

OPA raises the issue of an incident reported by Colgan Air, stating "Colgan Air reported in a letter to the FAA severe turbulence encountered by more than one arrival on the ILS, creating problems for pilots and passengers, when their aircraft flew in close proximity to a power plant thermal plume, in Morgan Town, West Virginia."

[45] FAA Safety Risk Analysis of Aircraft Over flight of Industrial Exhaust Plumes, Human Factors Assessment, January, 2006

The following is a synopsis of this reported incident. On 18 December, 2008, United Express flight 6922, operated by Colgan Air, en-route from Clinton, Oklahoma experienced severe turbulence on approach into Morgantown Municipal Airport in West Virginia. The flight was on an Instrument Landing System (ILS) approach to RWY 18, inside the Final Approach Fix (FAF), when the flight encountered what was reported as severe turbulence. The flight executed a Missed Approach Procedure (MAP) and diverted to its final destination at Dulles International Airport. Conditions were described as calm winds, overcast at 100' with a temperature of one degree Celsius and surface visibility of two miles.

Located 3.6 miles directly north of the airport and directly beneath the RWY 18 approach is the Fort Martin Power Plant, an 1107 MW coal fired facility with two stacks at a height of 550' AGL and two 370' AGL cooling tower stacks. The RWY 18 ILS approach passes 662' above the boiler stacks and 842' above the cooling tower stacks.

This facility differs from the Troutdale Energy Center in the following ways:

The Troutdale Energy Center facility is not situated beneath either the airport traffic pattern or beneath the final approach course to any runway at TTD, while the Fort Martin facility is located directly beneath the centerline of the RWY 18 instrument approach procedure at Morgantown.

The Troutdale facility is approximately one-third the size of the Fort Martin facility and has much lower stack exhaust flows. The thermal energy released from the Fort Martin plant is far greater than the amount of energy released from the Troutdale facility. This would naturally cause a much larger thermal plume which was also intensified by the freezing temperatures on 18 December, 2008.

Given that these marked differences between the location and strength of the Troutdale Energy Center as compared to the Fort Martin Facility, the Troutdale Energy Center will not pose adverse impacts to pilots as were experienced by the Colgan Air flight.

F. In regard to (6) "**by putting TTD traffic into conflict with PDX traffic**"

The existence of the power plant does not preclude aircraft from operating within the confines of the normal traffic pattern. Consequently the current airspace is sufficient and won't conflict with PDX. ATC coordination between controllers at adjacent facilities is routine and common within the NAS. All air traffic controllers, including those at TTD, are able to allow aircraft under their control to enter adjacent airspace with proper coordination. OPA is incorrect their remarks concerning what TTD air traffic controllers are, or are not able to do in regard to aircraft operating within the TTD traffic pattern.

NTSB Report of Helicopter Crash occurring August 9, 1989

A review of over 800,000 records gathered over a 30 year period indicated zero accidents or incidents related to aircraft over flights of exhaust plumes from power plants such as the Troutdale Energy Center.[46]

There are, however, two known accidents on record that were not considered in the analysis. One accident occurred in the U.S and the other in Dublin, Ireland. The U.S. accident occurred in 1989 and involved a Bell 206 helicopter that was hovering over and filming a cogeneration plant and which subsequently experienced an engine failure.[47] During its third orbit around the plant, the helicopter passed over the exhaust stack. Based upon the temperature and composition of the plume exhaust gases, the helicopter was at an altitude of between 50 and 100 feet above stack. The helicopter lost power due to oxygen starvation and subsequently entered autorotation into an adjacent parking lot.

Turbulence generated by the exhaust plume was not listed by the NTSB as a causal factor in this accident. Additionally, this accident did not qualify as an over flight accident since the helicopter was working over the plant and hovering over the stack at an altitude well below the minimums specified in FAR Part 91.119, *Minimum Safe Altitudes.* FAR 91.119 states that except when necessary for takeoff or landing, no person may, in an uncongested area operate an aircraft below an altitude of 500 feet above the ground (AGL).

