MEMORANDUM

To: Hamilton County Policy Committee Members

From: Jeffrey W. Aluotto, Manager – Hamilton County Solid Waste District

Re: Analysis of Potential for Vegetable Oil/Waste Grease for Use as an Alternative Fuel

Date: August 24, 2005

The following relates to information requested by the Policy Committee on grease and vegetable oil in Hamilton County. Specifically, this report is a continuation to a preliminary report that was given to the Hamilton County Solid Waste Management District Policy Committee on September 1. At that time, the Policy Committee had requested that staff direct further research toward determining whether or not a pilot project should be implemented to test the use of vegetable oil as a diesel substitute. The following report provides some basic information on Grease and Vegetable Oil in Hamilton County. The report is divided into the following sections:

I. Executive Summary

The following report was conducted to determine whether there is justification, from an environmental, financial and technical standpoint, to conduct a pilot program utilizing vegetable oil as a direct fuel substitute in diesel engines. The report relates the following findings and recommendations:

- Waste vegetable oil as received by the Metropolitan Sewer District, or as collected in grease traps, is currently unsuitable for use as a diesel substitute.

- Most pure waste vegetable oil, as collected by rendering firms, is not disposed in local landfills (and is, in fact, recycled) thus lowering its priority as a solid waste issue of concern.

- Staff research and anecdotal evidence from private individuals and fuel system conversion vendors indicates that vegetable oil can successfully be utilized as a substitute for diesel fuel.

- Empirical research and expert analysis indicates that while vegetable oil can be used in the short run, long-term usage leads to a variety of engine problems, increased maintenance costs and reduced engine life. Staff has not located any recent, empirical testing of commercially available fuel conversion technologies.

- The degree of financial benefit derived from using vegetable oil directly as a fuel is uncertain and depends upon the price of diesel and the method used to acquire the vegetable oil. Vegetable oil, acquired as either waste material or straight product, most likely will still have an associated financial cost.

- Given current diesel prices, it is likely that there would be a financial benefit from the use of vegetable oil, with a relatively short payback period on the initial capital investment for vehicle conversions and fueling infrastructure. However, it is also possible that these benefits may decline, over time, as local market conditions for waste vegetable oil adapt to the new demand for the material.

- The benefits of a short financial payback period may be outweighed by expenses incurred from shortened engine/vehicle life as a result of using vegetable oil as a diesel substitute.

- Very little research is available on the environmental/emissions benefits of utilizing vegetable oil as a diesel substitute. What information there is shows a substantial reduction in emissions. A conversion of fleet vehicles to run on vegetable oil would have little, if any, impact on material going to landfill.

- With the available technical evidence indicating increased O/M costs and shortened engine lives, staff would not recommend the use of vegetable oil as a diesel substitute in vehicles considered critical or requiring heavy cold weather usage. Rather, if a pilot is desired, staff would suggest approaching a local university to assist with testing a non-critical vehicle to examine issues of long term mechanical and environmental performance.

II. Market Information on Grease and Vegetable Oil

a. Definitions

SVO: Straight Vegetable Oil. Refers to unused vegetable oil produced for cooking purposes (e.g. Canola oil, sunflower oil, etc.)
WVO: Waste Vegetable Oil. Refers to oil and grease remaining following the use of vegetable oil in a cooking process.
VO: Vegetable Oil. For the purpose of this report, VO will be used when referring to both SVO and WVO.

b. Amount of Grease Generated in Hamilton County

Appel Consultants of Valencia California produced a study in 1998 which characterized the volumes of grease, produced from restaurants, in 30 metropolitan areas. The study is widely utilized by those looking to provide estimates of the amount of grease generated within their communities. This study provided a range of 2,000 – 13,000 pounds of grease/per year/per restaurant. Brown or trap grease, on the other hand, may be generated in amounts between 3,000 and 24,000 pounds per restaurant per year.

