



# SAF Report

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# Table Of Contents

- I. Executive Summary
- II. Introduction to the Problem
- III. SAF Creation and Manufacturing Development
  - A. Waste Stream
  - B. Manufacturing Process Requirements
    - 1. Data Table
    - 2. Computer Assisted Design Visuals
    - 3. Dimensions of Storage Tanks
- IV. Site Selection and Condition Assessment
  - A. Proximity to residential zones and environmentally sensitive areas
  - B. Transportation to Washington airports
  - C. Site size and room for expansion
    - 1. SAF Storage Sites
- V. Evaluation of Adherence to King County Sustainability and Climate Change Policies
- VI. Community
  - A. Community Impact
  - B. Plan to Engage the Communities
    - 1. Impacted Communities and Community Characteristics
    - 2. Local Community Organizations
    - 3. Our Plan
- VII. Conclusion
- VIII. Appendices
  - A. SAF Creation and Manufacturing Development-Criteria Matrix
  - B. Community Impact Map

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# Executive Summary

The aviation industry is a significant contributor to global CO2 emissions and climate change, accounting for approximately 2.4% of global CO2 emissions and 5% of global warming. To address these environmental concerns, Ecoflight Fuels proposes a solution to produce sustainable aviation fuel (SAF) using biomass from local landfills, starting with a test run at one landfill in Washington for the King County International Airport (KCIA).

Using waste from landfills is an ideal option as it utilizes materials already present on Earth, reducing the amount of food waste in landfills and generating renewable energy. Biomass-derived biofuels are considered carbon-neutral as the CO2 released during combustion is offset by the CO2 absorbed during plant growth. This makes biofuels a viable and environmentally friendly alternative to conventional jet fuel.

The manufacturing process involves collecting biomass waste from landfills and converting it into SAF through a carefully designed and cost-efficient process. Additionally, there is potential to produce biodiesel for conventional trucks, which could cut carbon emissions from the trucking industry by half. In the long term, the transition to electric semi-trucks can further reduce carbon emissions, aligning with industry trends and regulations.

The Cedar Hills Regional Landfill is the chosen waste stream for the initial test run. While there are concerns about the proximity of the landfill to residential zones, Ecoflight Fuels prioritizes safety and ensures thorough inspections and precautions during the transportation of biofuel to minimize any negative impacts.

Ecoflight Fuels' plan aligns with King County's Sustainability and Climate Change policies, creating environmentally friendly job opportunities and engaging with the community. Community involvement is crucial, and the company intends to organize informative banquets, outreach events, and social media communication to keep residents informed and address any concerns. This approach fosters support and allows individuals to have a voice in projects that affect their lives.

The proposed plan demonstrates Ecoflight Fuels' commitment to sustainability, safety, community engagement, and collaboration. By leveraging biomass resources and promoting cleaner fuel alternatives, the company aims to make a significant positive impact on the aviation industry's environmental footprint. Achieving net-zero emissions by 2050 is a challenging goal, but it serves as a driving force for Ecoflight Fuels to preserve the planet and reduce carbon emissions for companies globally.

With its comprehensive approach, Ecoflight Fuels positions itself as a leader in the pursuit of a more sustainable future. By utilizing local biomass resources and fostering collaboration with community organizations, manufacturing companies, and KCIA, the company aims to create a healthier and more environmentally friendly aviation industry and contribute to a greener world for present and future generations.

# Introduction to the Problem

The aviation industry, while relatively small compared to other sectors, is a significant contributor to global CO<sub>2</sub> emissions and climate change. Aviation accounts for approximately 2.4% of global CO<sub>2</sub> emissions, and when combined with other gasses and water vapor trails produced by aircraft, it is responsible for around 5% of global warming. The sector has experienced rapid growth in recent years, leading to increased concerns about its environmental impact. The total CO<sub>2</sub> emissions from aviation were estimated to be around 2.5% of global emissions in 2018. These statistics highlight the pressing need to address CO<sub>2</sub> emissions in the aviation industry to mitigate climate change and work towards a more sustainable future. Ecoflight Fuels has a solution. Ecoflight Fuels wants to bring a more sustainable, cost efficient form of SAF to the table, biofuel. Ecoflight Fuels wants to make a test run with food waste taken from one landfill in Washington, to produce biofuel for KCIA. If all goes well, this project should be able to be expanded in the future.

