

**Graduate Student Government Parking and Transportation Committee**

**Spring 2008 Parking and Transportation Graduate Student Survey Report**

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## Executive Summary

The Graduate Student Government (GSG) Parking and Transportation Committee recently conducted an online survey measuring parking and transportation needs and opinions in Princeton's graduate student community. This survey, with 1078 complete responses, 62 partial responses, and an overall response rate of 48%, represents the most comprehensive, in-depth study of graduate student parking and transportation priorities to date. Initial results include the following findings:

- Graduate students prioritize reliability, efficiency, and continuity (i.e., lack of transfers) in their shuttle system over shuttle frequency and environmental sustainability.
- Responses regarding past, current, and proposed shuttle system features reflect rational assessments of how these systems meet these criteria, such that students in housing most advantaged or disadvantaged by various system changes respond accordingly.
- The potential system proposed in the University's campus plan elicits a very negative response from graduate students. Among students who anticipate that the new plan will change their current transit patterns, the majority indicate they will drive to campus more, work from home more in place of coming to campus, and attend fewer university or social functions. Thus, the proposed system changes will negatively impact graduate students and prove counterproductive to the goals of environmental sustainability and campus integration.
- Graduate students report that they would use a variety of other potential changes to the shuttle system in a manner that could reduce overall car use. In order of preference, these alternative potential changes include (1) weekend service between housing and (a) central campus and (b) the Dinky station / Dillon Gym area, (2) weekend service between housing and shopping destinations, (3) late night service, and—for the small fraction of the student population with offices there—(4) service between central campus and the Forrester campus. These changes offer real opportunities for the University to foster shuttle ridership instead of car use by providing services that a majority of students anticipate using frequently.

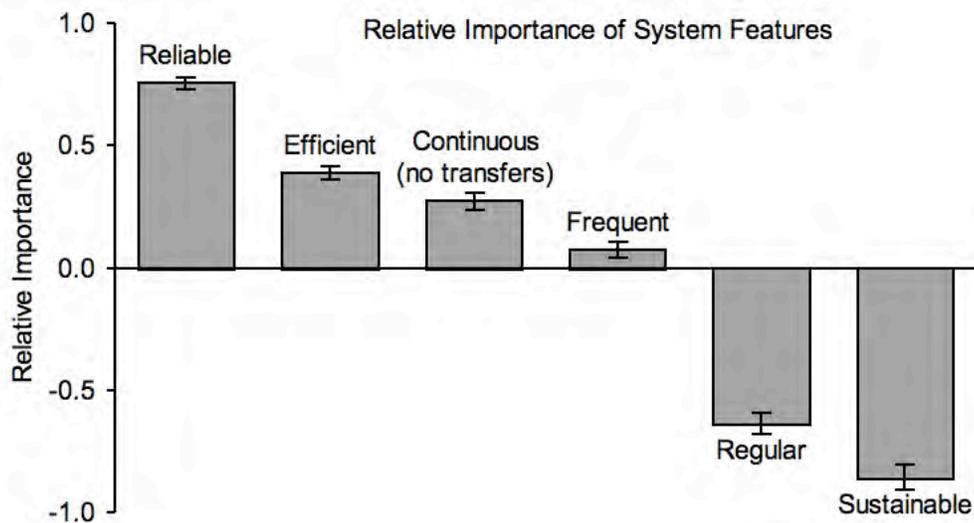
With these data in mind, this report concludes with an alternative proposal that serves the needs and goals of all local constituencies—including the University administration, undergraduates, graduate students, University employees, and local residents—better than the proposal in the campus plan.

Furthermore, as this report will describe, these survey responses represent a very rich source of data for designing a shuttle and parking system that is optimal for all parties, and the survey administrators encourage the University to fully examine and utilize this resource before rushing into any changes to the existing campus shuttle system.

## Section I: Graduate Student Transit Priorities

### **Graduate Students prioritize reliability and efficiency, and their responses to recent changes to the shuttle system reflect these concerns**

Contrary to conventional wisdom, shuttle frequency is not the campus shuttle system feature that is most important to the graduate student community. The figure below reports the relative importance assigned by graduate students to six system features: reliability, efficiency, continuity (no transfers), frequency, regularity (consistent times each hour), and environmental sustainability. Students indicated that all features were at least somewhat important, so these ratings are ipsatized—meaning each respondent’s average importance ratings were subtracted from his/her individual ratings—to assess each feature’s importance relative to all others.