FAR 91.119 allows helicopters to be operated at lower altitude if the operation is conducted without hazard to persons or property on the surface While FAR 91.119 does allow flight below 500 over sparsely populated areas, in no case may a person operate an aircraft closer than 500 feet to any person, vessel, vehicle, or structure.[48]

Had the helicopter involved in this accident been operating at least 500 feet from the plant as specified in FAR Part 91 (as would all other aircraft), the oxygen composition of the plume at that altitude would have been nearly identical to normal ambient air and oxygen starvation would not have occurred.

Pilots who operate their aircraft at minimum altitudes other than those specified in FAR Part 91.119 may be cited under FAR 91.13 for Careless or Reckless Operation, which states that no person may operate an aircraft in a careless or reckless manner so as to endanger the life or property of another.[49] Pilots operating their aircraft in violation of Federal Air Regulations are subject to FAA enforcement action resulting the suspension or revocation of their pilot certificate.

---

[46] FAA Safety Risk Analysis of Aircraft Over flight of Industrial Exhaust Plumes, Section 2, January, 2006
[47] National Transportation Safety Board Factual Report of Aircraft Accident, Bell 206, 8/9/89
[48] FAR 91.119 *Minimum Safe Altitudes*
[49] FAR 91.13 *Careless or Reckless Operation*

The second accident not included in the risk analysis occurred in 2002 in Dublin, Ireland and also involved a Bell 206 helicopter that was performing a photo mission in the vicinity of an exhaust stack.[50] In this case, the helicopter, flying at an altitude "slightly higher than the top of the stacks" flew into the exhaust plume, lost power due to oxygen starvation and subsequently entered autorotation onto the adjacent beach.

As was the case with the U. S. accident, turbulence generated by the exhaust plume was not listed as a causal factor in this accident. This accident also did not qualify as an over flight accident since the helicopter was working over the plant and passed over the stack at an altitude just slightly higher than the top of the stack.

[50] AAIU Synoptic Report No: 2004-001 January, 2004

APPENDIX 2 – Obstruction Analysis

The proposed exhaust stack associated with the Troutdale Energy Center project is planned to have an elevation of 189 ft Above Mean Sea Level (AMSL) (approximately 159 ft Above Ground Level). The obstruction evaluation and airspace analysis included a review of the following to determine possible adverse impacts to aeronautical operations at TTD:

1. Federal Aviation Regulation Part 77 Obstruction criteria
2. Visual Flight Rule (VFR) Traffic Pattern Criteria define in FAA Joint Order 7400.2J
3. Terminal Instrument Procedure (TERPS) obstacle clearance surfaces in accordance with Federal Aviation Administration (FAA) Order 8260.3B Change 24 Terminal Instrument Procedures and 8260.54 US Standard for Area Navigation

FAA Obstruction Evaluation Process

Title 14 of the Code of Federal Regulations (Part 77) was established to promote air safety and the efficient use of the navigable airspace. To accomplish this mission, the FAA evaluates existing and proposed structures to determine if the structure will have an adverse effect on aeronautical operations.

Any proposed structure that exceeds FAR Part 77 notice criteria must be submitted to the FAA's Obstruction Evaluation office via FAA Form 7460-1. This form must be submitted at least 45 days prior to the earlier of the following dates:

1. The date the proposed construction will begin.
2. The date an application for construction permit is to be filed.

The FAA studies the proposed structure considering criteria outlined in FAR Part 77 including the structure's impact on terminal instrument procedures and whether the structure will require mitigation such as lighting and marking. The evaluation process generally takes 30 days; however, if the structure exceeds FAR Part 77 Obstruction Standards, the evaluation could take up to 90 days. Structures that exceed FAR Part 77 Obstruction Standards usually require the FAA to solicit public comments regarding structure's impact on aeronautical operations. After the study is complete, the FAA will issue a letter that contains the structure's effect on the navigable airspace and mitigation requirements (lighting/marking).

Methodology

AutoCAD Map 3D was utilized to generate georeferenced three dimensional surfaces of the studied criteria. ESRI ArcMap was then utilized to analyze the three dimensional surfaces in relation to the project site in order to determine the elevation and height to which structures could be erected without exceeding the three dimensional surfaces. Airport and Runway data was derived from the current Airport Layout Plan and Terminal Instrument Procedures were obtained from the FAA's Instrument Procedure website.