# SAF Creation and Manufacturing Development

## Waste Stream & Manufacturing Process Requirements

The idea of using waste from a landfill is the best option that has been co-producing. Since the waste in landfills sits on the land for years, the Ecoflight Fuels focuses on not using new waste but instead using materials that are already here on Earth. If this idea were to be used nationwide, roughly 181,500 metric tons of food waste would be reduced nationally in landfills annually. An article from King County's Department of Natural Resources and Parks' Solid Waste Division explains that "in 2021, the landfill generated an average of about 6,500 standard cubic feet per minute of landfill gas." This energy created from renewable gas produces equal to the amount of natural gas needed to power 17,500 homes in King County. Although the Department of Natural Resources and Parks have started a plan to use the waste from the landfill to produce biofuel, they seem to just be producing gas and diesel for vehicles and homes. The proposition is to collaboratively use the waste to create SAFs and biofuels to reduce the amount of GHG and carbon emissions created by conventional jet fuel.

In an article from the *U.S. Energy Information Administration*, they explain how using biomass for energy has positive and negative effects. Within this article, they explain how, although burning biomass releases carbon dioxide and greenhouse gases, "the plants that are the source of biomass for energy capture almost the same amount of CO<sub>2</sub> through photosynthesis while growing as is

released when biomass is burned, which can make biomass a carbon-neutral energy source." Because of the neutral impact, anxiety won't be an issue when thinking about the possible carbon footprint caused by the production of biofuels.

Traditional semi-trucks which haul large amounts of mass typically use combustion engines that guzzle gas like no other. According to *Climate Nexus*, "Trucks are responsible for 28 percent of the climate pollution from transportation, the biggest source of emissions in the U.S." Accounting this into the factor of carbon emissions means that the proposal must use a different type of fuel than conventionally used fuels for these trucks. One potential idea that could come into play, along with creating biofuels for airplanes, is additionally creating biodiesel which is more cost-efficient than SAFs and would imaginably cut carbon emissions from trucks in half by 2050 if all vehicles in the trucking industry use biodiesel. While biodiesel could be useful for the next 5-15 years, once the carbon reduction from biodiesels reaches the planned 50 percent, then the proposition would switch to reducing the carbon emissions from the mode of transportation to net zero, which is where electric semi-trucks come into play. As stated by *CNBC*, "the California Air Resources Board is requiring truck manufacturers to begin phasing in available heavy-duty EV technology by 2024, with expectations to have all zero-emission short-haul drayage fleets by 2035." This means that by 2035, all transportation that will be used could theoretically cut emissions down to net zero. Although the plan may not consist of using biodiesel to power our mode of transportation, it could be a beneficial way to bring carbon emissions to net zero in other industries rather than the aviation industry.

## Data Table

SAF Providers	Landfills	Sewage	Waste	Cooking Oils	Salt Marsh Grass
Distance from KCIA	2	3	2	3	2
Cost Efficiency	3	1	1	3	1
Usefulness	3	3	2	2	1
Usability	3	3	3	2	2
Feasibility	3	3	2	3	1

We went thru extensive criteria to find our best need for SAF. These included cost efficiency, usefulness, usability, and feasibility. Our top 5 choices were landfills, sewage, waste, cooking oils and salt marsh grass. These all derived from nearby places from KCIA for the best source. Ultimately, we concluded landfills were the best option.