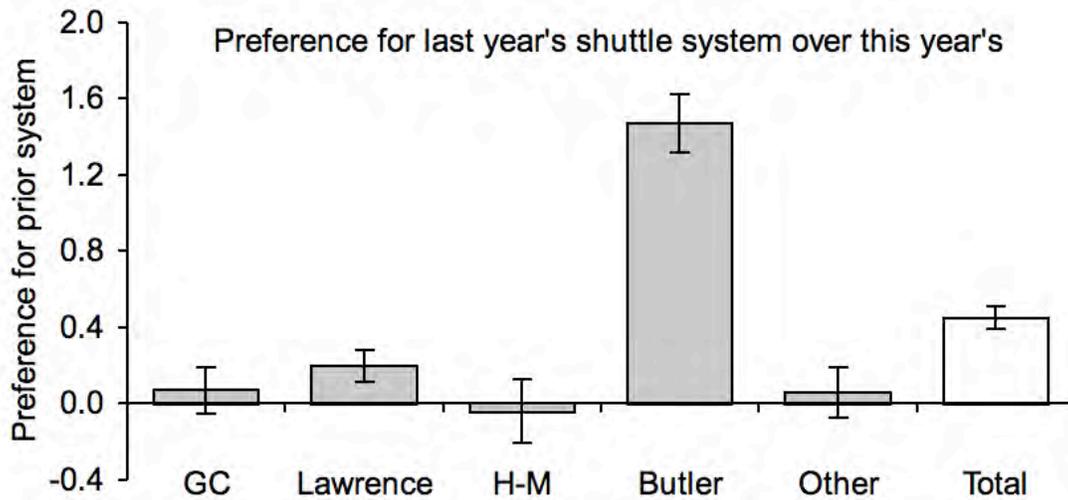


These data then indicate that students substantially rate reliability higher than all other traits, with efficiency and continuity following as slightly less important. These differences, though small, are extremely reliable: for example, the probability that the greater importance placed on continuity (lack of transfers) relative to frequency reflects random error is less than 1 in 10,000. While students do rate frequency as important, it is not close to being the most important trait of a campus shuttle system to the graduate student community. *Thus, any changes that primarily emphasize increasing frequency do not reflect the true priorities of graduate student riders.*

These priorities are reflected meaningfully in students’ reactions to two different changes to the shuttle system in the last year: the addition of the Lawrence Express service, and the route changes from Butler Apartments to central campus. The first change greatly increased efficiency and reduced travel times for residents of the Lawrence Apartments, while the second set of changes made travel from Butler Apartments to campus (and to the Engineering Quad in particular) far less direct and thereby increased travel times for residents of Butler Apartments. Even though these changes have both been in effect for many months, the student reactions reflect a rational assessment of the impact of these changes. Students in the Lawrence Apartments report substantively and significantly greater satisfaction with the Lawrence Express

(with 92% expressing satisfaction) than students in other housing complexes (33% satisfaction). This finding is predictable and demonstrates that these responses reflect actual use and needs.

Conversely, residents of Butler Apartments are singularly negative towards the recent route changes, which (after the Fisher Hall stop was created) decreased the efficiency primarily of Butler residents' routes. The graph below indicates the relative preference for last year's shuttle system over this year's, showing that residents of housing complexes other than Butler are relatively neutral to the changes, while Butler residents substantially prefer last year's system.

