

Evaluating Walkway and Bicycle Safety around Campus

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Executive Summary:

Niranjan and Susana are conducting a research project on the safety and usefulness of bicycle and walkway paths. This project focuses on the following four areas: i) Woodchip path between Minota Hagey and University Avenue, ii) Westmount Road between University Avenue and Columbia Road, iii) Conrad Grebel path between the Residence and Academic buildings, and iv) Walkway path along Seagram Drive and through Parking “Lot A”. Moreover, we also want to improve the quality of the paths and generate feasible solutions to any potential shortcomings. The intention of the study is to generate input from the student body upon how they view the safety and function of bike and walkway paths. This input will be generated from a survey of 300 people. This data will be triangulated with observations and a literature review. Resources that were used to supplement our knowledge are, books on various topics including pedestrian and bicycle safety, and urban planning. The recommendations made take into account the issues of safety, accessibility, and sustainability but at the same time evaluating time versus cost in accordance to these proposed changes. We have deemed ourselves capable of carrying out this research project because we have integrated the research methods that we have learned in ERS 250: Greening the Campus into our methodology.

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1. Introduction:

Green transportation is a common goal between non-governmental organizations and environmentally conscious students; knowing that one is making a difference in the world yields to a more positive outlook for the future. To encourage sustainability and to carry further the vision of WATgreen to create a sustainable campus at the University of Waterloo, we will be looking at pathways in and around campus.

We are interested in this topic because we both cycle and walk as our means to get to school and we noticed that some improvements to the paths were necessary. We want to improve the quality of the paths and generate feasible solutions to any potential shortcomings, thus making it beneficial for us, and the rest of the student body. Unfortunately, we have found that the issue of pedestrians and cyclists with relevance to University students and pathways around campus has not been addressed. Therefore by conducting a study that specifically addresses the safety needs of students and the general public both on campus and around the region; hopefully we will be making the paths safer. Therefore the intention of the study is to generate input from the student body upon how they view the safety and function of bicycle and walkway paths. By conducting our surveys we will also attempt to educate people on safety issues. We also want to study the student body because we want to see if they have the same thoughts about the paths as we do.

a) Background - Current Conditions of Paths:

The current situation at the Conrad Grebel residence is that construction for a new building is blocking a heavily used path that people employ to cross from Westmount Road to main

campus. We, as students consistently use this path as a quick way to reach main campus. We are concerned about how this will divert us from our usual routine and the amount of safety in terms of lighting and a railing. Because winter is approaching, we are concerned that weather conditions combined with the steepness of the path will create safety hazards. We have looked at the architectural design and temporary path thus allowing us to evaluate current conditions at the construction site.

Westmount Road does not have a bicycle lane or sidewalk between University Avenue and Columbia Road. We are cycle enthusiasts and frequently use Westmount Road as a means to travel in the city. Riding in a minimal amount of space on the roads' shoulder is a safety concern for us.

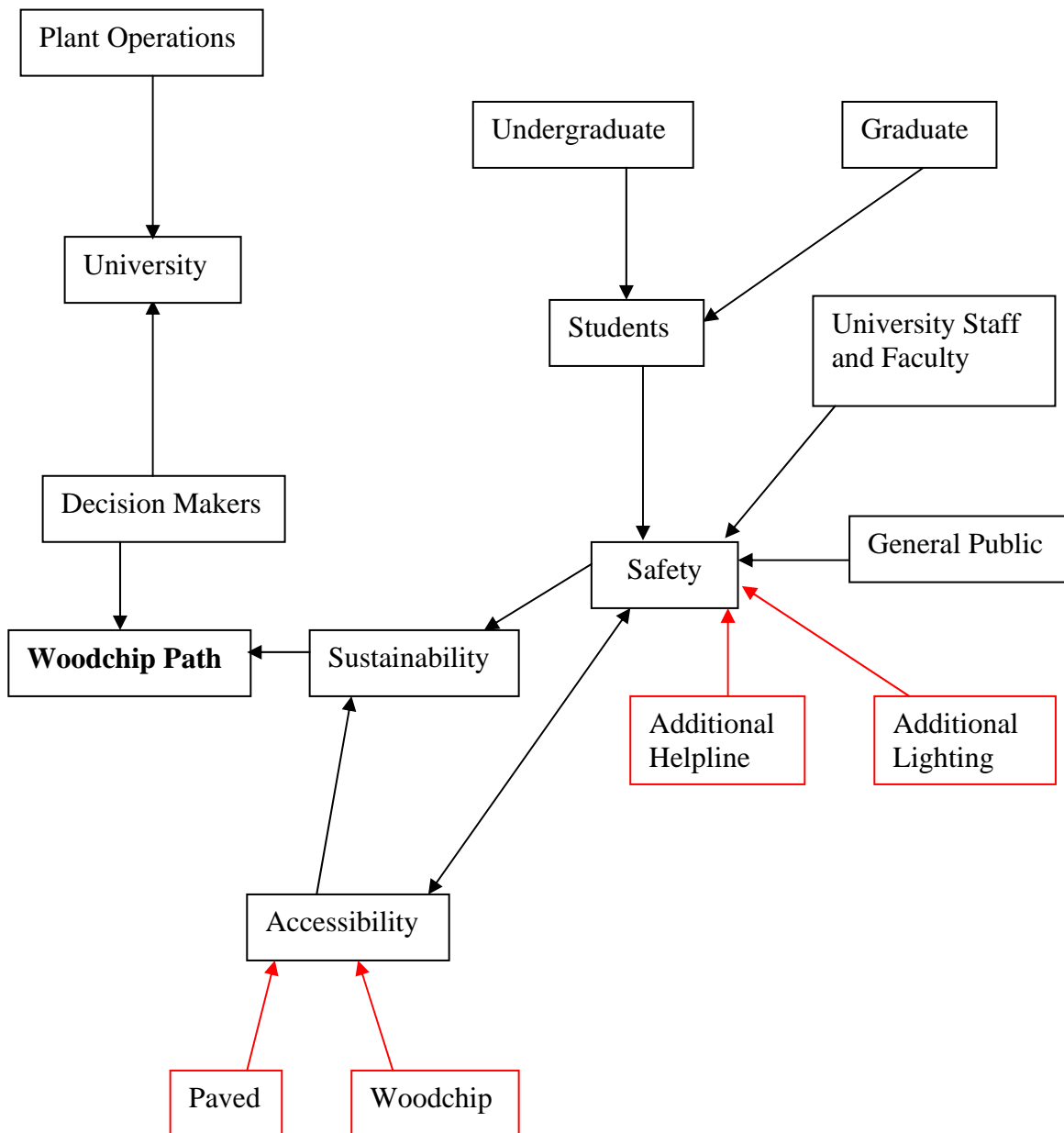
Seagram Drive has a sidewalk that stops between Parking "Lot A" down to University Avenue. Students who cross the parking lot must do so by evading cars that are attempting to park. This is due to inadequate infrastructure owing to the lack of a continuous sidewalk and walkway through the parking lot. Thus we are concerned for their safety. Based on observations of people traveling through the parking lot we know that these conditions prevail.

The woodchip path links University Avenue to Minota Hagey residence. It is constantly used by cyclists and pedestrians; and was implemented as a means to shorten traveling distance and time for students traveling from University Avenue to campus. We are interested in alternate solutions to the design of the woodchip path. Based on our experience over our three years at the University of Waterloo we have found that it becomes increasingly difficult to cycle or walk on the woodchip path due to mud as weather conditions worsen, such as rain or snow.

