

HELPING THE FUTURE
THROUGH HYBRID BUSES

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INTRODUCTION

During the 1960's and 1970's, Portland's population practically doubled in size. Because of this growth, many people ended up living further away from the city in the suburbs, compelling them to depend more on their cars. In 1972, Portland's downtown air was so dirty it violated federal health standards one out of every three days. Between 1989 and 1993, an estimated 41,000 cars were added to the Portland metropolitan region's highways during rush hour. And over the next 20 years, the region's population is expected to increase by 500,000. Officials project that even if the region is successful in carrying out its current land use and transportation plans, traffic congestion could still more than double over the next 15 years.⁽¹⁾ So what this means for the city of Portland is that there will be more traffic on the roads, which equals more congestion. Also, with increased amounts of cars on the road, the amount of emissions from vehicles will also increase.

So, what are emissions? Why should we as a society and citizens be concerned? Theoretically, if we could achieve complete combustion, we would only have carbon dioxide and water vapor from the exhaust and we wouldn't have as much to worry about, besides the debated topic of global warming. Unfortunately it is not feasible to achieve complete combustion due to the impurities in the fuel, after-products, and many other factors. Many of these pollutants are regulated by various governmental agencies. The regulated portion of NO_x, CO, HC, and NMHC, cause the formation of smog and contribute to acid rain.⁽²⁾ So, where would one start on such an overwhelming task to control these emissions? The main issues are cost, making the

plan attractive to future users, and considering what effects it would have on the environment.

Many different companies have been trying to invent efficient ways to transport people from place to place for over one hundred years. The introduction of light rail was not even a new concept; Portland had its first electric rail line running as early as 1891. After World War I ended, more and more men bought their own automobiles, thus depending less on public transit. In the 1930's after the Great Depression, buses started to become more popular and transit in the Portland area started to rise once again. In 1969, the City of Portland created Tri-Met. A company that would be left in charge of providing public transportation throughout Multnomah, Washington, and Clackamas counties, hence the name Tri-Met: Tri meaning three and Met was short for metropolitan. In 1986 the first MAX (Metropolitan Area Express) line was finished, running from Gresham to downtown Portland. In 1998 Westside light rail began to connect with the original MAX line, enabling passengers to go as far West as Hillsboro.⁽³⁾ It was believed that MAX would improve most traffic congestion problems, but we can see with statistical data that that is not the case. MAX lines are not feasible to most people, because it runs in one direction and cannot be altered to drive to other areas. Wherever the tracks are laid down is where the train must go. MAX is also very expensive to construct. Consequently we now are in need of another transportation method to reduce the amount of traffic congestion.

THE HYBRID DIESEL/ELECTRIC BUS

Because of the need to reduce traffic congestion while also decreasing the amount of pollutants being introduced into the atmosphere, diesel/electric buses running

in express lanes could do just that. A small number of such hybrid buses are being tried out around the country. These buses use half as much diesel fuel, have considerably less pollutants, and are much quieter than conventional buses. Hybrid buses get electricity from two sources. The diesel-fueled engine on the hybrid operates a generator that produces the electricity to run an electric motor that propels the bus. Also, when the brakes are applied, motors on the wheels become electric generators that send electric energy to batteries stored on the roof of the bus.⁽⁴⁾ The engine runs at a constant speed regardless of road speed or terrain, which provides optimum levels of fuel efficiency and emission reduction.⁽⁵⁾ Each of these buses will cost us \$550,000, while maintaining them will cost \$300,000 per year.⁽⁴⁾ As described later, we will need 25 buses (23 for each of the site locations and 2 extra buses in case anything should go wrong with any one of the other buses). The total cost of the buses will be \$14,050,000, which is significantly less than \$963,000,000 needed to build MAX.

HOV LANES

These hybrid buses will be considered express buses because of the new HOV (high occupancy vehicle) lanes that we will be putting in. There will be HOV lanes on I-84, Highway 26, and the continuation of the I-5 HOV lane. The lanes will operate from 6:30 am to 9:00 am for the morning rush hour. The evening schedule will be from 3:30 pm to 7:30 pm. The cost of all of the HOV lanes will be approximately \$15,000. We will have the prisons make the signs for us, and then we will hire a company to paint the diamond sign on the road itself. If we can't get people out of their cars and onto our bus, hopefully they will at least carpool because people who are carpooling will also be able to use the HOV lanes.

RIDERSHIP

According to Tri-Met, in 1999 they had 1,950 originating daily rides per route. If we have five locations for our express buses, then there would be 9,750 new passengers. We also would be taking 8,125 cars off of the road: 9,750 divided by the number of occupants in each car, which is 1.2.

EMISSIONS FROM CARS AND BUSES

A diesel engine emits 2.46 grams of pollutants per passenger mile with an average of ten passengers, while a car emits 19.3 grams per passenger mile with an average of 1.2 passengers in the car, and the electric portion of our bus will not have any emissions.⁽²⁾ When one commuter leaves their car at home and uses Tri-Met for a year, our lungs and planet are spared 78 pounds of pollutants.⁽⁵⁾ As a result, if we did have 9,750 passengers, then we could save ourselves from 17,550 pounds of pollutants going into the air: 261 work days times 78.