Applying this information to Hamilton County, in which there are approximately 1,820 restaurants, would yield between 9.1 million pounds (1.1 million gallons) and 67.3 million pounds (8.8 million gallons) of waste oil and grease produced annually in Hamilton County – solely from restaurants.

c. Collection Management Methods

Grease is managed in two primary ways at the source. It is either poured off, separately, into a container which is then serviced by a private sector entity, or it is washed into the sanitary sewer system where it may, in part, be collected by a grease trap - the remainder traveling to MSD. For the most part, material finding its way into the sewer system is material resulting from the cleaning of restaurant equipment and thus is also mixed with other material – primarily water, soap and food material. Material poured into a separate container is typically much cleaner than the material poured into the sewer system.

District staff conducted a survey, focused on restaurants in Hamilton County, to determine current practices as it relates to grease management. Almost all restaurants surveyed indicated that they contract with a private company to take most of their grease. Those contractors then utilize the material in different ways including selling it to manufacturing operations for use in various products and utilizing the material in the blending and production of biodiesel fuel. Surveyed restaurants typically contract for the hauling of most of their pure grease but utilize the sanitary sewer system to accept grease from the cleaning of cooking operations, etc.

d. Costs to Generators

As stated above, restaurants typically contract with private entities to take the grease that has been poured off into separate containers. However, the cost involved with this practice varies. 8 out of 17 restaurants surveyed actually receive money back for the grease they provide to the private contractor. Of those that do pay, the amount ranged from **$100 - $2,400** per location per year.

Applying these costs to Hamilton County restaurants, and assuming that half of these facilities receive free collection or are paid for the material, yields a total management cost of approximately $667,000 per year. This data assumes 1,820 restaurants in Hamilton County.

Factors which determine how much a facility pays to dispose of its grease range from type, quality and quantity of the material in addition to the market conditions for grease when the contract is signed.

e. Disposal Practices

From interviews and surveys, staff has discerned that the primary methods for managing grease include handling through a private contractor for recycling or disposal through the sanitary sewer system. A survey of landfill operators indicated that they did not receive grease from restaurants in any significant quantity. MSD uses grease as a fuel source in its sludge incinerators. Remaining grease is mixed with grit and landfilled. MSD estimates that they spend approximately $160,000 per year on disposal costs relating to both the grit and the grease.

Thus, of all the grease material going to landfill, it appears that the vast majority is material coming from MSD. This material, however, is most likely ill suited for use as an alternative vehicle fuel. To the degree it does have thermal properties; it is currently being used by MSD as a fuel source.

f. Current Markets for Grease and Potential for Use as a Diesel Substitute

i. Yellow Grease

Straight vegetable oil, or yellow grease, collected from restaurants does not lack market opportunities. Rendering plants currently market locally generated material for use in pet food products, other manufacturing operations and biodiesel fuel. Most yellow grease is also a viable candidate, after filtering, for use as a diesel substitute.

ii. Trap Grease

Unlike yellow grease, however, brown or trap grease does not possess much market value. This material is the grease collected by grease traps and disposed at MSD. Discussions with individuals involved with the collection of this material indicate that it is unlikely that this material could be upgraded to serve as a viable fuel option. The proprietor of one firm heavily involved in the collection of trap grease informed staff that his firm was currently making significant capital upgrades in order to separate the grease material from the water which could be sent to sewer. Even after making these upgrades and performing this separation process, however, this individual stated that the remaining grease product was completely different from the yellow grease collected by the rendering industry and was not suitable for any beneficial use. The reason behind separating the water was simply to reduce disposal costs.

Likewise, staff posed the same question regarding trap grease to the proprietors of Greasecar.com, one of the leading vendors of vegetable oil fueling conversion technologies. The following response was received from Mr. Michael Garjian, one of the administrators with Greasecar.com:

“Your trap grease problem is not unusual. . . I cannot say I am optimistic because of the possibility of contaminants. In the future, we would be willing to provide you with a possible testing regimen to determine its viability. This would primarily be a filtering process however, that does not address the possibility of organic chemical contamination.”

Thus, all indications are that upgrading trap grease into a viable fuel commodity would require the employment of physical and chemical separation technologies beyond the scope of this research. In addition, it is likely that employment of such technologies would significantly reduce or eliminate any economic advantage associated with utilizing WVO for a fuel alternative.