## CAD Designs

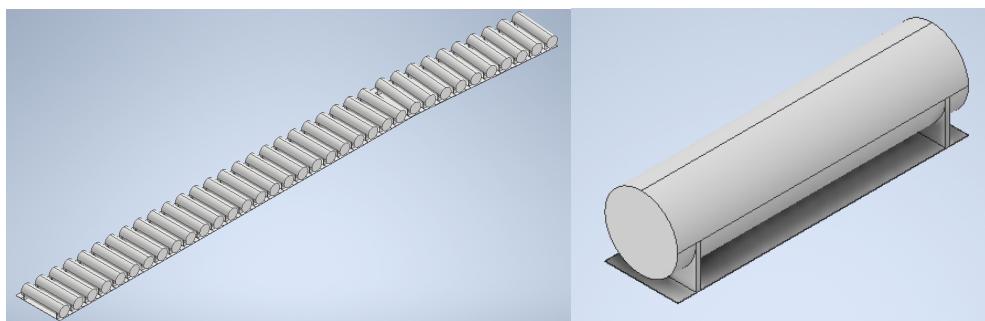
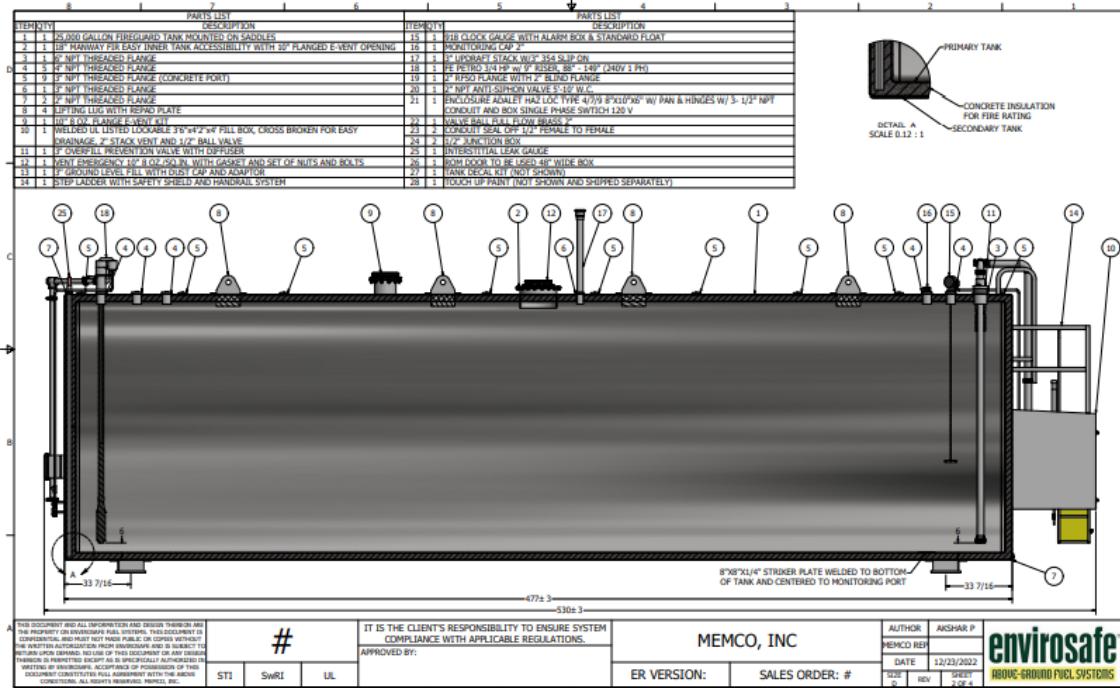