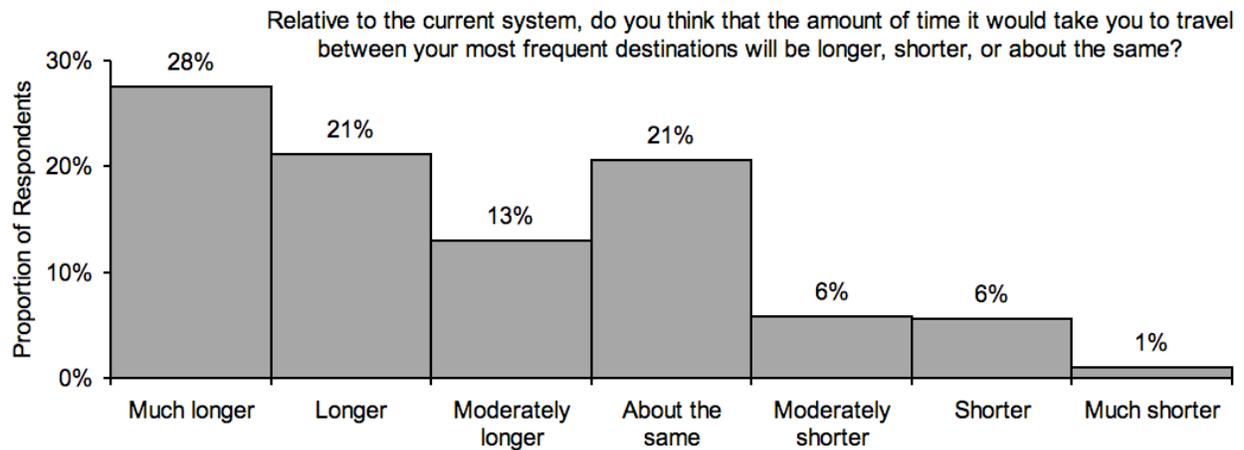
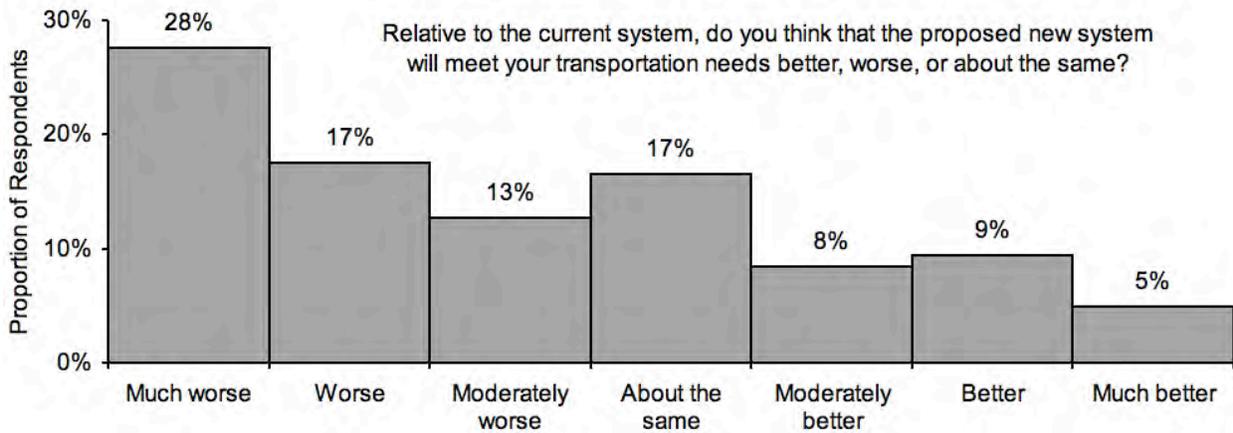
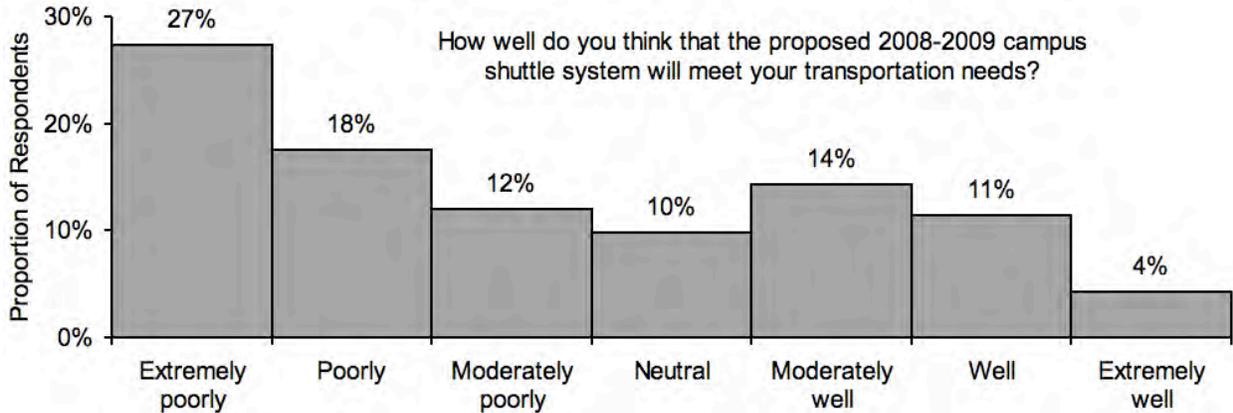