2. Conceptual Framework:

a) Conceptual Framework for Woodchip Path:

Figure 1) Systems/Actor Diagram for Woodchip Path



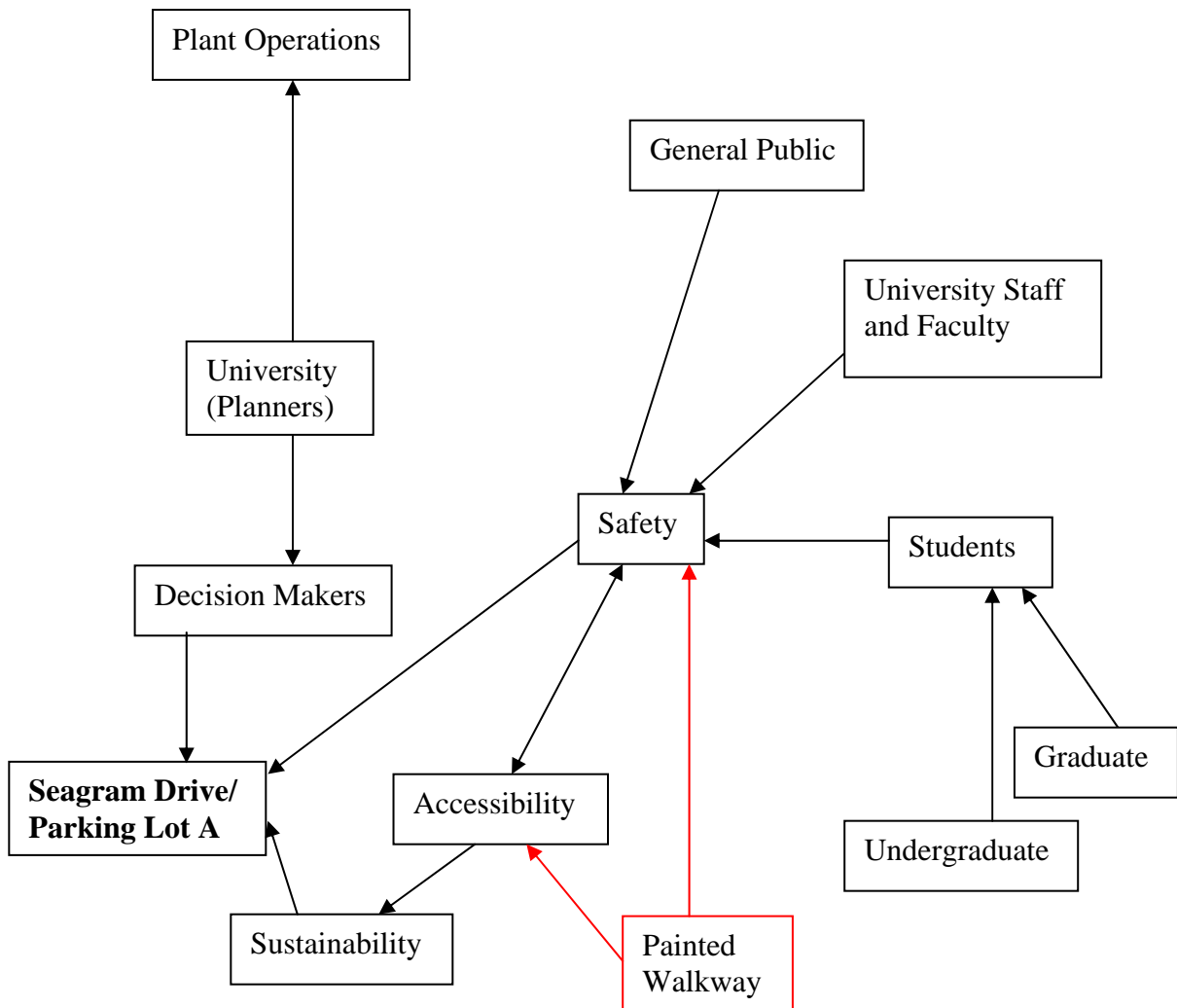
Note: The boxes and lines in red are proposed changes to the Woodchip Path

a) Conceptual Framework Analysis for Woodchip Path:

The current state of the path is such that it is usually muddy since the woodchips are not spread on the path often enough; the path is also poorly lit and the nearest helpline is in Parking Lot T. Since the users of the path are students (undergraduate and graduate), University Staff and Faculty, as well as the general public, it is in their best interest to improve the safety and accessibility of this path. Our definition of sustainability for this path is to ensure the safety and accessibility conditions. In terms of safety, we would like to suggest certain changes that will ensure that no one is harmed when using this path. We would also like to improve the accessibility of this path so that the needs of the users of this path are met. For example, we would like to ensure that cyclists no longer get their tires stuck in the mud when utilizing this path. In order to improve accessibility, we have suggested that the path either be paved or have woodchips spread along the path more often (once a month or more – especially during rainy and snowy weather). To ensure safety we have suggested additional lighting and an added helpline in the middle of the path. In order for these changes to get implemented it will need to be approved by the decision makers. University urban planners would first need to approve the changes; they would then pass the blueprints to Plant Operations department for implementation. This systems diagram is useful for this study because it encompasses all major actors, decision makers and proposed recommendations in the process.

b) Conceptual Framework for Seagram Drive and Parking Lot A:

Figure 2) Systems/Actors Diagram for Seagram Drive and Parking Lot A



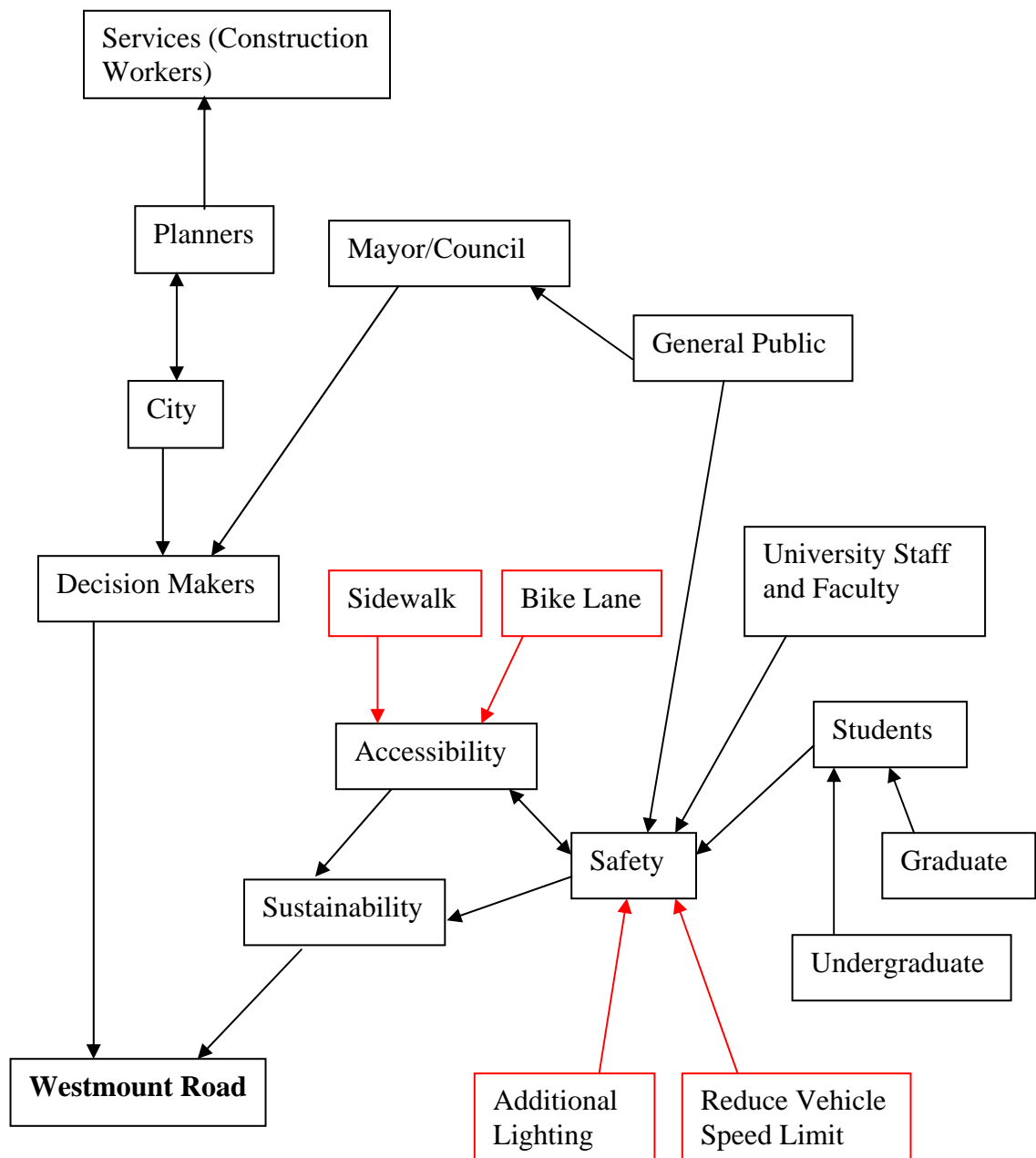
Note: The boxes and lines in red are proposed changes to Seagram Drive and Parking Lot A

b) Conceptual Framework Analysis for Seagram Drive and Parking Lot A:

The current state of the path is such that it is usually hazardous for pedestrians to walk through Parking Lot A, since there are no continuous walkways for them to cross from Seagram Drive to University Avenue. Since the users of the path are students (undergraduate and graduate), University Staff and Faculty, as well as the general public, it is in their best interest to improve the safety and accessibility of this path. Our definition of sustainability for this path is to ensure the safety and accessibility conditions. In terms of sustainability, we would like to reduce competition of pedestrians and cars over space in the parking lot. By this we mean that since there is no designated area for pedestrians to walk in the parking lot, they will tend to use the entire parking lot space to walk through. Cars who are trying to park will either have to wait for pedestrians to cross their path in more than one location or they will have to cut off pedestrians as they drive towards their parking space. Therefore, to ensure safety and accessibility we would like to suggest that a painted walkway be implemented in the parking lot. This will ensure safety, by decreasing their risk of accidents. It will increase accessibility because pedestrians will have a designated area to walk in, while cars will have greater mobility in the rest of the parking lot. In order for these things to get implemented it will need to be approved by the decision makers. University urban planners would first need to approve the changes; they would then pass the blueprints to Plant Operations department for implementation.

c) Conceptual Framework for Westmount Road:

Figure 3) Systems/Actors Diagram of Westmount Road



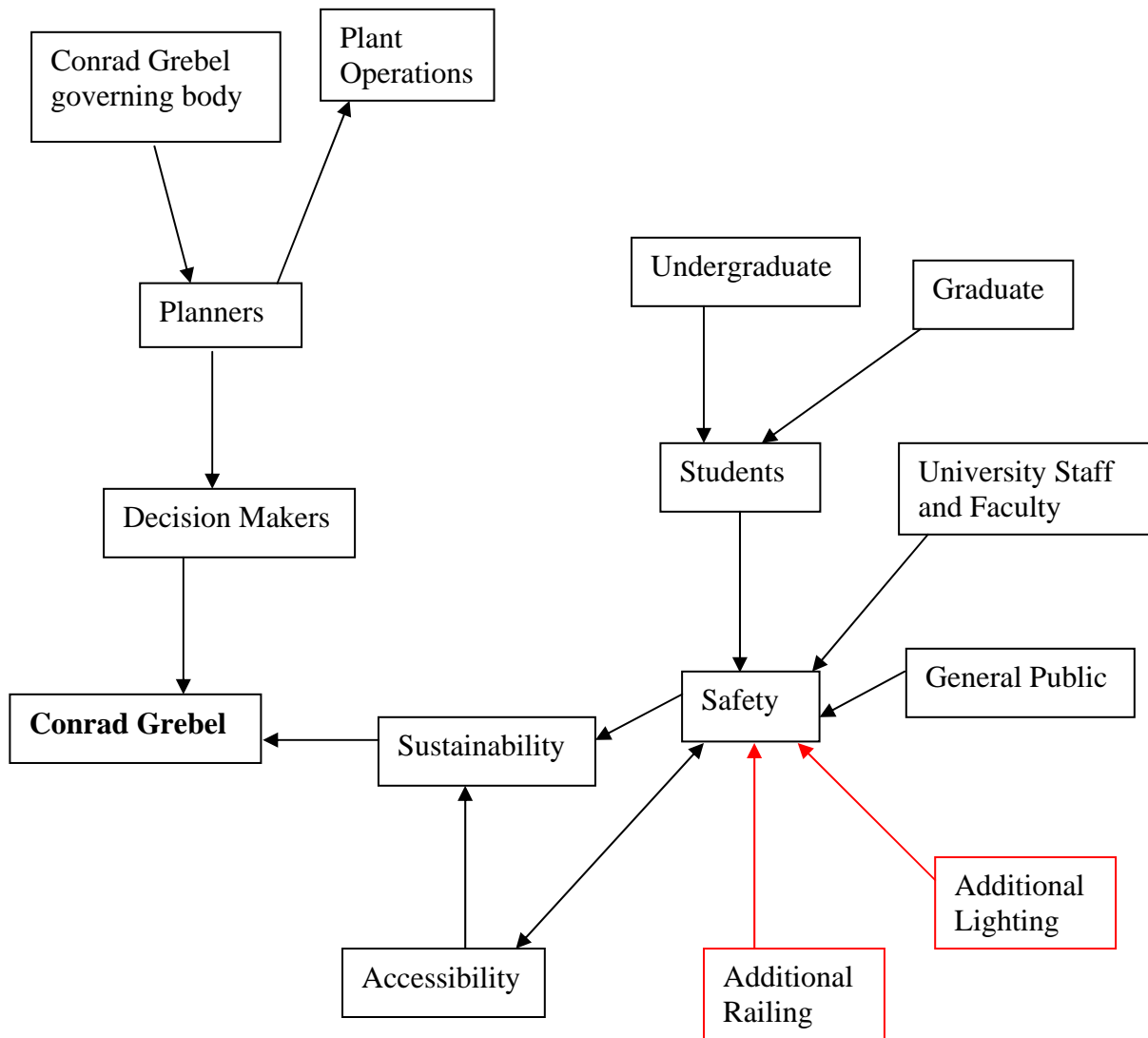
Note: The boxes and lines in red are proposed changes to Westmount Road

c) Conceptual Framework Analysis for Westmount Road:

The current state of the path is such that it is usually hazardous for pedestrians and cyclists to travel along Westmount Road because they can only use the shoulder of the road. There is also minimal lighting along the sides of the road. Since the users of the path are students (undergraduate and graduate), University Staff and Faculty, as well as the general public, it is in their best interest to improve the safety and accessibility of this path. In terms of sustainability, it is necessary to implement a sidewalk and a bike lane for people to use. As well, the proposed additional lighting would increase the degree of safety. If the sidewalk and bike lane are not implemented, we would then strongly suggest that the speed limit be reduced from 60 km/h to 50 km/h. In order for these things to get implemented it will need to be approved by the decision makers. The Region of Waterloo is the main decision maker in this process. They tend to be slower to implement change due to more bureaucratic and complicated procedures, as well as restructuring of the budget since it is coming out of the tax payer's money. Once the approval has gone through the Mayor/Council the urban planners will design the proposed changes, afterwards the construction workers that work for the Region of Waterloo would begin construction.

d) Conceptual Framework for Conrad Grebel Path:

Figure 4) Systems/Actors Diagram for Conrad Grebel Path:



Note: The boxes and lines in red are proposed changes to Conrad Grebel

d) Conceptual Framework Analysis for Conrad Grebel Path:

The current state of the path is that the path itself is composed of gravel. There is minimal lighting along the path, and there is no railing for people to steady themselves when walking along this slightly sloped path. These are the current conditions of the path, but after completing the construction of this path it will be paved and have additional lights installed. Since the users of the path are students (undergraduate and graduate), University Staff and Faculty, as well as the general public, it is in their best interest to improve the safety and accessibility of this path. In terms of sustainability, we would like to suggest additional lighting based on the current conditions. We would also recommend a railing be added because in the winter the path can still become slippery due to its inclination. In order for these things to get implemented it will need to be approved by the decision makers. Conrad Grebel has its own governing body; therefore it will be them who give final approval for changes to be made. They will then pass it onto their own plant operations team who go about implementing these proposed changes.

3. Problem Statement:

The overall dilemma or issue is that of safety and efficiency for bicycle paths and walkways. Due to a growing student body of many thousands of people, it is our belief that at some point someone will be injured while traveling on or around campus. Therefore by reducing factors that could contribute to possible safety hazards, we can improve the overall safety for student commuters.

a. Target Audience/Stakeholder:

First, our target audience is mainly students. Due to a growing student body they are the ones that travel most to, from and within campus. Waterloo citizens are also important stakeholders because they commute by biking or walking in the city and around the campus. Therefore by reducing factors that could contribute to possible safety hazards we can improve the overall safety for student commuters.

b. Purpose of Study:

The purpose of this study is to examine bicycle and walkway path safety and utility. This will be carried out using a methodological approach based on an analytical and quantitative method in order to improve these paths for students and residents of Waterloo.