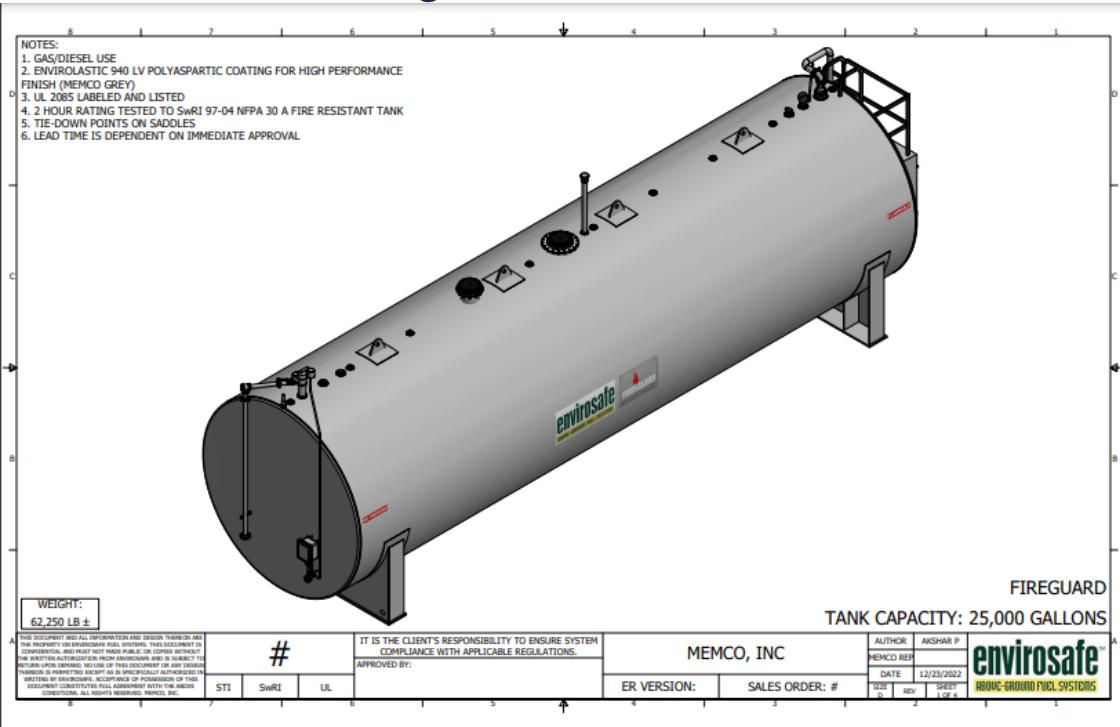
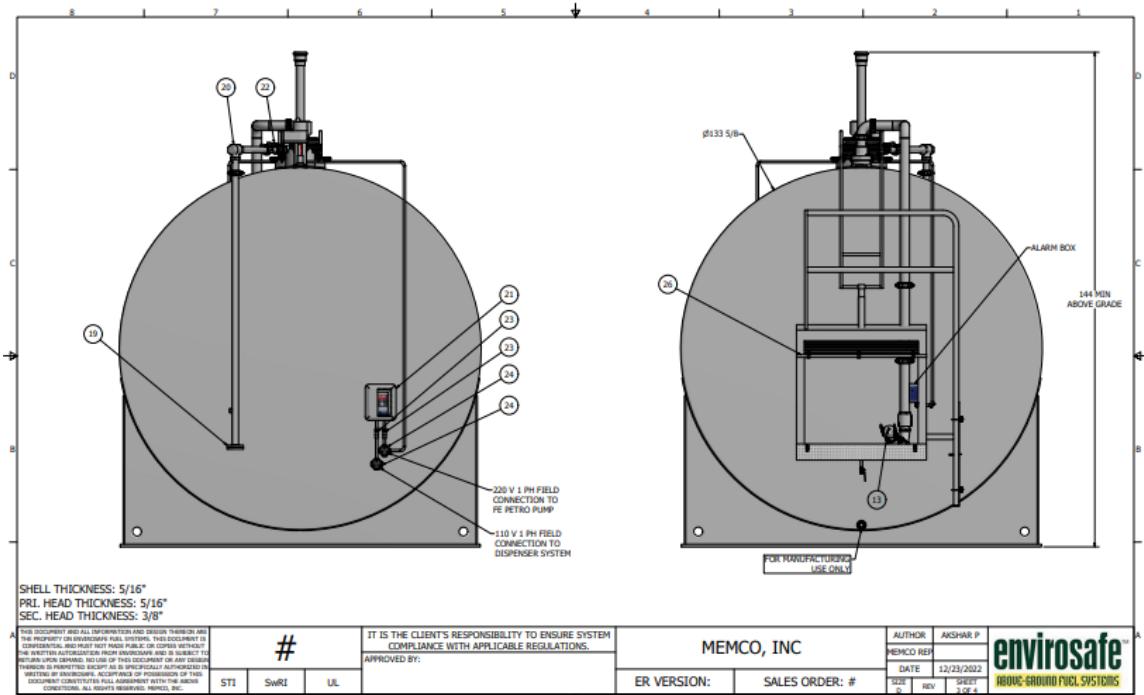