Taken together, these results paint a clear picture of graduate student shuttle riders: they seek a reliable, efficient, and direct shuttle system, and they can rationally assess how well changes to the system meet or fail their needs on these dimensions.

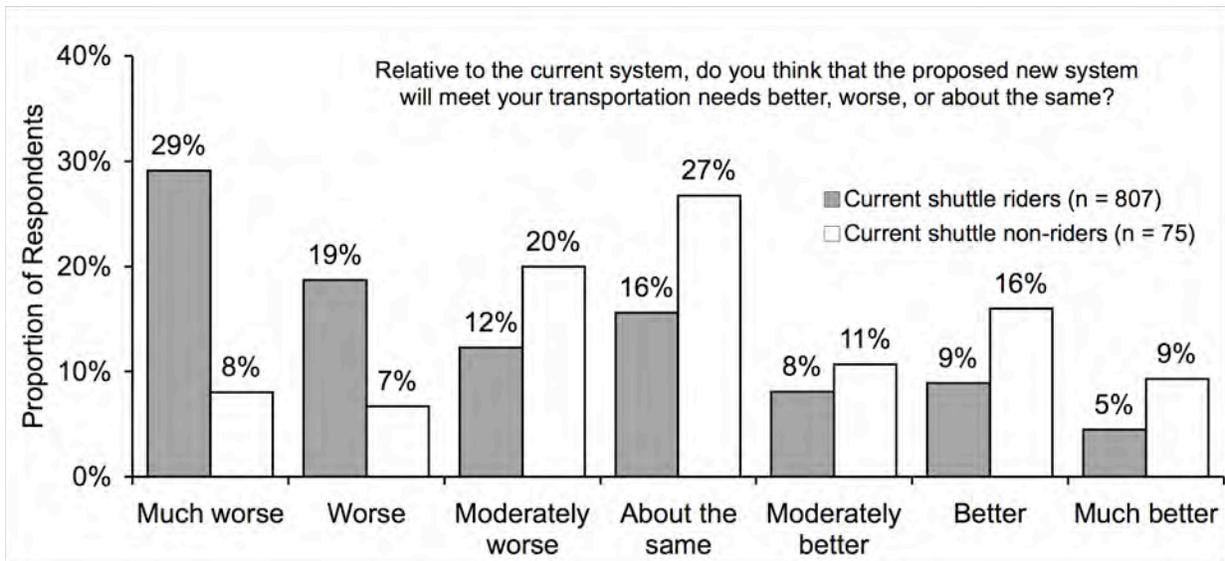
**Section II: Graduate Student Reactions to Proposed Changes**

**Graduate students are overwhelmingly negative in their evaluation towards the proposed shuttle system changes outlined in the Campus Plan.**