III. Conversion Project Details and Projections

This section discusses the potential logistics involved with a vegetable oil conversion project in Hamilton County. Much of the discussion focuses on an entire fleet conversion in order to detail the full scope of potential costs and benefits. This data, however, can easily be manipulated to show the likely costs and benefits from a pilot program which would work with only a portion of the available fleet.

a. Potential Number of Conversions

Across the County's Engineering Division, Public Works Division and the various operations of the City of Cincinnati utilizing on-road diesel vehicles, there are approximately 200-250 vehicles with the potential for being converted to VO technology. SORTA has indicated a total of 440 diesel vehicles which would be potential candidates for conversion to an alternate fuel.

b. Fuel Cost Savings

Between the City, County and SORTA, the region spends approximately $7.6 million on diesel fuel each year. Obviously, any technology which could significantly reduce the amount of diesel fuel used in regional fleets could have a significant positive financial benefit. According to a leading vendor of VO technologies, implementation of these systems will allow fleets to reduce use of diesel fuel by a factor of 95%.

i. Fuel Cost Savings Using VO

One option for utilizing vegetable oil as a diesel substitute would be to purchase straight vegetable oil, in bulk, from a supplier as opposed to working with waste vegetable oil. As of early October, soybean oil was trading for 20 - 30 cents per pound on the CBOT. Prices of this level translate to approximately $1.50 - $2.30/gallon for soybean oil. Therefore, while an SVO project may have significant emissions reduction benefits, the financial benefits would range from $0 to $1.00/gallon given a $1.75 - $2.50/gallon cost of diesel (current estimated range of contract prices for diesel for large regional users). The financial benefits, however, would increase in direct proportion to the rising price of diesel.

ii. Fuel Cost Savings Using VO

There would be two options for utilizing VO as a fuel for vehicles. The first option would be to work with a rendering operation to provide the vegetable oil. This option, however, would entail a cost as yellow grease does in fact have a market value. Yellow grease currently sells on the open market for approximately $1.10/gallon (in bulk shipments). It is unlikely that a rendering company would part with this material without compensation. Thus, it would not be unforeseeable that the County could pay between $1.25 - $2.00/gallon for yellow grease material from a rendering company.

An alternative to working with a rendering company would be to collect this material independently. This, however, would involve the region getting into the business of grease management and disposal. In order to collect enough grease to fuel 20% of the vehicles in the

City/County fleet, it is estimated that material would be needed from approximately 200 restaurants. Thus capital investment would be required in transportation and collection equipment as well as in staff to perform hauling, contractual and customer service duties.

iii. Financial Cost/Benefit Comparison[1]

	Diesel Fuel	SVO	WVO (Purchased)	WVO (Collected Directly from Generators)
Purchase Price/gallon	$1.75-$2.50	$1.50 est.	$1.25 - $2.00 est.	Initially Zero to Minimal
Current Fuel Cost	$7.6 million	-	-	-
Total Estimated Fuel Costs	$7.6 million	$6.4 million	$5.3 - $8.5 million	Contingent upon collection and operation costs
Increase in Annual Maintenance (5% - 10% increase)[2]	-	$200,000 - $400,000	$200,000 - $400,000	$200,000 - $400,000
Range of Annual Savings/(Costs)	-	$800,000 - $1.2 million	($1.3 million) - $2.1 million	Unk.
Capital Costs	-	$3 million[3]	$3 million[3]	$3.6 million[4]
Payback Period (yrs)	-	2.5 – 3.75	1.43 – ∞	Unk.

1 Estimate of fuel costs for SVO and WVO assumes 100% usage of vegetable oil. This ignores the fact that vehicles operating on vegetable oil still require diesel fuel for start up and shut down. Vendors of conversion technologies have stated that vehicles can realistically cut diesel usage by 95%. This analysis also assumes year round and fleet-wide usage of vegetable oil. It is likely, however, that vegetable oil usage would decrease in winter months and may not be used at all in critical vehicles with heavy cold weather usage such as snow plows.

2 Assumes an average annual vehicle maintenance cost of $3,992 for vehicles and $8,268 for busses (ICMA Center for Performance Measurement FY 2003 Fleet Mgt. Report). Also assumes a range of 5%-10% increase in annual maintenance costs due to the use of vegetable oil as diesel substitute. See Section IV a for more information on this assumption. Does not show increase in costs due to potential for decreased vehicle life.