Image on the left shows the CAD assembly of the row of storage tanks which will be put into place on KCIA. Image on the right shows the CAD model of the storage tank

# Dimensions of Storage Tanks





Each image above shows the dimensions and features of the 25,000 gallon tanks that will be used for storage, provided to us by Envirosafe Tanks.

### Manufacturing process requirements



# **Site Selection and Condition Assessment**

## **Proximity to Residential Zones & Environmentally Sensitive Zones**

The Cedar Hills Regional Landfill is located in close proximity to several neighborhoods. Within a mile to the east and west of the landfill, there are local residential areas. One of the residential areas west of the landfill is home to an elementary school situated 1.1 miles away. Due to the short distance between these neighborhoods and the landfill, there is a concern for potential health issues. The landfill emits contaminated air that can lead to various health effects such as eye, nose, and throat irritation, flu-like symptoms, and other associated risks. Anyone that is living within a 1.8 mile radius of the landfill is at risk of these health issues.

## **Transportation to Washington Airports**

To transport all the landfill waste, the goal of Ecoflight Fuels is to have semi trucks fueled by biodiesel to transport biomass. Ecoflight Fuels will use the biomass from the landfill to make biodiesel for the trucks. Although this may seem like less SAF's will be produced, biodiesel is significantly easier to make with much less biomass.

## **Site Size & Room for Expansion**

The Cedar Hills regional landfill is our offsite waste stream that is a 920 acre site. The landfill has neighboring sites and residential areas. Although there is no room to expand on this site, Ecoflight Fuels plans to expand and use multiple locations in King County. In addition, this company will have a 50ft wide by 556ft long storage facility for the SAF's that we produce. This facility will be on KCIA so that aircrafts will be able to be fueled and refueled efficiently. This site will be able to hold up to a total of 875,000 gallons of SAF's using 35 storage tanks, each holding about 25,000 gallons.

## SAF Storage Sites



# Evaluation of Adherence to King County Sustainability and Climate Change Policies

The King County Sustainability and Climate Change policies offer numerous opportunities for the utilization of sustainable aviation fuel. By complying with SRFC 3.3.1 in the King County Strategic Climate Action Plan, the implementation of Ecoflight Fuels' sustainable aviation fuel (SAF) would create environmentally friendly job opportunities for community members, aligning with the county's goals. King County residents would be given priority in these job openings, and all SAF installations would be designed to minimize their impact on the climate.

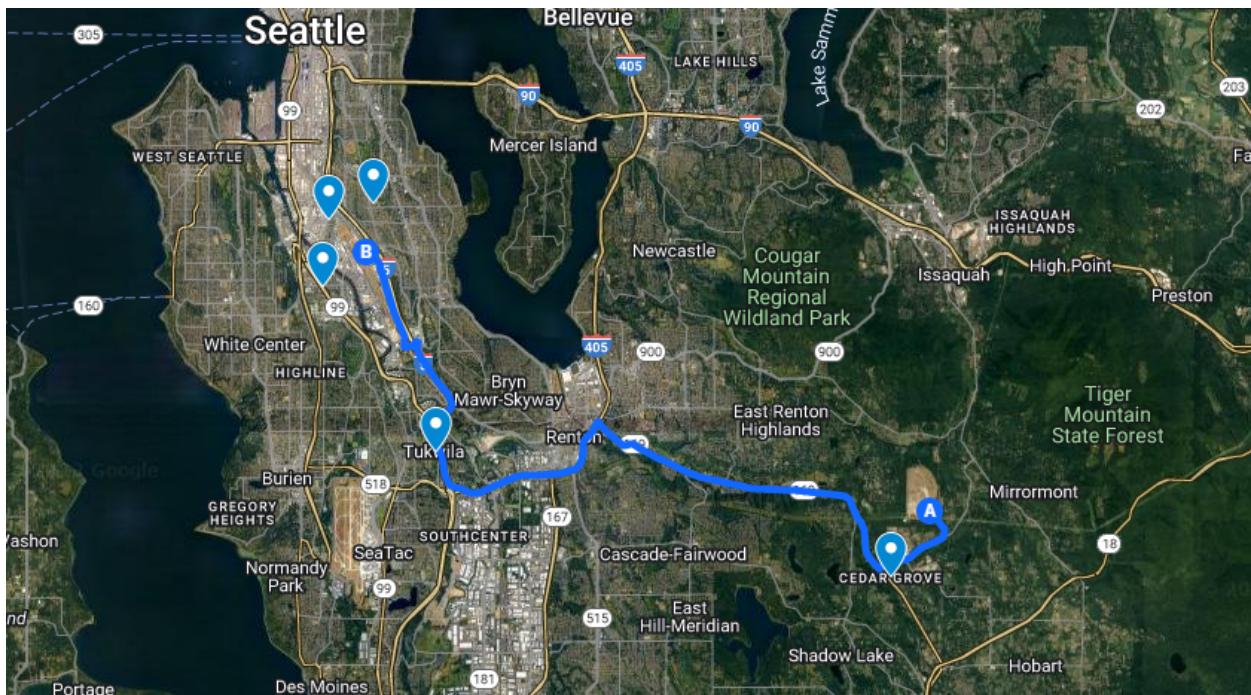
This initiative would not only support the county's sustainability objectives but also have a positive impact on the local economy. By adding cleaner jobs, King County's unemployment rate, which stood at 2.5% in March 2022, would experience growth. The King County Strategic Climate Action Plan consists of three key sections, with the second section being, Sustainable & Resilient Frontline Communities which emphasizes community engagement.