Analysis

Public Airports:

TTD has paved runways, instrument approach/departure procedures and supports jet operations; therefore this airport was studied to determine the height to which structures could be erected at the project's site without impacting aircraft operating at this airport.

FAR Part 77 Obstruction Standards – Current Runway Configuration

An analysis of FAR Part 77 obstruction standards was completed to determine the maximum elevation and height to which a structure could be erected at the project site without exceeding FAR Part 77 obstruction criteria. FAR Part 77 obstruction criteria is not used to determine if a structure will be a hazard to air navigation or adversely impact aeronautical operations, rather structures exceeding this criteria are studied closely by the FAA to determine if the structure will require mitigation or if the structure will impact terminal instrument procedures or VFR impact traffic pattern airspace. Generally, a structure that exceeds FAR Part 77 obstruction standards will require mitigation such as lighting and/or marking in order to make it more conspicuous to airmen.

The proposed Troutdale Energy Center Exhaust Stacks will be located within the boundaries of the horizontal surface as defined in FAR Part 77.19(a). The horizontal surface extends outward from the transitional surface and has a constant elevation of 150 ft above the airport (189 ft AMSL). *Figure 1* displays the exhaust stack in relation to the FAR Part 77 obstruction surfaces.

APPENDIX 2 – Obstruction Analysis

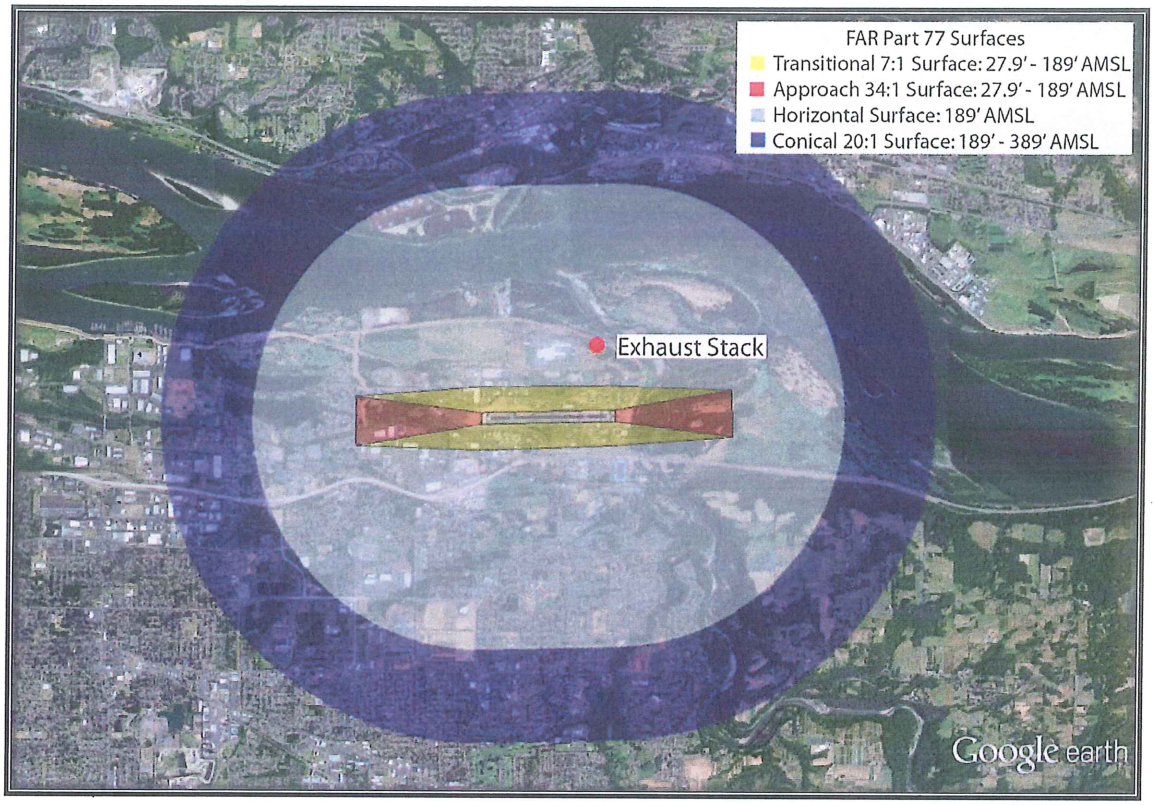


Figure 1 - Elevation to which a structure can be erected without exceeding the TTD FAR Part 77 Obstruction Surfaces

Conclusion: The proposed 189 ft AMSL exhaust stack will not exceed the horizontal surface.