LOCATIONS OF THE EXPRESS BUS PARK & RIDES

There will be five main locations for the Park & Ride station's pick-up sites in the morning. The main goal of this express bus service is to provide quick and easy transportation to and from downtown Portland. In the process, we will be reducing traffic congestion on I-84 and Highway 26, while also reducing the amount of carbon monoxide emitted into the environment.

LOCATION #1: GRESHAM

The first of these five pick-up sites is in Gresham on 181st between Glisan and Burnside. Currently this piece of land is paved and empty. This location is expected to draw people from as far east as Sandy to as far west as 165th. The other options that

Gresham transit commuters have is MAX or their personal vehicles. It takes MAX approximately one hour to get to downtown Portland from the Cleveland station, and a half an hour to 45 minutes by car when in vehicular traffic. With express bus service, one can make it downtown in less than 30 minutes and not have to worry about finding a place to park. The Gresham lot would operate with five buses in order to follow the strict schedule.

LOCATION #2: VANCOUVER

Pick-up site number two is in Vancouver on Columbia House Road right next to SR-14. This site enables drivers quick access on and off the freeway. With such a rapidly growing town, a park and ride that can get you downtown in just 20 minutes is sure to be a hit, while attracting people from Camas all the way to Battleground. This location will require four buses for the bus to be on time.

LOCATION #3: GATEWAY

Location number three is situated at the already widely used Gateway transit center. This site will also serve as the home of our buses. We will build two parking garages and one additional building for conducting business and doing maintenance on the buses. Gateway is expected to be quite popular, bringing in people from a four to five mile radius. The trip from Gateway to downtown will take only 15 minutes, saving people much valued time and using only 4 buses to do it.

LOCATION #4: CLACKAMAS

Site number four is in Clackamas, located at the southeast end of Clackamas Towne Center's parking lot. The completion of a parking structure right next to a mall will no doubt be a benefit to the mall and their clients. This lot will be given to us at no

cost with only one stipulation; the mall customers may use this facility on weekends and holidays. Clackamas is also a growing community, and will be delighted to find an express bus service that will cut travel time in the morning from approximately 45 minutes to about 25 minutes. This location will require six buses to run the same schedule only because it is further away than other locations.

LOCATION #5: BEAVERTON

The fifth and final lot is in Beaverton on Canyon Road and Canyon Drive. This express bus is expected to be quite busy with such a high need for a service in this area for the reason that MAX is too slow and the freeway is approximately the same because of overcrowding. With the use of our express buses, customers will be able to relax and jet downtown in less than 20 minutes. There will be four buses needed for this location site.

COST OF PARKING LOTS

The cost of acquiring all of these parking lots will total \$450,000, which is a very affordable price. The Clackamas lot will be given to us, due to the mall's usage on the weekends. We will share the land at Gateway with MAX, since we are also going to be under Tri-Met as well. Vancouver's land will cost \$100,000 plus \$50,000 to be paved. The Gresham and Beaverton sites have both been previously paved, so the cost to us will be \$150,000 each.

BUS SCHEDULE AND PRICES

Each station will have buses departing at 6:00 am, 6:30 am, 6:45 am, 7:00 am, 7:15 am, 7:30 am, 7:40 am, 7:50 am, 8:00 am, and 8:30 am. These times will be the same at every station and will be strictly enforced. Pick-up and drop off sites are

strategically placed throughout downtown at these locations: 5th & Morrison, Broadway & Harrison, 3rd & Main, and 10th & Morrison. Pick-up times will begin at 3:30 pm, and run every half hour until 7:00 pm. The price of each ticket for the express bus is \$1.75 for one-way and \$3.00 for a two-way ticket. The reason that the price is more expensive than MAX or for conventional buses is so we can keep the buses looking nice and the parking structures free. The reason that most people would choose the express bus instead of their own vehicles or MAX is mainly because of the convenience. Someone can jump on the express bus and not have to worry about driving or where to park once downtown. The express bus is also more reliable because of the extra buses and because of the mechanics who will check each bus before they are sent out every morning and evening. The express bus service is also fast. People know that the bus will leave on time and there will be another one coming in less than 15 minutes.

PARKING STRUCTURES AND SECURITY

There will be a parking structure built at each of the parking locations. Many people who will be taking the express bus are going to need a place to park their cars, since it is our goal to get people out of their cars and onto our bus. If we hope to accomplish this, then a substantial place to park will be needed. The parking structure will need to be secure so that cars will not be broken into when people are at work. One or two security guards at each garage will be on hand to watch over the cars. There will be a security room where security personnel will be able to view each level through video surveillance cameras. Only people parking their cars will be allowed into the structures. The visible presence of uniformed officers is one of the best crime

prevention methods, which is what will be used in our structures. Also, unscheduled patrols by attendants who vary their routes throughout the shift will be most effective. All security personnel will be trained to properly monitor, operate, and respond to all security equipment within the facility. The security guards will be paid \$10 – 12 dollars an hour.