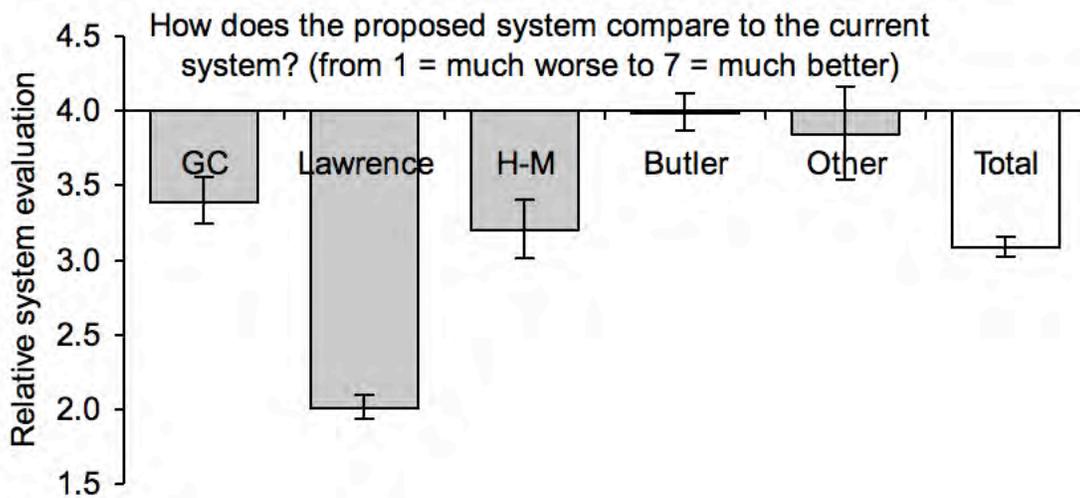
Compared to the current shuttle system, the proposed plan receives a strong negative evaluation, particularly from those students who will be in a position to use it. People are overwhelmingly negative in their basic evaluation of the system, their relative evaluation of the system compared to the current system, and their evaluation of the time the new system will add to their commute.



Predictably, the most critical of this new plan are the students who will be most affected by the changes: (a) current shuttle riders and (b) students who live in Lawrence.



As with the reactions to the past shuttle changes, the students who would be most disadvantaged by the current proposal in the Campus Plan—Lawrence Apartments residents, who would require a lengthy route extension and a transfer to get to campus—are the most negative in their assessment of the proposal relative to the current system.



Notably, no group of respondents (including Butler residents, current shuttle non-riders, or Forrestal department students) evaluated the changes as significantly positive on average.

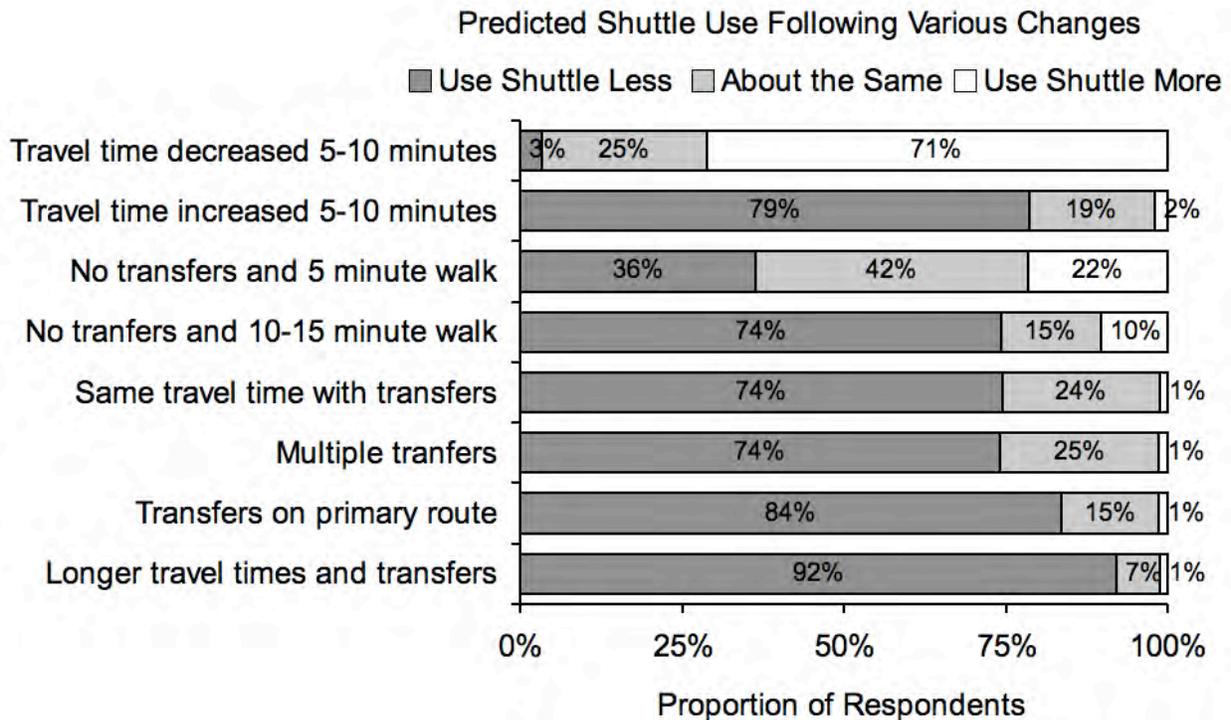
**Selected quotes from free responses:** *Optional: What do you perceive as the disadvantages of the proposed 2008-2009 campus shuttle system?*