VFR Traffic Pattern – Current and Future Runway Configuration

An analysis of FAR Part 77 obstruction standards as applied to VFR airports was completed to determine the maximum elevation and height to which a structure could be erected at the project site without impacting the VFR Traffic Pattern. Generally, the FAA will not approve structures that exceed VFR Traffic Pattern Criteria.

The proposed Troutdale Energy Center exhaust stack will be located within the boundaries of the TTD Horizontal Surface as applied to visual runways. ***Figure 2*** displays exhaust stack in relation to the surfaces that define the VFR Traffic Pattern.

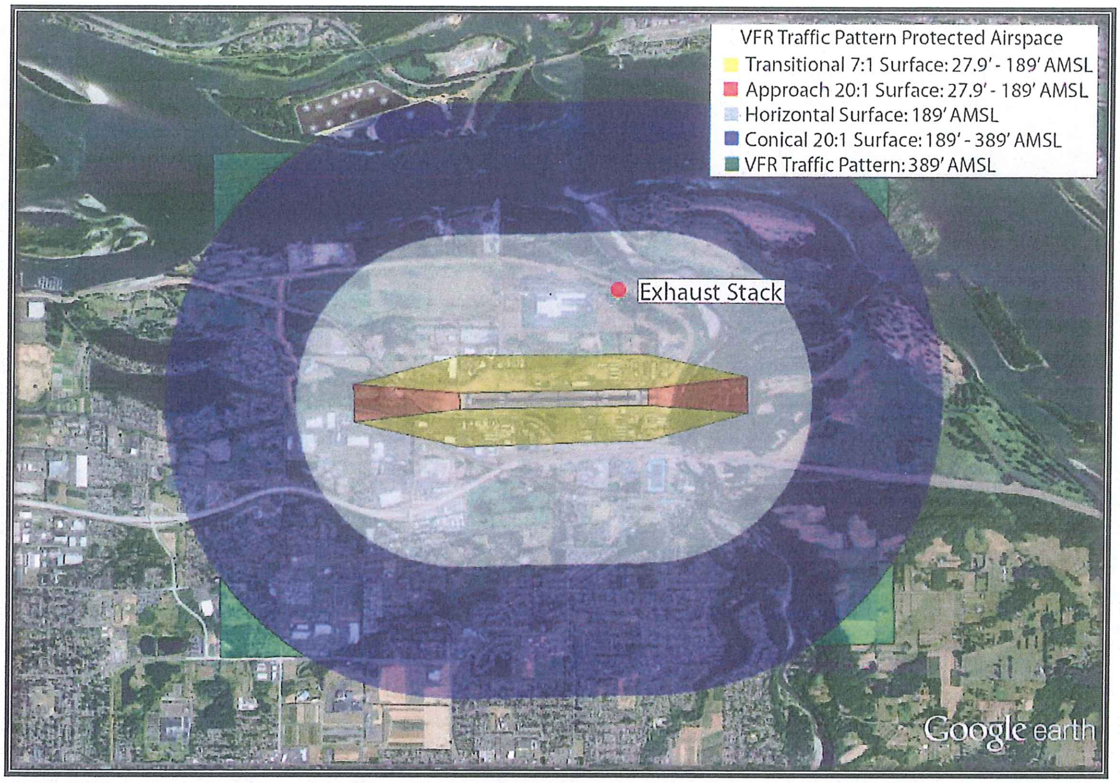


Figure 2 - Elevation to which a structure can be erected without exceeding the TTD VFR Traffic Pattern Criteria

Conclusion: The proposed exhaust stack will not exceed the TTD Horizontal Surface (as applied to VFR runways) and therefore will have no impact on the aircraft operating in the VFR Traffic Pattern.