There will be no fee to park in the structures. The money needed to maintain the structures is going to come from revenues generated by the new express buses. One of our goals is to make entering and exiting the structure as expedient and fast as possible. One of the current problems with the existing Tri-Met system is convenience. People want to get to their destination in a timely manner and the last thing they want is to be stuck in a parking garage. The new parking structures will significantly reduce traffic congestion at the exits during peak hours because there are no attendants at the exits to collect fees, validate passes, or check permits, since it will be free to park.

After a particular location has been picked for a new parking structure, the land will have to be bought and plotted for construction of a parking structure. Lets take for example the Gateway area. A parking structure could be placed behind the existing Fred Meyer in the already crowded parking lot.



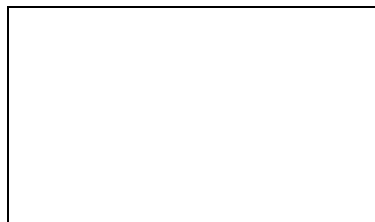
The existing Gateway parking area is not adequate. It only has 826 spaces that are quickly filled by 7:20 am each morning. The plan is not to move existing MAX riders to the new deluxe buses but to actually make more people get out of their cars and use the express bus.



If this is to happen then 826 parking spaces are not going to be enough. The new parking structures are going to be similar to the new one at the airport and the existing Tri-Met parking structures that are located downtown. These structures are going to be made out of Precast concrete. This type of production is where most of the parking structure is built off the site and then assembled back at the construction site. Precast concrete is engineered to withstand the elements, which includes everything from wind

and rain to road salt, acid rain and the occasional careless driver. Precast concrete naturally resists dents, corrosion, and dirt; specifying precast concrete means that Tri-Met will face lower maintenance and up-keep requirements throughout the building's life cycle. Precast concrete members are built to last with a low water to cement ratio in order to maximize strength and to minimize the possibility of cracking due to shrinkage.

When this type of concrete is used, there are many choices of color, texture and shape. Precast concrete requires fewer columns than the traditional way of pouring the concrete on site. Many different and appealing designs are available that contain an open-look with fewer hiding areas to harbor would-be criminals. There are a wide variety of lighting systems available that are compatible with this type of parking structure. Better and more lighting will help prevent fewer cars from being broken into. Parking for people with disabilities will be available on all levels of the structure and there will be an elevator accessible from all levels. Tri-Met's existing crew will maintain the parking structures along with a few new needed employees that will be hired.



COST OF THE PARKING STRUCTURES

Each structure is expected to cost 5 million dollars to construct. The owner of the land will be given the full amount of the property and any buildings on the site. The Beaverton site is the only one with a building that would need to be torn down, which will cost us \$500,000. The area that contains the existing parking space at gateway

needs to be used more efficiently, hence we will use this space to build parking structures.

Each bus will need a driver. The drivers will make the same amount as existing tri-met drivers, so as to not cause competition between existing tri-met drivers wanting to get the new jobs. We will need drivers that are already employed by Tri-Met, so that we can have people that are already under Tri-Met.

SAFETY FOR THE DRIVER AND CUSTOMERS

Tri-Met has recently installed a satellite-aided, computer-controlled bus dispatch system. For the first time in Tri-Met's history, they will be able to accurately locate each bus during its entire service period. They do this by utilizing the U.S. Department of Defense's Global Positioning System of 24 satellites (located 11,000 miles out in space). This system was fully implemented in the spring of 1997. Our new express bus fleet will also use this system. Bus drivers will also have radios to communicate with other drivers and dispatchers. This will be not only for driver safety, but will also help the customers. With everything so intertwined, the buses will actually leave on time.

TOTAL COST OF THE PROJECT

Cost for buses	\$13,750,000
Cost for maintaining buses	\$300,000
Cost for HOV lane	\$15,000
Cost for land	\$450,000
Cost for parking structures	\$25,500,000
TOTAL COSTS	\$40,015,000

CONCLUSION

We say that the air is “polluted” when it contains enough unhealthy particles and gases to harm people, animals, plants, and even objects such as buildings. Carbon monoxide from vehicles is mixing with otherwise clean air. The air we breathe should be healthy enough for us to breathe, which means that we need to keep as much of the man-made pollutants out of the atmosphere as possible. Natural air pollutants have always been part of the earth’s history, but because of man-made pollutions, there has been an alarming rise in these kinds of emissions into the environment. Given that so little can be done by humans about natural pollutions, our main concern has to be with the additional pollution that comes from human activities. Humans introduce large quantities of additional compounds into the air, which can unbalance and disrupt the normal biochemical cycle. In general, the quality of the air depends upon how efficiently people use fuel. Air pollution is often the result of incomplete combustion from burning gasoline. What we need to do as humans is to come up with a way to stop putting so many pollutants into the air from our vehicles. If we use electric transportation, we can almost diminish all pollutants from all means of transportation. Hence, if we start using express electric/diesel buses, we can make a transit system that will appeal to most people while also achieving a reduction in car emissions, thus attaining a plan of action that will work for most people.

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