3 $3 million for conversion expenditures. Average $4,500 per conversion. Assumes 100% fleet conversion.

4 $3 million for conversion expenditures. Average $4,500 per conversion. Assumes 100% fleet conversion. $600,000 for additional capital expenditures relating to fueling infrastructure (trucks, containers, tanks, etc.)

c. Pilot Program Costs

A pilot program utilizing 5 City/County vehicles would cost approximately $22,500 in conversion costs. A centralized fueling system would require a tank to store raw, unprocessed fuel as well as another tank where heated, filtered oil could be stored prior to pumping. In addition, purchased vegetable oil may be stored in 275 gallon Schutz bulk containers. In total, a centralized facility should not cost more than $20,000. Depending upon the number of conversions, however, more than one facility may be required.

IV. Environmental Benefits

a. Air Quality Benefits

There is very little published data concerning emissions testing of vehicles using VO technology. Most of the published data relates to the use of biodiesel. *One study, however, conducted by a vendor of VO conversion kits, details a 26% reduction in emissions of carbon monoxide along with a 39% reduction in the emissions of particulate matter using VO.*

Assuming a total conversion of eligible vehicles to VO technology throughout the City, County and SORTA, the region would see a 41,000 pound reduction in the amount of vehicle related pollutants (PM and CO) entering the atmosphere. A 20% conversion would eliminate 8,000 pounds of pollutants. The vast majority of this reduction (94%) would come from reductions in Carbon Monoxide (CO) while the remainder (6%) would stem from reductions in Particulate Matter (PM). Information on changes in other pollutants was not available and thus was not included in this analysis. The following table details total fleet vehicle emissions using standard diesel fuel and VO.

100% Fleet Conversion Emissions Potential

Annual Emissions of PM, CO and NOx Using Diesel in City, County and SORTA Vehicles (lbs)	**653,582**
Annual Emissions of PM, CO and NOx Using SVO in City, County and SORTA Vehicles (lbs)	**611,737**
Reduction in Emissions of PM, CO and NOx from Conversion to SVO (lbs)	**41,845**

As detailed above, converting 100% of eligible fleet vehicles would lead to emissions reductions of approximately 20 tons annually.

V. Concerns with Vegetable Oil as a Diesel Substitute

a. Operational/Contractual Issues

Under the current management method for grease, restaurants pour the material into containers owned and serviced by one of several companies located in the tri-state (e.g. Griffin Industries, Restaurant Technologies, Roto-Rooter, etc.). Restaurants are typically under contract with these entities to provide that material in exchange for collection. In addition, survey results tend to indicate that the direct financial cost of managing this grease (contracting for disposal) is low compared to traditional refuse. *Thus, any system for securing material for a VO project would either need to work through the contractors currently managing this material or would need to provide a system for managing the material which is as convenient and cost effective as the current system.*

From an operational perspective, a VO project would undoubtedly face concerns from fleet managers concerned with the reliability of the fuel source from both a supply and a quality perspective. Little research is available which examines the long term performance of VO on engine performance. The primary piece of research available is a literature review conducted by the University of Idaho. This report examined approximately 40 separate studies on the issue of replacing diesel fuel with un-modified vegetable oil and concludes that:

> *Studies involving the use of raw vegetable oils as a replacement fuel for diesel fuel indicate that a diesel engine can be successfully fueled with 100% vegetable oil on a short-term basis. However, long-term engine durability studies show that fueling diesel engines with 100% vegetable oil causes engine failure due to engine oil contamination, stuck piston rings, and excessive carbon build-up on internal engine components. Therefore 100% unmodified vegetable oils are not reasonable diesel fuel replacements.*

Ken Bickel of the University of Minnesota Center for Diesel Research[1] remarks "These problems (above) were attributed to A) polymerization of components of the oil (triglycerides) which lead to deposits, and B) low volatility and high viscosity which gives poor atomization, leading to injector coking and other issues. It is because of these issues that vegetable oils are esterified and made into biodiesel." Mr. Bickel goes on to remark that "Anyone using SVOs in diesel engines runs the risk of having higher maintenance costs and reducing engine life"