Terminal Instrument Procedures

An analysis of the obstacle clearance surfaces associated with each TTD instrument approach procedures (IAP) and departure procedures (DP) was completed to determine if the proposed structures would adversely impact instrument procedures pilots use to approach or depart during periods of bad weather and low visibility. Structures that adversely impact Terminal Instrument Procedures will generally not be approved by the FAA. Considering the current runway configuration and published Instrument Procedures, it was determined that the Circle-to-Land IAP would have the lowest obstacle clearance surfaces over the project site.

Circle-to-Land IAP

The proposed exhaust stack associated with the Troutdale Energy Center will be located within the boundaries of the Circle-to-Land IAP. ***Figure 3*** displays the maximum elevation (feet above mean sea level) to which a structure could be erected without impacting the Circle-to-Land IAP.

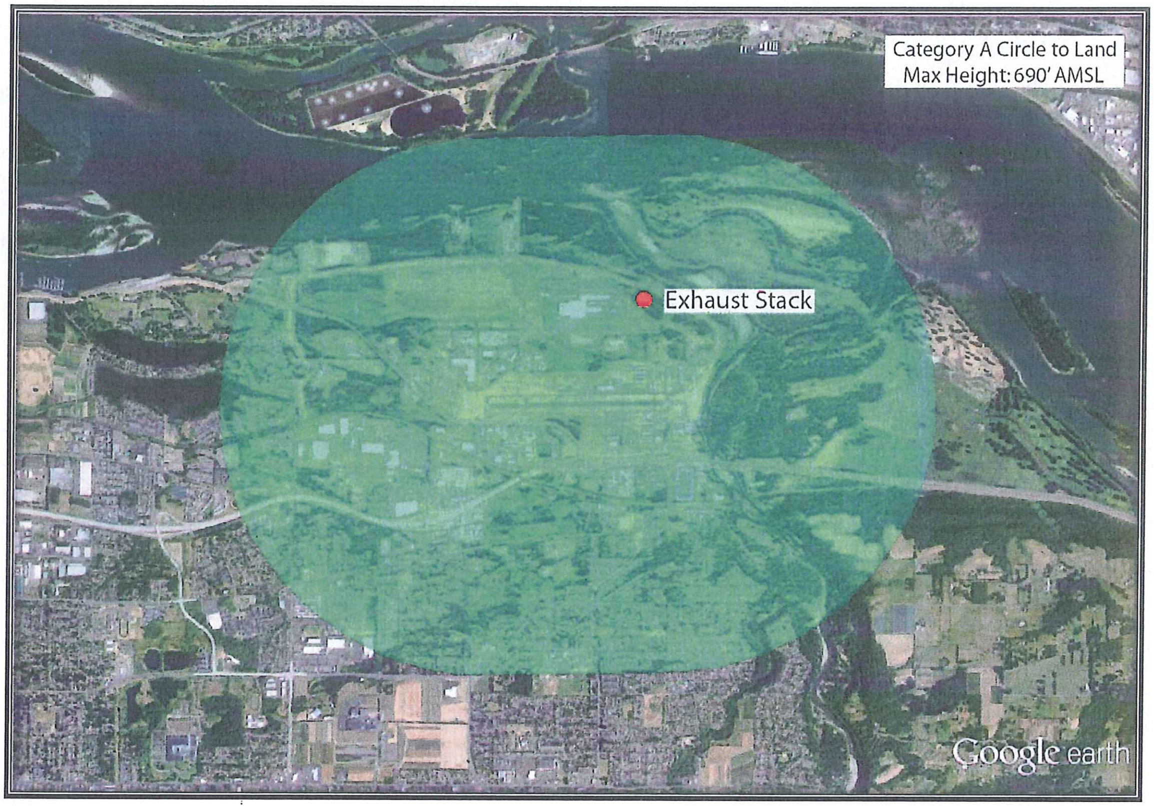


Figure 3- Elevation to which a structure can be erected without exceeding the current VNAV obstacle clearance surface

Conclusion: The proposed exhaust stack will not exceed the Circle-to-Land Obstacle Clearance surface and therefore have no impact on the TTD Instrument Approach Procedures.

Instrument Departure Procedure

An analysis of the TTD Instrument Departure Procedures was completed to determine if aircraft departing during instrument conditions would be impacted. *Figure 4* displays the proposed exhaust stack in relation to the obstacle clearance surfaces that protect the TTD Instrument Departure Procedure.