Research Questions/Objectives:

The major questions for this study are as follows:

- 1) If we modify (make changes) to the woodchip path to accommodate the needs of students, would this promote more environmentally friendly transportation?
- 2) Would a bike path/sidewalk be feasible or cost efficient on Westmount Road?

- 3) Is the alternate route at Conrad Grebel safe for use?
- 4) Is it feasible to extend the sidewalk at Seagram Drive and if so, would people use the path or would they continue to cut through parking “Lot A” to save time?
- 5) Is it feasible to implement a walkway through the parking lot?

4. Methods:

Due to the nature of our study being that we have to gather opinions from the student body regarding four different pathways, it is more convenient and informative for us to gather quantitative data rather than qualitative data:

The fact that all responses follow a standard form (e.g., using the same set of categorical alternatives, or using the same rating scale) makes comparability among respondents easier, since quantification or categorization is generally inherent to the items structure...closed questions are also particularly useful when one wants to cover a lot of ground in a questionnaire or interview, since one can ask many more structured than open questions in a given period of time (Palys, 165-166).

Therefore the foundation of our close ended survey style was based on time constraints. We needed the survey to run quickly and smoothly so that people would be more apt to accepting and completing the survey when we approached them.

Triangulation was necessary in order to get a representative data set. In order to get opinions from the student body we decided to conduct a survey of closed ended questions to quickly get adequate and relevant opinions on the paths in question. Due to a lack of time and a small group size we had to use methods that were time efficient. Therefore we decided to use observations, as a second method, to confirm or deny results that were gathered from the survey,

literature review was then needed to support our findings and to give explanations for people's responses on their surveys.

To summarize our methods; we surveyed fifty people in each of the following six buildings: Environmental Studies, Math and Computing, Physics, Carl Pollock Hall, Biology and Arts Lecture Hall. We arrived at a sample size of 300 people in order to get a representative sample of the student population. Therefore 300 people would give us a high confidence interval and a low margin of error. We used a random sampling of people in these different locations. This proved to be problematic because there was a large portion of the survey participants who had not heard of or used the paths we were concerned with. We also observed people at different times on different days on their use of the paths. We then consulted our literature to support our findings.

We chose to use closed ended questions because they were time efficient in terms of the amount of time that people had to take to fill out their responses; and time efficient for us when calculating the aggregate data. We find that if we keep the questions short and simple, people are more likely to understand the questions and give a more accurate response.

In order to readily gather and summarize data from the surveys we used "categorical response items. Categorical-response items present categories in which respondents may place themselves" (Palys, 166). In order to gather opinions on people's views on the four pathways we first had to enquire on their use of the pathway so we will use the "simplest type of categorical question is the dichotomous item" (Palys, 167). Thus we asked questions such as "do you use the woodchip path, yes or no?" In order to gain an opinion on the usefulness or safety of a path we used a rating scale to gather this data. For example the way we structured our rating scale for certain question were similar to:

the 'satisfaction' scale used by T. Atkinson (1977) and Palys (1979)...it supplies verbal labels at either end of the scale, with the numbers in between that the respondent would circle depending on the direction (or 'valence') of his or her feelings (i.e., satisfied or unsatisfied) and on the intensity of those feelings (Palys, 168).

Thus we were able to relate the dichotomous item with the rating scale, for example if they answered "yes" to lowering the speed limit on Westmound Road then we can see the relationship with the amount of safety they feel when using Westmount Road. We then used a "multi-response item" in order for the respondents to choose and rank multiple conditions that would affect their decision to bike or walk to school. This allows us to get a sense of how each condition varies in importance with the other conditions suggested in the survey.

We have identified the independent variables as the present conditions of the paths; we then attempt to gather data on the dependent variable which is the relative safety or usefulness people who use the path gain from it. For example, the independent variable of the woodchip path is its current state of having woodchips distributed over it, instead of being paved. We then asked survey participants how useful they feel this path is. This will tell us how the dependent variable relates to the independent variable when we also ask how useful they would find this path if it were paved over.

We made assumptions in the preliminary analysis of these paths. We then attempted to use observations, survey data, and literature review to prove or disprove these assumptions. We theorized that people would feel unsafe or that the path was not useful in its current conditions. For example, we thought people would feel unsafe when walking or cycling on Westmount Road due to the fact that there is no sidewalk or bike lane along this road. However respondents seemed indifferent or felt the path was moderately to very safe. Thus our theory was disproved.

5. Results and Discussion:

a. Observations:

Observations of the Woodchip path:

Date and Weather Conditions (Woodchip Path)	Number Of Pedestrians	Number Of Bicyclists	Number of Pedestrians per Bicyclist
Monday November 11th, 2002 (Clear and Overcast)	26	6	4
Wednesday November 13th, 2002 (Overcast - Partly Cloudy/Partly Sunny)	35	7	5
Friday November 15th, 2002 (Light Showers)	22	2	11

Chart 1

Chart 1 shows the observations that we made during the days that are indicated in the chart, along with the weather conditions. We made these observations between 12:00 pm and 1:00 pm. Based on these results we can see that the number of cyclists in proportion to the number of pedestrians has declined not only towards the end of the week, but more importantly during on poor weather conditions for example, when it was raining.

Observations of the Seagram Drive:

Date and Weather Conditions (Seagram Drive and Parking Lots)	Number Of People that Used Parking Lot	Number Of People that Continued Down Seagram Drive
Monday November 4th, 2002 (Partly Sunny)	15	0
Wednesday November 6th, 2002 (Overcast - Partly Sunny)	19	0
Friday November 8th, 2002 (Overcast)	12	0

Chart 2

Chart 2 shows the observations that we made during the days that are indicated in the chart, along with the weather conditions. We made these observations between 1:00 pm and 2:00 pm. Based on these results we can see that none of the subjects observed continued to walk down Seagram Drive past Parking Lot A. Instead, everyone that was observed had crossed into Parking Lot A.

Observations of the Westmount Road:

Date and Weather Conditions (Westmount Road)	Number Of Pedestrians	Number Of Bicyclists	Percentage of Pedestrians that Dodged When a Car Passed By	Percentage of Bicyclists that Dodged When a Car Passed By
Monday November 11th, 2002 (Clear and Overcast)	11	3	0%	34%
Wednesday November 13th, 2002 (Overcast - Partly Cloudy/Partly Sunny)	13	5	8%	60%
Friday November 15th, 2002 (Light Showers)	8	1	0%	0%

Chart 3

Chart 3 shows the observations that we made during the days that are indicated in the chart, along with the weather conditions. We made these observations between 1:00 pm and 2:00 pm. Based on these results we can see that not many if any pedestrians dodged or moved out of the way when a vehicle passed by them. A lot of cyclists did move out of the way when a vehicle passed by them. Based on these observations and our own experience, cyclists are more nervous when riding beside vehicles versus pedestrians.

Observations of Conrad Grebel Paths:

Date and Weather Conditions (Conrad Grebel Paths)	Number Of People that Used the Old Path	Number Of People that Used the New Path	Number of Old Path Users per New Path
Monday November 4th, 2002 (Partly Sunny)	20	3	7
Wednesday November 6th, 2002 (Overcast - Partly Sunny)	23	5	4.6

Friday November 8th, 2002 (Overcast)	16	2	8
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Chart 4

Chart 4 shows the observations that we made during the days that are indicated in the chart, along with the weather conditions. We made these observations between 12:00 pm and 1:00 pm. Most people that were observed used the old path that crossed between the Academic and Residential Building, rather than using the new path to the north side of the building. Thus they still found the old path more useful or direct.

b. Survey Results:

Survey Results for the Woodchip Path:

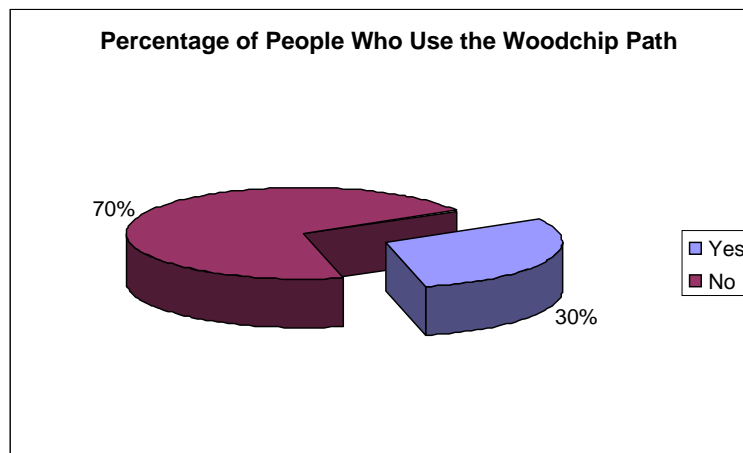


Figure 5

This survey question asked participants whether or not they had used the Woodchip path that runs between University Avenue and Minota Hagey. We were surprised with these results because very few people surveyed (30%) had answered yes to using this path.