As it relates to fuel quality standards, there are currently no such standards for the production, supply or use of straight or waste vegetable oil as a fuel. There is no guarantee that one batch of fuel will be identical to the next. Material is collected and used, in virtually unprocessed form, directly from waste generators. Thus, while the product may be filtered before use, there is no guarantee that the fuel will be free of chemical contamination which may impede performance or damage engine components.

b. Engine Warranties

Current research has not located any original equipment manufacturers which cover engines using VO under existing warranties. *Therefore, a potential hurdle involved with utilizing VO technology in fleets throughout the region would be the chance that engine warranties would be voided by using the fuel.* Most engine warranties typically permit the use of biodiesel fuel in concentrations of up to 5%. A review of warranty statements indicates that there may be a movement in the industry to examine blends of up to 20% biodiesel. In general, warranties require that fuels meet petroleum industry specifications. It is understood that any fuel not meeting these specifications is not covered by the warranty. John Deere is one company which expressly prohibits the use of raw vegetable oils in its engines.
Other manufacturers of engine equipment also have published cautions against the use of SVO or WVO. As an example, Delphi which supplies injection units and electronics for the manufacture of engines, states the following in one of their service bulletins: "Unmodified vegetable oils, when subjected to heat in the fuel injection system, form sticky deposits that can be found inside the fuel pump and they form a hard lacquer in the injectors where exposure to even higher temperatures takes place."

Staff has not found any organizations currently using VO for fleet vehicles. However, manufacturers of conversion kits recommend that, in order to overcome this obstacle, only vehicles with engines out of warranty be used for conversions.

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[1] The Center for Diesel Research is dedicated to serving the diesel engine, automotive, and the alternative fuels industries. The Center specializes in the physical and chemical characterization of exhaust emissions, evaluation of emission controls, evaluation and demonstration of alternative fuels, certification of on- and off-highway engines, and the evaluation of control technology in the field

c. Availability of Material

If it were the case that the project looked to utilize the material from MSD instead of material directly provided from restaurants, a challenge arises in terms of material quality. District staff's research indicates that the material received by MSD would be inferior in quality to that siphoned off by restaurants and thus not suitable for use as an alternative fuel. The material received by MSD is typically referred to as "trap grease" and has a high contaminant level in terms of solids and water. It differs widely from the pure, "yellow" material collected at the restaurants. This "trap grease" material may not be viable for use in alternative fuel projects. Material collected directly from grease traps would be subject to this quality issue as well.

d. Quality Assurance

Another issue related to the use of VO is the issue of continually assuring quality in the fuel supply. The problem here is not so much with the fact that use of the fuel would probably void most engine warranties (using bio-diesel at blends above B-5 would do the same). Rather, the problem is that there is currently no, and unlikely ever to be, any sort of quality assurance standard for the production or use of vegetable oil. Bio-diesel, for example, is manufactured specifically for use as a fuel. As such, producers, and the fuel itself, are subject to certification requirements and quality assurance standards. Every gallon used is certified as a homogenous product. Every gallon is produced according to stringent standards. No such standards exist for waste vegetable oil. Without these standards, vehicle operators and fleet managers would be dealing with a truly different blend of fuel, with different physical and chemical properties, each and every time they fueled a vehicle.

e. Conversion Costs

The costs associated with converting fleet vehicles to run on VO technology would be fairly moderate given the potential for pay-back through fuel savings. According to information provided by a vendor of conversion kits, the typical cost for converting a vehicle would be approximately $4,000 - $5,000. Thus, converting 10% of the approximately 679 eligible vehicles would cost approximately $350,000. If this conversion reduced diesel fuel consumption, in participating fleets, by 95% (recognizing that converted vehicles still use some diesel fuel) these participants would recognize a return on investment in approximately 1 year.