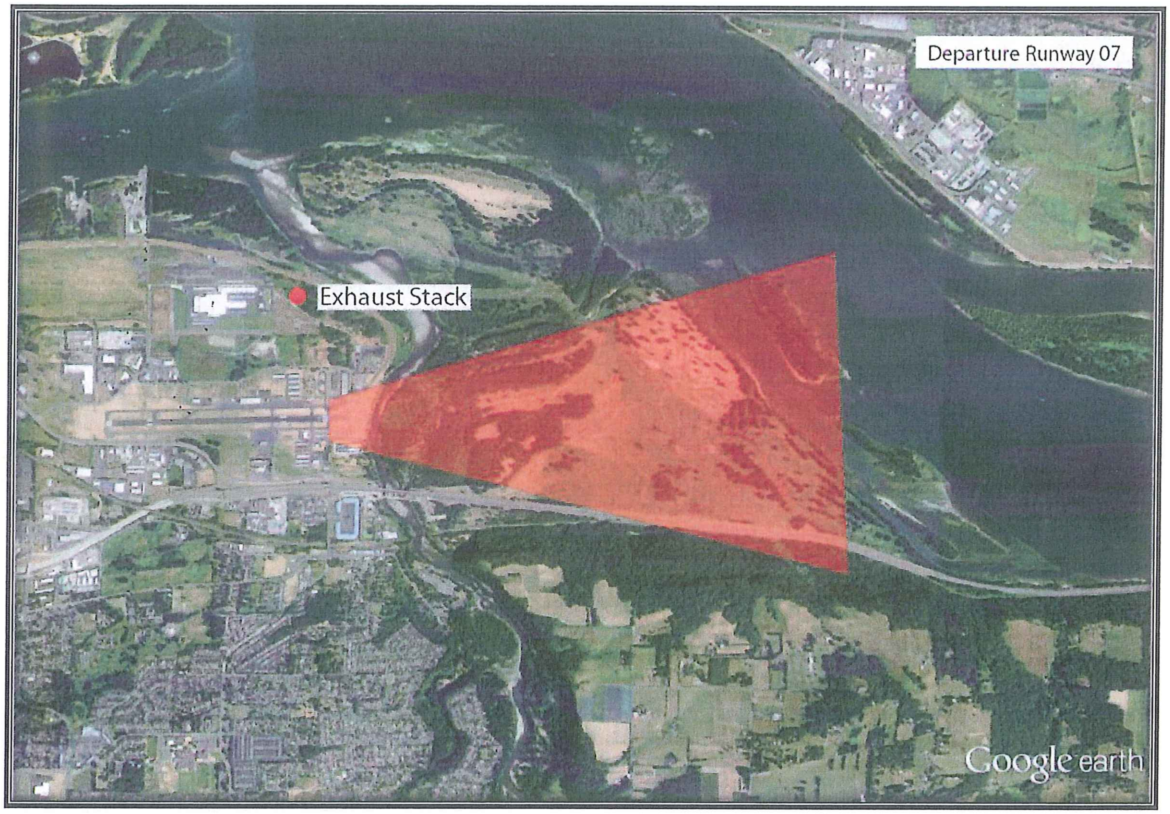


Figure 4 – Boundary of Initial Climb Area associated with TTD Instrument Departure Procedure

Conclusion: The proposed exhaust stack will not be located within the boundaries of the obstacle clearance surfaces associated with the TTD Instrument Departure Procedure and therefore will have no impact on the TTD Instrument Departure Procedures.

MEMORANDUM

To: [Siting Officer]
Oregon Department of Energy

From: [Name, Title]
[Department/Agency]
[Street Address]
[City, State Zip Code]
[Phone #]
[Email]

Date: [Date]

RE: [Type of response, Phase of process, Application]

General Comments: [Include general comments here.]

Specific Comments: [If there are comments or edits related to a specific location, please include in the comment matrix below. Where applicable, please utilize the following format which includes both the subject of the comment and the specific comment.]

[Project and Project Phase]		Exhibit [?]:
[Agency]	[Commenter Name & Title]	[Date]
Page / Section / Paragraph / Sentence Reference	Comment / Edit	