- Transferring lines. The main reason I used the shuttle is due to bad weather and because I don't feel comfortable alone at night. By making a transfer, this would defeat the purpose of taking the shuttle ENTIRELY and significantly reduce my feeling of personal safety.
- I would say 80% of shuttle users will need to transfer, which means getting off and on. The point of taking the shuttle for many of them is to avoid getting caught in the rain, snow or cold; hence, the new system would serve badly such purpose. Also, I wouldn't feel safe to know my girlfriend waiting outside for transfer at 12.30am on her way back home from campus.
- Don't change the Green Line! Don't take it away from Lawrence!
- seems very silly that most grad students would need to change shuttles to get to work every day...
- There are no advantages for graduate students, without a doubt the most frequent users of the campus shuttle system. It takes longer to get to campus, transfers are annoying and will likely be convoluted, and I don't quite see how this would be more environmentally friendly, if indeed that was the point. The current system, although not perfect, is infinitely better than the proposed system.
- It will be an incredible inconvenience to have to transfer from Lawrence Apartments to campus! I am so disappointed to hear about this...[T]he Lawrence Express...has been hugely successful...Replacing the six minute Lawrence express ride with a commute that requires a transfer would be a nightmare. I hope that the graduate community can stop this change.
- Alexander St. gets very congested during rush hour. I believe having the shuttles from Lawrence traveling along Alexander and then onto Nassau St. will increase the time of travel to campus compared to the current route along Washington. I also don't see the point of transferring shuttles at the Dinky station. You will have a whole bus load of people emptying one bus just to fill another.
- This system would completely split [off] Lawrence and the Graduate College from the rest of the campus and make it incredibly difficult to get from Lawrence to north campus.
- Needing to change shuttles when traveling to/from the Graduate College and the Lawrence Apartments is, I feel, a completely fatal flaw in the proposed system. It would result in significantly longer travel times for most graduate students, and would probably result in more students being forced to drive themselves.
- I think it's problematic that you'd need to transfer to go between the graduate college and hidden Maggie and Lawrence seems very inefficient compared to the current system. I think you'd want to do some analysis of how often people use the shuttle to go between housing options before you make this change.
- That graduate housing is not linked with one shuttle. Most of us socialize at all of the apartments and GC at some time or another, and the proposed route is decidedly less convenient.

### Section III: Implications of Graduate Student Evaluation of Possible Changes

**The overwhelmingly negative expected consequences for graduate students of the proposed transportation plan will make the plan counterproductive to the stated goals of improved campus integration and environmental sustainability.**

We asked students to estimate their shuttle usage given a series of hypothetical changes to the shuttle routes, and to predict their behavior if the specific proposal in the campus plan were implemented. The first set of these analyses is depicted in the graph below.



These results indicate that increases in travel times, requiring a 10-15 minute walk as part of students' commutes, and adding transfers (even with the same travel time) would each result in less frequent ridership on the part of the respondents. (As noted earlier, 62% of respondents indicated that the proposed system in the campus plan would lengthen their travel times, and only 13% anticipated that the plan would decrease their travel times.)

Perhaps more importantly, however, are the responses that individuals provided to the specific details of proposal in the Campus Plan. As noted earlier, individuals report very negative reactions to this proposal. *In particular, if this plan is implemented, graduate students predict that they will ride the shuttle less, an outcome that would decrease campus integration and decrease environmental sustainability.*

**Campus integration:** A substantial portion of students are more likely to move further away from campus, work from home, and participate less in campus intellectual and social life.