The costs listed above include all equipment necessary for an individual vehicle to run on VO. This includes tanks, valves, heaters, filters, harnesses, etc. For fleet use, however, additional costs would be required to develop a centralized fueling facility as it would be impractical for government vehicles to utilize the waste oil containers behind food service establishments as is typically done with residential users. The cost of such a facility, however, may be minimal due to the fact that unlike most fuel facilities, vegetable oil is not a fire or explosion hazard.

Options for collection include contracting with current collection vendors to deliver a portion of the material to the fuel infrastructure developed by the County, or performing the collection independently. The former option would probably be preferable as it would be difficult for the County to logistically enter into the business of collecting material for which a privately developed market currently exists. Performing independent collection would also necessitate additional capital investment in equipment such as collection tanker trucks and grease dumpsters as well as operational investment in staff to coordinate routes, customer service, and contract management.

f. "Competition" With Other Fuel Technologies

Any effort to initiate and promote a VO project is likely to face questions from those concerned with the fuel's track record and prospects for use in their own fleet. Many of the potential fleet users of VO have experimented, or are experimenting, with other alternative fuel technologies (E85, biodiesel, etc.). VO would be a "new player" in the local market and thus proponents would have to convince potential users of the fuel's viability from a financial, logistical and operational standpoint.

g. Solid Waste District Funding Limitations and Priorities

Currently, use of Solid Waste Management District funds (generated through a disposal fee on waste disposed in Hamilton County) is prescribed by the Ohio Revised Code. In general, the Ohio Revised Code requires that funds be used for purposes affecting the municipal solid waste stream. Staff is of the opinion that an argument could be made that, to the degree material from MSD is winding up in the landfill, District funds could be used to address this waste stream. However, it should be noted that information from MSD shows that the total amount of grit, screenings and grease they dispose of annually is approximately 3,200 tons. Assuming one third of this material is grease, the District would be embarking on an effort to divert approximately 1,000 tons from the waste stream. While this is not insignificant, the District may wish to prioritize this material in terms of other unaddressed waste streams.

With that said, however, the point is made moot by the fact that the material from MSD is most probably inappropriate for use as an alternative fuel.

VI. Vegetable Oil vs. Biodiesel

Much of the research performed by staff produced more information on biodiesel than VO. In addition, the research performed by staff seems to indicate the potential for conflict between an effort to develop a VO infrastructure and the currently developing biodiesel infrastructure – as both technologies utilize the same raw material and target the same potential fleet vehicles. Conversations with representatives from the agricultural industry, for instance, indicate a strong support for biodiesel due to the strict specifications and quality assurance standards designed around the fuel. The agricultural community is less supportive of VO technologies due to the lack of standards associated with those products for use as fuel. In sum, any discussion of VO will undoubtedly lead to discussions on biodiesel.

For the most part, the difference between VO and Biodiesel comes down to whether a vehicle is modified to accommodate a fuel or whether a fuel is modified to accommodate a vehicle. VO works on the former premise while biodiesel works on the latter. With VO, vehicle fuel systems are converted to operate on either traditional petroleum products or VO. These vehicles then can operate on either petroleum or VO. Biodiesel, in contrast, is made through a chemical process called transesterification whereby glycerin is separated from vegetable oil. The process leaves behind two products -- methyl esters (the chemical name for biodiesel) and glycerin (a valuable byproduct usually sold to be used in soaps and other products).

VII. Summary of Findings and Recommendations

The purpose of this analysis was to determine whether or not there is justification for pursuing a pilot program using waste or straight vegetable oil as a fuel source for public sector fleet vehicles.

After reviewing this issue, staff is of the opinion that there is obviously technical merit to the idea of utilizing vegetable oil as an alternative fuel. Since the creation of the diesel engine, it has been known that it is possible to use vegetable oil as a diesel substitute. In addition, there is a considerable amount of anecdotal evidence which indicates that individual residents are successfully utilizing vegetable oil and grease through the use of commercially available conversion kits. With this said, however, staff is of the opinion that there are several obstacles, both technical and logistical, which limit the practicality of utilizing this fuel in a fleet setting.

1. The only substantive evidence on the long term use of vegetable oils as a substitute for diesel fuel indicates the potential for significant long term engine problems. While anecdotal evidence is available which demonstrates the possibility of using vegetable oil, most reliable technical sources cite inevitable long-term engine problems from its use. Staff also has unanswered questions regarding the potential for this material to be used in cold weather operations. If cold weather operation were not deemed practical or reliable, this would significantly limit the potential benefits of the project.