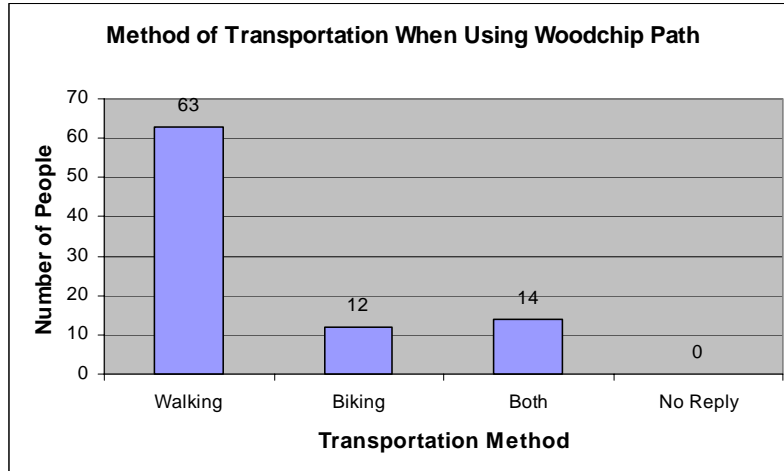


Figure 6

This survey question asked participants what method of transportation they used when using the Woodchip path. This shows us that most people walk rather than bike. This shows us that cyclists are the minority group of people that use the path, which is important to consider when compiling our recommendations for either paving it or maintaining its current wood chipped form.

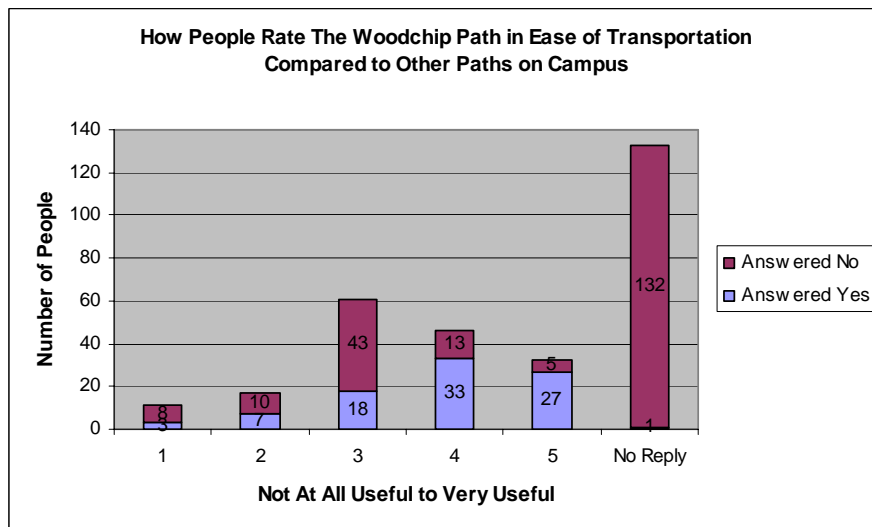


Figure 7

Figure 7's survey question asked participants how they would rate the usefulness of the woodchip path in comparison to other paths on campus. The majority of people who answered

yes to using this path stated that it was moderately to very useful, thus they seemed to be satisfied with the current condition of the path. However, there were a significant number of people who hadn't used this path before that still answered this question. This can be attributed to the fact that since this was one of the earliest questions that was related to a previous question, they were unaware to simply skip to the next question rather than answering it.

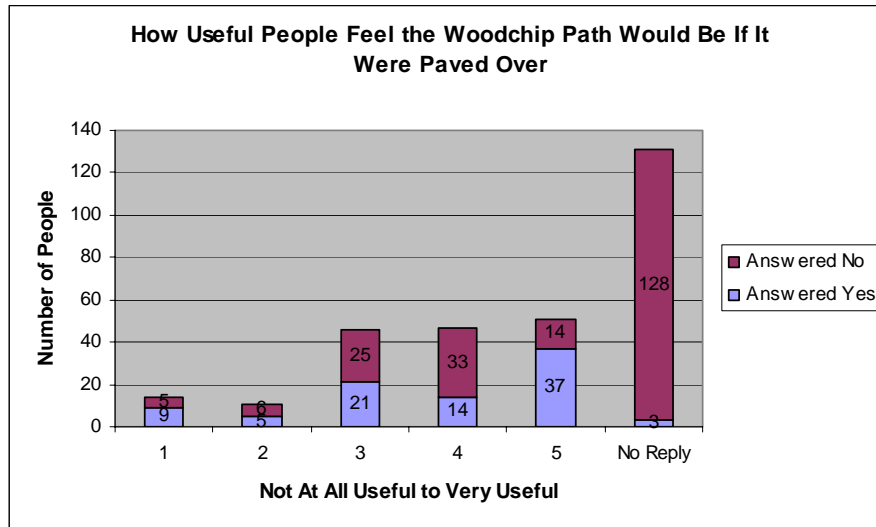


Figure 8

This survey question asked participants how useful they would find the woodchip path if it were paved over. Out of the participants who answered yes to using the woodchip path, the majority of them answered very useful to this question. Again, there were a significant number of people who answered no to not having used the woodchip path but still answered this question for the same reasons as the previous question.

Survey Results for Seagram Drive:

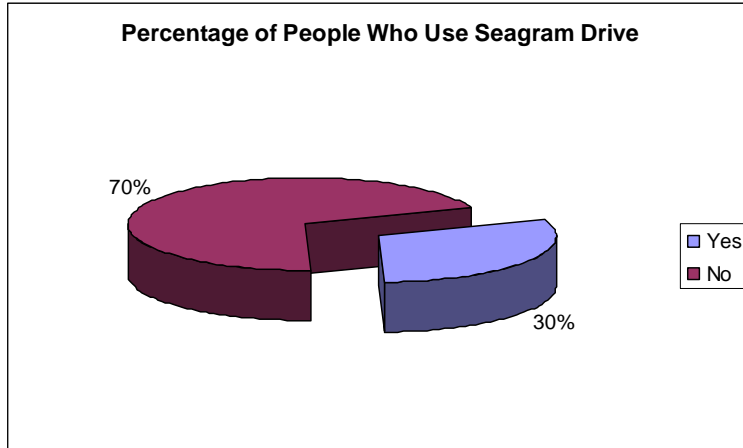


Figure 9

This survey question asked participants whether or not they had used Seagram Drive and the Parking Lot A. Once again we were surprised with these results because very few people surveyed (30%) had answered yes to using this path.

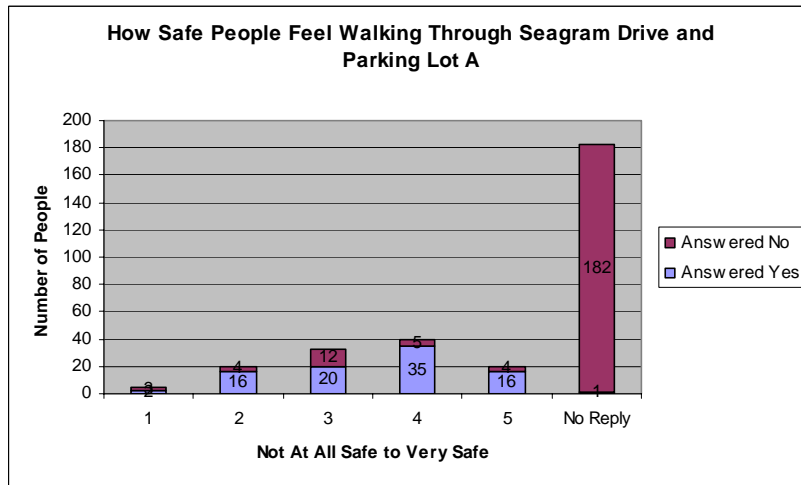


Figure 10

Figure 10's survey question asked participants how safe they felt walking through Seagram Drive and down into Parking Lot A. Most people seemed indifferent or felt moderately to very safe when using this path.