	At least somewhat less likely to:	At least somewhat more likely to:	Net impact
<b>Move off campus</b>	9.8%	23.3%	+13.5%
<b>Work from Home</b>	9.2%	38.4%	+29.2%
<b>Attend Univ. Events</b>	42.2%	11.9%	-30.3%
<b>Attend social Events</b>	44.3%	14.4%	-29.9%

**Sustainability:** Students who can do so will drive more and ride the shuttle less. Plus, those who move away from campus will not be able to take the shuttle but can drive more often to campus.

	At least somewhat less likely to:	At least somewhat more likely to:	Net impact
<b>Move off campus</b>	9.8%	23.3%	+13.5%
<b>Drive to campus</b>	12.0%	41.6%	+29.6%

Overall, these data show that graduate students would like to minimize their overall travel times, and within some reasonable bounds would prefer to take the campus shuttle as their primary means of travel to campus. However, if (a) they live beyond the reach of the campus shuttle, (b) they need to come to campus when the shuttle does not run, or (c) the shuttle takes too long or is too unreliable, graduate students will either stay at home more frequently or find other means of transportation to campus, including driving private cars.

These responses should be taken seriously by the administration planning the next shuttle system, for graduate student responses significantly impact the extent to which the University can meet its own goals of attracting the best graduate students from around the country and around the world to Princeton, of reducing car use and car ownership on campus, and of enabling graduate students to be active on campus without providing daytime on-campus graduate student parking. It is worth recalling that this last goal was precisely the motivation for establishing the Green Line in the first place. *In short, it is precisely by meeting graduate student needs that the University can accomplish its own stated goals.*

#### Section IV: Potential Innovations to the Campus Transportation System

**Despite the negative evaluations of the Campus Plan proposal, this survey shows that other changes targeting unmet needs could improve campus integration and decrease car usage.**

The people who do not use the shuttle currently primarily do so because they live off campus, and therefore are not likely to use the shuttle under any circumstances. Thus, the largest potential increase in shuttle ridership is among those who already use it to some extent. If the aim is to reduce the emissions from car use, addressing unmet demand for transit services is paramount. These opportunities largely exist outside of the 9-5 work week, as the current system largely serves graduate student needs in that period. Some statistics from the survey bear out this trend:

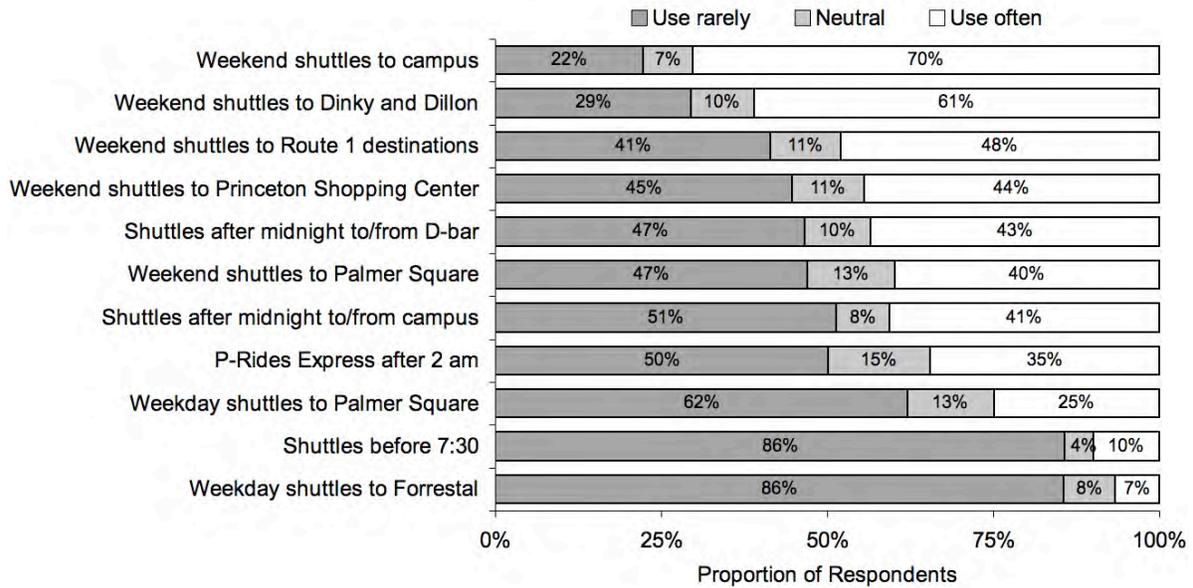
- 92% of respondents living in University Housing already use one of the three shuttles at least once a week, and 87% report using the Green Line at least once a week.
- 78% of those who do not ride the shuttle weekly give as a reason their housing location.