In accordance with the community engagement plan, various activities would be organized, including events, outreach to news stations, and social media communication, to ensure that community members are informed and involved. Gaining the support of the community is crucial as it allows individuals to have a voice in projects that affect their way of life. Section three of the King County Strategic Climate Action Plan addresses the significance of preparedness for climate change and potential climate impacts resulting from this project.

The primary focus of this project is the production of sustainable aviation fuel and achieving net-zero emissions by 2050. SAF derived from renewable biomass and waste resources has the potential to match the performance of petroleum-based jet fuel while significantly reducing its carbon footprint. This provides airlines with a solid foundation for decoupling greenhouse gas emissions from flight operations. By reducing the overall carbon footprint of our environment, SAF contributes to the fight against climate change.

# Community

## Community Impact



The map above shows the route from Cedar Hill to King County International Airport. In the website which it was created in each marker shows the demographics and data of languages spoken, ethnicities, income rates, and more in the area which it falls under.

## Plan to Engage the Community

Ways to Engage with the Community	Flyers	Social Media	Zoom	Dinner	News Segment
Engagement	1	2	3	3	1
Attendance	2	3	3	3	3
Quality	3	3	3	3	3
Quantity	3	3	2	1	2
Effectiveness	2	2	3	3	3

We used a decision making criteria to efficiently find the best way of reaching towards the community. Our top 5 choices included flyers, taking onto social media, a Zoom meeting, an informational dinner and a segment on local news about Ecoflight Fuels. After researching topics such as engagement, quality, effectiveness and engagement, we concluded that the most effective way of reaching towards a community was through an informational dinner and/or banquet.

## Impacted Communities and Community Characteristics

Tukwila is an area where the spillage of biofuel during transportation could profoundly impact the local community. It is worth noting that the population primarily consists of People of Color or Indigenous individuals, with Spanish being the predominant language spoken and it has an average of 2.76 people per household. The neighborhoods of South Park, Georgetown, Beacon Hill, Cedar Grove could potentially be affected by the biofuel mixture. When analyzing the

demographics of South Park, it becomes evident that People of Color or Indigenous individuals are the most prevalent racial group, and Chinese is the most commonly spoken language with an average of 3 people per household. In Georgetown, the most recurring racial group is Caucasian, while Chinese remains the predominant language with an average of 2.4 people per household. Then Beacon Hill is characterized by a diverse population comprising African American, Indigenous, and People of Color individuals, with Chinese being the most widely spoken language with an average of 2.18 people per household. Lastly, Cedar Grove predominantly comprises individuals belonging to Black, Indigenous, and People of Color communities, with Spanish emerging as the predominant language spoken among its residents. On average, there are approximately 2.76 individuals per household.