Survey Results for Westmount Road:

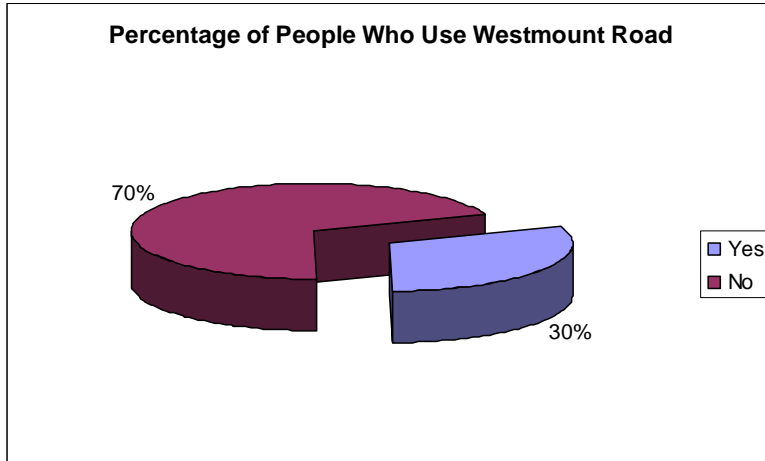


Figure 11

This survey question asked participants whether or not they had used Westmount Road. Once again we were surprised with these results because very few people surveyed (30%) had answered yes to using this path.

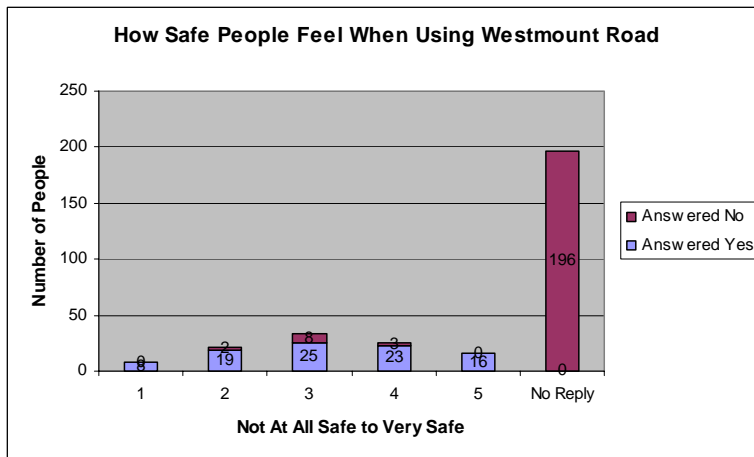


Figure 12

This survey question asked participants how safe they felt when using Westmount Road. The majority of participants answered moderately to very safe. This tells us that most people are indifferent or feel relatively safe when using this path.

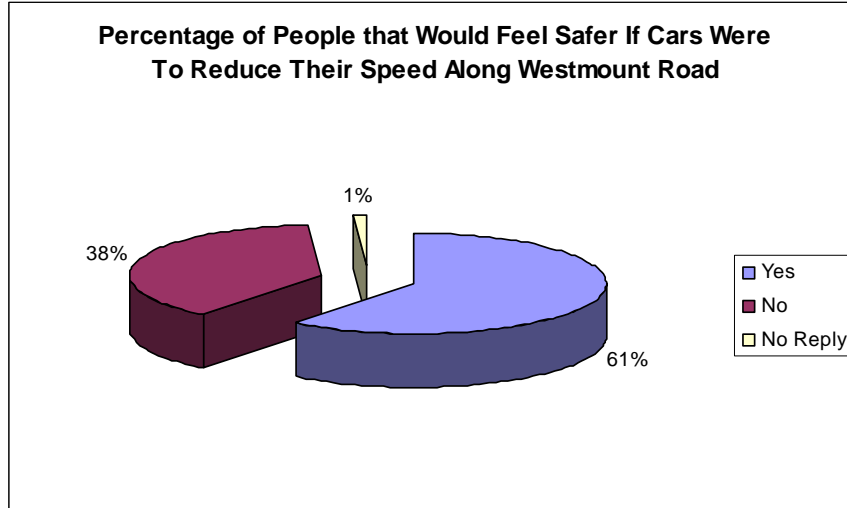


Figure 13

Figure 13’s survey question asked participants whether or not they would feel safer if the speed limit along Westmount Road were to be reduced. Results were only looked at from participants who answered yes to using Westmount Road in Figure 11. This shows us that the majority of people (61%) would feel safer if the speed limit were reduced.

Survey Results for Conrad Grebel Path:

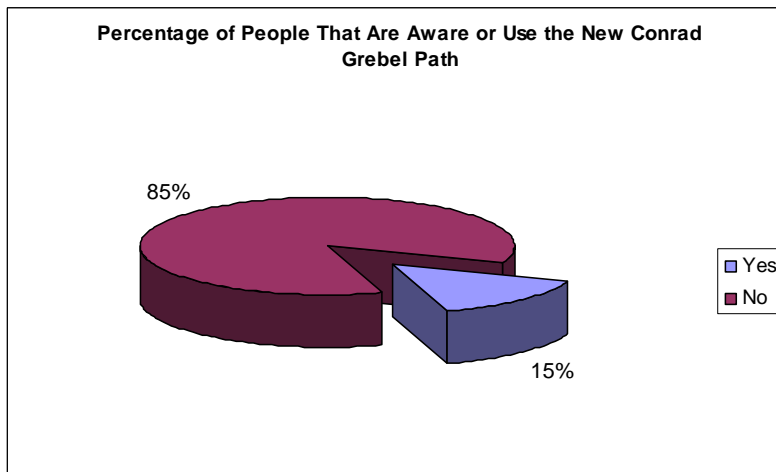


Figure 14

This question asked participants whether or not they had used the new Conrad Grebel path that runs along the north side of the building. We were very surprised to note that only 15% of

the people surveyed had used this path. Therefore they still found the old path more useful, since this survey was conducted before the old path had been closed off for construction.

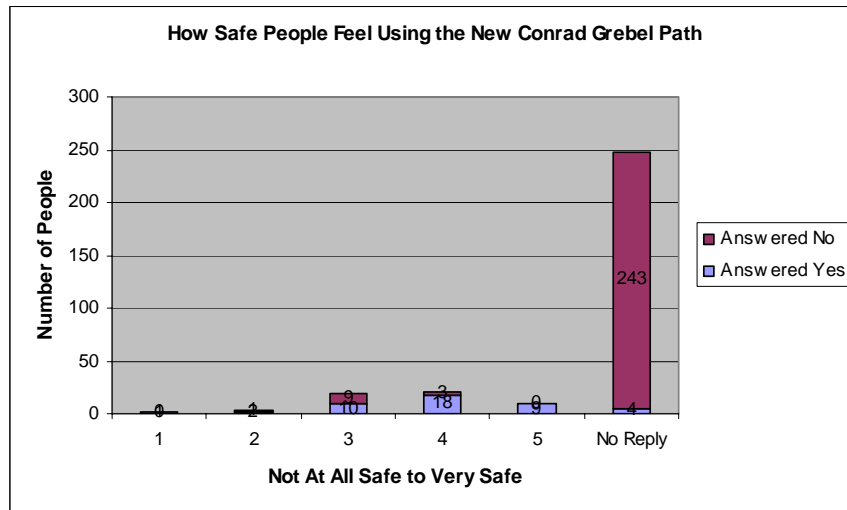


Figure 15

This survey question asked participants who answered yes to using the new Conrad Grebel path, how safe they felt when using this path. The majority of respondents answered moderately to fairly useful. This is surprising since the current state of the path was unfinished, it was still a dirt path (unpaved), and didn't have many lights or a railing installed.

Survey Results for Conditions:

This survey question asked participants to rate the following conditions as to how it would affect their decision to not want to walk or bike to school: lack of path on route to school, weather, conditions of path, distance from home to school and other conditions. These results were rated from number 1 (major concern) to number 5 (minor concern). If it was unrated then it was not a condition in their decision making process.