   Simply examining the financial payback period, in this case, can be misleading. Without adequate information on all long term costs associated with the use of VO the payback schedule may be positively skewed to a significant degree.

2. Acquisition of sufficient supplies of vegetable oil could only be accomplished through:

   a. Purchasing the material from a rendering company,
   b. Purchasing straight vegetable oil in bulk, or
   c. Collecting grease directly from a generator

3. All of the above options entail a cost which would limit the potential financial benefits of the project. Option C, in particular, would require a significant capital and operational investment while forcing the county into direct business competition with local rendering firms. (Note: While the grease rendering companies typically have contracts on most of the grease material produced by restaurants, there is nothing in the long-term which entitles those companies to the rights on this material. If an individual restaurant decided that it would rather have its grease material used as an alternative fuel in a County sponsored project that would be its prerogative. However, what cannot be understated is the tremendous infrastructure investment that the rendering companies have made to store, manage and collect grease material from these generators. For the County, or any fleet, to obtain free grease material from local generators, it would have to 1. Develop a partnership with a host of willing generators, and 2. Be willing to make an equal investment in such a collection infrastructure. Even then, it must be willing to respond competitively to the maneuvers of the private industry players in this market as they react to what they would certainly see as a new competitor. In other words, while the average resident may currently find it possible to obtain free grease material, this is unlikely to be the case for any large scale user of the material).

   As the demand for VO continues to rise, it is also realistic to believe that the price of the material will follow. Sporadic monitoring of VO discussion boards indicates that there are already places in the U.S. where VO is being sold by generators, to individual users (the type of consumer currently receiving the material for free locally), for approximately $1.00 per gallon.

   It may be possible to arrange a pilot program where VO would be provided by a willing generator free of charge. However, this does not seem to be a realistic possibility for implementation of a long term project.

4. Issues of fuel quality and consistency would be of continual concern – despite conducting a pilot program. Issues of fuel consistency would not be able to be effectively researched due to the lack of quality assurance and manufacturing standards on the product as a fuel (i.e. simply because the batches of fuel during the pilot were acceptable does not ensure that a batch after the pilot will be. This risk is much greater using vegetable oil than with a fuel meeting petroleum institute or ASTM standards).

5. From a solid waste perspective, the attractiveness of the project is diminished by the fact that the material to be used in the pilot is currently not going to landfill – and is in fact already being recycled. Likewise, the material which is going to landfill (and thus would make for an appropriate waste diversion project) is not conducive for use as an alternative fuel.

6. An interesting issue which staff came across several times during its examination of this issue is the lack of fuel tax applied to SVO or WVO. Those raising this concern have stated that individuals using a fuel which currently does not have fuel tax applied should somehow be made to pay this tax to contribute to road construction and maintenance. Staff has found incidents, nationwide, of state troopers fining individuals for using a fuel without paying fuel tax. This may become a more significant issue as use of WVO increases.

Staff does not discount the potential for this fuel source to become more attractive as the price of diesel continues to increase and possibly as engine technologies advance to handle more viscous fuels. However, staff has concerns regarding the current technical issues identified by the various parties who have studied this issue. A pilot project may still be desirable so long as the parties participating fully understand the operational risks inherent with the use of vegetable oil as a fuel and understand that the goal of the pilot would be to document mechanical and environmental performance while determining whether the aforementioned complications actually materialize during practical operation. District staff can continue to assist by identifying likely candidate vehicles for a pilot project if the Policy Committee would like to proceed with this issue. From there, however, County and City policy makers will need to solicit interest and participation with owners and operators of regional fleets.

Staff would also recommend that local universities be approached to expand on past research related to the mechanical and environmental performance of raw vegetable oils used as a diesel substitute through the application of commercially available conversion systems. Staff from the University of Cincinnati's Department of Civil and Environmental Engineering has already expressed interest in this topic. If requested, District staff could discuss this issue further with the University to determine what resources would be required and how to proceed with a pilot.