## **Local Community Organizations**

Ecoflight Fuels believes that organizing an event at Jefferson Park would yield significant benefits. We want to host an informative banquet, open to the public, to facilitate a deeper understanding of the topic of biofuels, sustainable aviation fuels (SAFs), and related subjects. This informational banquet will be hosted at the Tukwila Community Center. Finally, Ecoflight Fuels wants to establish a dedicated segment within a local news station that specifically focuses on Ecoflight Fuels. This new segment will aim to enlighten individuals who may still be unaware of what our plan is. Finally, it is essential to develop an interactive website where residents can conveniently submit their inquiries and concerns.

## **Our Plan**

Ecoflight Fuels' plan is to regain control of the environment by aiding the aviation industry to achieve net zero emissions by 2050. SAFs and biofuels must be

produced and used if we want to save our planet. The saying of killing two birds with one stone could be used in terms of our situation. By using biomass from local landfills to create biofuels for one helps the condition of the environment in general, but in turn reduces the carbon footprint from landfills as well as from airline companies.

Throughout the manufacturing process, we may run into some issues with safety. Safety is one of the top priorities which Ecoflight Fuels holds. With this in place, Ecoflight Fuels will provide utmost safety throughout the transportation of biofuel while actively engaging with communities by carefully considering their valuable feedback. Within the safety of our transportation, each vehicle will be inspected before departure to each site to ensure maximal welfare. The threat of a crash or accident could put a negative impact on Ecoflight Fuels' reputation, which is why using extra precautions is a must have in the plan.

While working with local organizations, manufacturing companies, and most importantly, KCIA, this plan will succeed past others in creating a sustainable and healthy environment. Although obtaining net zero emissions will be difficult and demanding, the end goal will give succor to the environment, people around the world, as well as alleviate stress that many companies may have from their carbon footprint in the past.

# Conclusion

Ecoflight Fuels' plan to produce sustainable aviation fuel (SAF) using biomass from local landfills presents a promising solution to address the pressing environmental concerns in the aviation industry. By utilizing waste materials already present on Earth, the plan aims to reduce CO<sub>2</sub> emissions and mitigate climate change. The use of biomass as an energy source offers a carbon-neutral alternative, as the CO<sub>2</sub> released during combustion is offset by the CO<sub>2</sub> absorbed during plant growth. Additionally, the proposal to explore biodiesel for conventional trucks and transition to electric semi-trucks aligns with broader efforts to reduce carbon emissions in the transportation sector.

The proximity of the Cedar Hills Regional Landfill to residential zones raises concerns about potential health risks associated with contaminated air emissions. However, Ecoflight Fuels emphasizes safety as a top priority throughout the transportation of biofuel, ensuring careful inspections and precautions to minimize any negative impact. Adherence to King County Sustainability and Climate Change policies demonstrates the company's commitment to creating environmentally friendly job opportunities and engaging with the community, which is essential for achieving project success and gaining public support.

The plan to engage local community organizations, manufacturing companies, and KCIA reflects the collaborative approach in creating a sustainable and healthy environment. By harnessing the potential of SAFs and biofuels, the project not only addresses the environmental impact of the aviation industry but also contributes to reducing the carbon footprint associated with landfills and other sectors. Although achieving net-zero emissions by 2050 poses challenges, the

ultimate goal of preserving the planet and alleviating the burden of carbon emissions for companies worldwide serves as a driving force for Ecoflight Fuels.

Furthermore, Ecoflight Fuels' comprehensive plan, with its emphasis on sustainability, safety, community engagement, and collaboration, positions the company as a leading player in the pursuit of a more sustainable future for the aviation industry and beyond. By leveraging biomass resources and promoting the adoption of cleaner fuel alternatives, Ecoflight Fuels strives to make a significant positive impact on the environment, benefiting both current and future generations.

# Appendices

## SAF Creation and Manufacturing Development - Criteria Matrix

SAF Providers	Landfills	Sewage	Waste	Cooking Oils	Salt Marsh Grass
Distance from KCIA	2	3	2	3	2
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# Community Impact Map