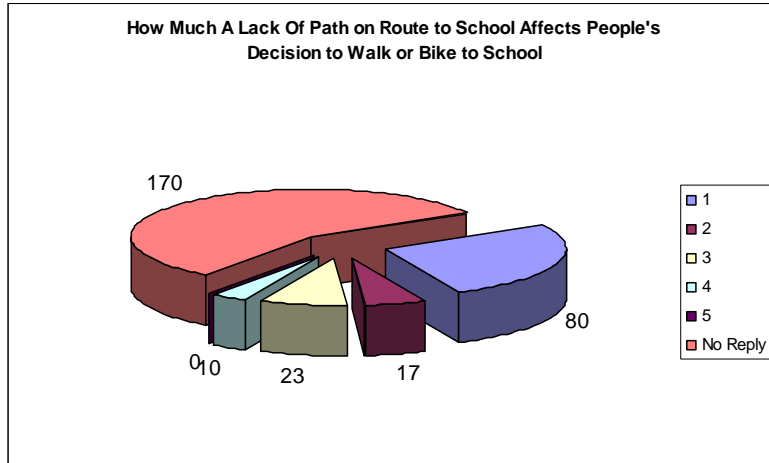


Figure 16

Most people didn't rate this as a concern for their decision making. Only 80 out of 300 people (27%) stated this as their number one concern.

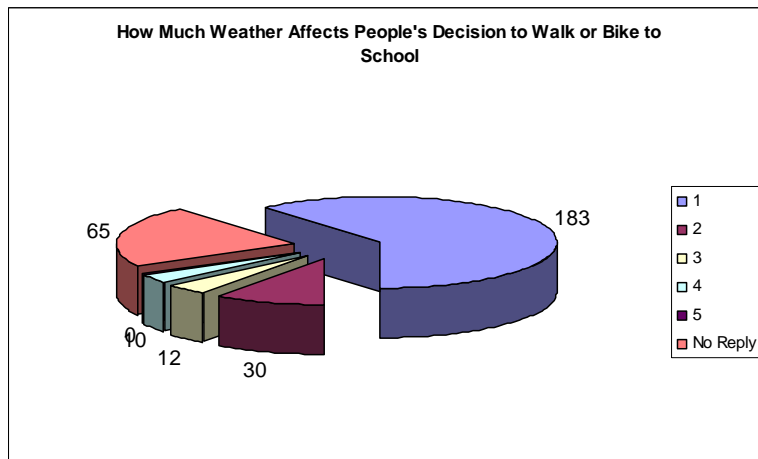


Figure 17

Most people stated weather as their number one concern, 183 out of 300 participants (61%). This result confirms our observations at the Woodchip Path (Chart 1).

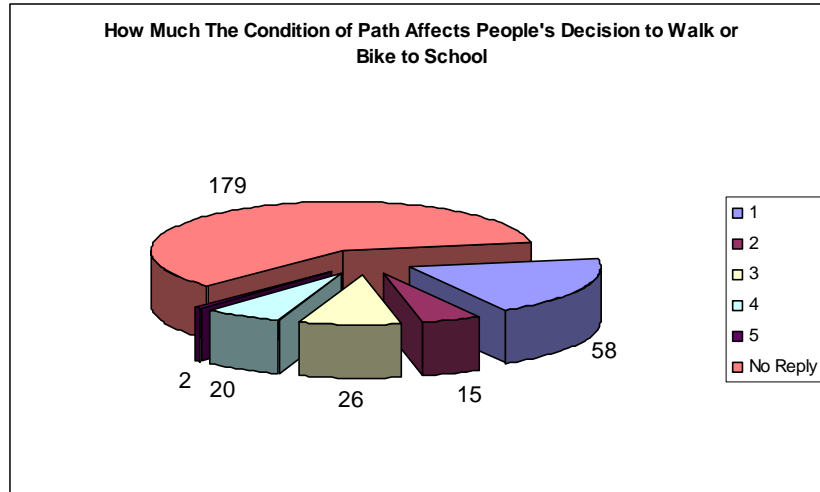


Figure 18

The majority of respondents didn't rate this as a concern for their decision making. Only 58 out of 300 participants (19%) stated the condition of the path as a major concern.

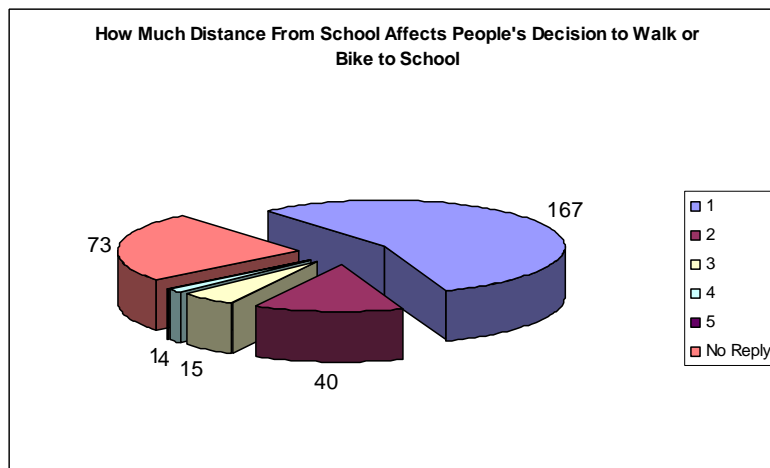


Figure 19

Most people stated the distance from home to school as their most important concern, 167 out of 300 respondents or 56%.

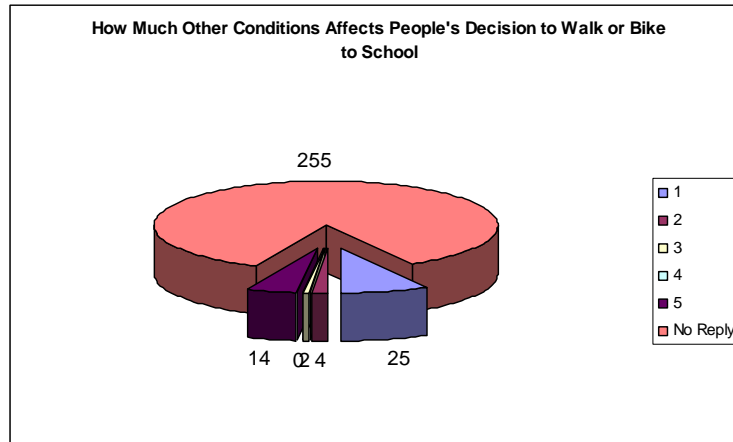


Figure 20

Majority of respondents didn't have any other conditions as a factor for their decision to walk or bike to school. 255 out of 300 participants (85%) gave no rating to this condition.

c. Literature Review:

- 1) Tolley, R. (Eds). (1997). The Greening of Urban Transport edition 2 Toronto: John Wiley and Sons.

“Cyclists pose little danger to themselves or others and it is primarily the presence of motor vehicles that makes cycling hazardous (pg 7)”. This quote taken from the book can be applied to Westmount Road. Since cyclists do not have a bike lane to ride on, they are in danger of getting hit by a car. The second quote that applies to our study is as follows: “adverse weather is often cited as a deterrent to increased cycle use (pg 9)” This relates to our category on the survey about weather conditions, this being one of the most important reasons for someone not to want to bike to school.

- 2) Hudson, M. (1978). The Bicycle Planning Book. London: Open Books.

“Cars drivers are often inconsiderate in their attitudes to cyclists (pg 7)”, therefore one must always use caution when sharing the road with cars. By recommending a bike lane for Westmount Road we hope to encourage safer conditions for people.

- 3) The city of Calgary Transportation department. (1997). The Calgary Cycle Plan. Calgary: The city of Calgary Transportation publishing department.

“Programs are an effective means of encouragement. Bike education programs should provide cyclists with the necessary information and skills to operate their bike with confidence in most situations (pg 78)”. Cyclists with this knowledge are more likely to improve and extend their cycling activities while serving as a role model for others.

- 4) Fruin, J.J. (1975). “The Role of the Pedestrian” in Planning Design and Implementation of Bicycle and Pedestrian Facilities. New York: American Society of Civil Engineers, 26-32. [article in book].

“The underline cause of all pedestrian accidents is based on the competition of the pedestrian and vehicle for urban space. Vehicles require large amounts of space for movement and parking, and demand preemptive traffic priority (pg 27-28)”. This applies to Westmount Road in terms of lack of space between cyclist and pedestrian on the road, as well as Seagram Drive in terms of pedestrians walking through the parking lot.

6. Recommendations:

a. Woodchip Path:

For the woodchip path we have a split recommendation. Niranjan feels that paving this path will provide for a more permanent solution. This will require almost no maintenance in the years that follow. Paving will eliminate any adverse affects that cyclists felt before when the

path was wood chipped. Such as mud splattering on their jackets and clothes, and getting wheels stuck in the mud. Susana feels that if this path had wood chips spread along the path more often than it is now, then this would be a more environmentally friendly and sustainable solution. If the wood chips were distributed every week or so during the rainy and snowy seasons then this would also eliminate the problem of the path becoming too muddy.

To improve the safety conditions of the path we would also like to recommend that additional lighting and a helpline be installed. Although there is a helpline in the parking lot adjacent to Minota Hagey (Parking Lot T), we feel this is too far for someone inside the woodchip path to reach in case of an emergency. Therefore it is important to install a helpline inside the path due to the fact that the path is in the middle of a small woodlot. The nature of this path makes it more likely for someone to have an emergency situation in there without anyone noticing it unless they pass by. It is for these same reasons that we suggest additional lighting be installed in order for people to see clearly what is in the woods at night.

b. Seagram Drive:

Based on our survey results, it seems that the students that we sampled are indifferent to safety issues that may arise by crossing through the parking lot to get to school. Therefore we feel that extending the sidewalk along Seagram Drive past the parking lot would not be useful. This is because the majority of the students would use the parking lot as a short cut rather than walking along Seagram Drive which is longer. However we feel that pedestrians' having to dodge cars in the parking lot is still a safety concern. Therefore we would like to suggest that a walkway be painted along the ground. This would allow for pedestrians to walk along this one path and not be dispersed throughout the parking lot. This will also help car drivers because they will be expecting pedestrians to walk in front of their cars in areas that are marked as pedestrian

walkways. Thus, we feel that painted walkways will greatly improve safety conditions in Parking Lot A.

c. Westmount Road:

Although the students surveyed had indicated that they feel moderately safe on Westmount Road, we feel that if a sidewalk and a bike lane were implemented, these students would certainly use this as opposed to continue using the side of the road. We believe that this will definitely increase the level of safety at Westmount Road.

Since the students feel that the speed limit should be reduced we feel that it would improve safety conditions if vehicles were to drive slower. Therefore if there is still no sidewalk or bike lane installed in this road, then we would definitely suggest that the speed limit be reduced. However, if a bike lane and a sidewalk were to be installed then the speed limit can remain unchanged. This is because vehicles will no longer be driving so close to pedestrians and cyclists.

d. Conrad Grebel:

Unfortunately there was not as many respondents as we had hoped that were aware of the new Conrad Grebel path around the north side of the building. Thus we are hesitant to accept the fact that most of them seemed satisfied with the usefulness of this path. Based on current conditions of the path we would like to suggest additional lighting and a railing to be installed along the path. However, upon contacting Paul Penner (Operations Manager) at Conrad Grebel, he has informed us that additional lighting is being planned for upon completion of the construction. He did mention that no railing is being planned for, although they are open to discussing the possibility of having this installed at a later date. Therefore we believe that with

the addition of a railing to the additional lighting the safety concerns for this path will be alleviated.

7. Conclusion:

In conclusion, we have found that this study of all four paths to be very worthwhile and useful for several reasons. First, we believe that this study was innovative because the issue of safety for pedestrians and cyclists is not a priority issue that gets a lot of publicity. However, walking and cycling have environmental relevance in application to the issue of making improvements for cleaner air. But how this issue relates to University students is not studied.

Second we feel that this project will be effective in promoting change because we are improving safety issues to pre-existing paths. As well, safety should be a main concern that not only effects students but residents and staff.

There is a different degree of efficiency among the paths that were studied in terms of time versus money. We feel that paths that are directly controlled by the University will be faster to implement than paths that are controlled by the region because there is less “red-tape”. The first path that we feel could have a high degree of efficiency is the woodchip path. First, adding lights and a helpline is time and money efficient because greater lighting and a helpline will resolve safety issues at relatively little cost, and is a sustainable solution. The physical path is the next task at hand; continuously wood chipping the path would be more time, cost-efficient and more environmentally friendly as opposed to paving.

The second path with a potential for higher efficiency is Seagram Drive. By painting walkway lines all the way through the parking lot from Seagram Drive to University Avenue, it would be cheaper than constructing a sidewalk down from Seagram Drive. It would also be safer in the parking lot as cars will be more aware of pedestrians and cyclists.

Westmount Road is the path which we feel would have the most limitation for efficiency. Reducing the speed limit, adding a bike lane and side walk, and adding lights along Westmount Road will not be time and cost efficient. The Region of Waterloo will tend to be slower to implement change due to more bureaucratic and complicated procedures, as well as restructuring of the budget since it is coming out of the tax payer's money. Although adding a sidewalk, bike lane and lights along Westmount Road will be costly in terms of time and money spent, we feel that a lot of students would walk on the sidewalk rather than walking along the road. Thus we feel that these changes would benefit people indefinitely versus the one-time cost of implementing it.

Conrad Grebel College is another path which we find could be very efficient in the future. Adding lights and a railing along the path is time and money efficient because the implemented changes would resolve safety issue at a relatively low cost while increasing the sustainability of the path.

We feel that the impact of our study and our recommendations will have positive impacts. The first path that will have a positive outcome is the woodchip path. Continuous re-chipping of the woodchip path will maintain the quality of the path and not allow it to get muddy. Also adding lights and a helpline will permanently maintain a higher level of safety for people.

The next path with a positive outcome is Seagram Drive. Painted walkways will organize pedestrians and cyclists in one area of the parking lot thus improving safety conditions by alleviating congestion.

The third path with a positive outcome is Westmount Road. The addition of a sidewalk, bike lane, lights and reducing the speed limit would benefit a large number of people indefinitely while only having a one-time cost.

The last path to be addressed is Conrad Grebel College. The addition of lights and a railing will benefit a large number of people indefinitely while having a one-time cost.

Thus, we have evaluated four paths which we thought were of importance to look at in terms of safety and improvement issues. By circulating our surveys we were able to educate people about these paths and their importance, and at the same time gained a better understanding of their practical knowledge. We enjoyed and gained valuable experience by conducting this research project.

8. References:

- 1) Fruin, J.J. (1975). "The Role of the Pedestrian" in Planning Design and Implementation of Bicycle and Pedestrian Facilities. New York: American Society of Civil Engineers, 26-32. [article in book].
- 2) Hudson, M. (1978). The Bicycle Planning Book. London: Open Books.
- 3) Palys, T. (1997). Research Decisions: Quantitative and Qualitative Perspectives 2nd Edition. Toronto: Harcourt Brace.
- 4) Penner, Paul. November 28th, 2002. [Phone Interview], Conrad Grebel.
- 5) The city of Calgary Transportation department. (1997). The Calgary Cycle Plan. Calgary: The city of Calgary Transportation publishing department.
- 6) Tolley, R. (Eds). (1997). The Greening of Urban Transport edition 2 Toronto: John Wiley and Sons.

9. Appendix:**Survey of Bike and Walkway Use**

1. a) Do you use the woodchip path between University Ave and Minota Hagey Residence?

Yes No

- b) If yes, do you: Cycle Walk

2. How would you rate this path in ease of transportation compared with other paths on campus?

Not at all useful → 1 2 3 4 5 ← Very Useful

3. How useful would you find this path if it were paved over?

Not at all useful → 1 2 3 4 5 ← Very Useful

4. a) Do you use the Seagram Drive walkway and Parking Lot to get to school?

Yes No

- b) If yes, how safe do you feel walking along the bike path/road or through the parking lot?

Not at all safe → 1 2 3 4 5 ← Very Safe

5. a) Do you walk/bike along Westmount Road between Columbia Road and University Ave?

Yes No

- b) If yes, how safe do you feel safe walking/biking along the path/road?

Not at all safe → 1 2 3 4 5 ← Very Safe

6. Would you feel safer if cars were to reduce their speed along Westmount Road?

Yes No

7. a) Are you aware or use the new Conrad Grebel path around the north side of the building?

Yes No

- b) If yes, how safe do you feel safe walking/biking along the path?

Not at all safe → 1 2 3 4 5 ← Very Safe

8. Which of the following conditions would affect your decision to not walk or bike to school? Rank only those that apply:

lack of path on route to school weather conditions of path

distance from home to school other