Together, these data suggest that unless more graduate student housing is created in reach of the shuttle system, it will be very difficult to increase the number of people who use the service for commuting to and from campus, and that replacing car usage with shuttle ridership will require expanding services for current riders. The survey assessed a number of potential improvements:

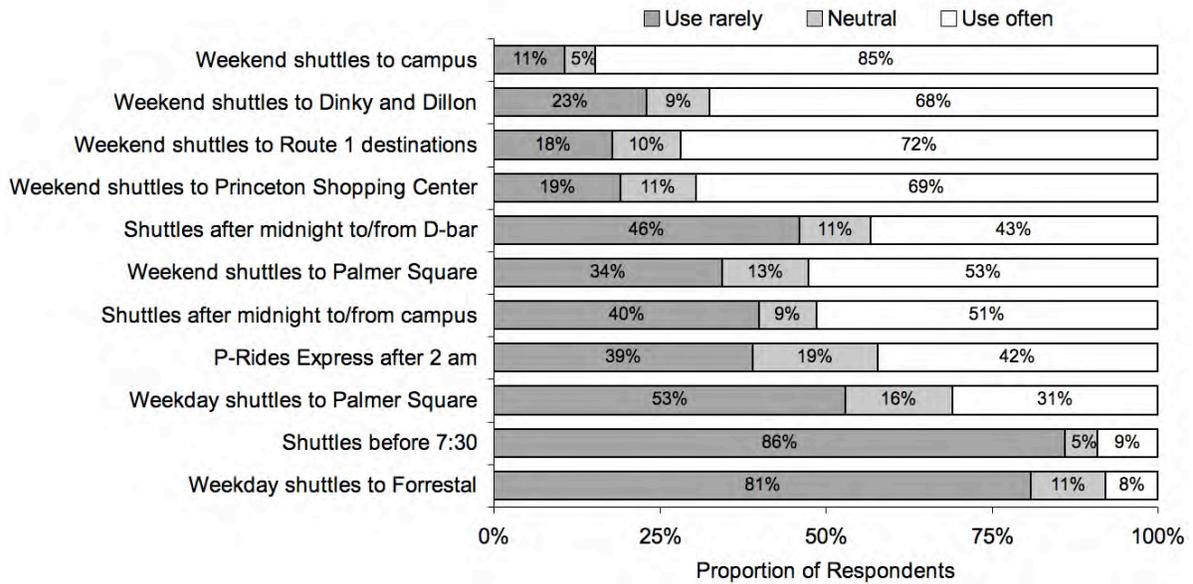
- **Weekend service:** The survey shows that more than half of graduate students come to campus six or seven days a week. Weekend service from housing to campus and the Dillon Gym / Dinky Station area received the highest usage estimates of any proposed hypothetical changes to the current system.
- **Weekend shuttles to shopping destinations.** The second highest set of usage estimates were for weekend shuttles to shopping destinations (Princeton Shopping Center and Route 1), particularly for students without cars. If the aim is not only to reduce the amount which car-owners on campus use their cars, but also to reduce the number of people who bring cars to Princeton or purchase them, adding this service is a necessity.
- **Late night shuttles.** The third most popular set of hypothetical changes were late-night shuttles between housing and (a) campus and (b) the D-Bar. This again demonstrates an opportunity for students to use shuttles instead of private cars. In addition to the environmental benefits of such a change, this possible change to the current route would also improve on-campus safety (reducing the temptation to drink and drive) and campus integration (encouraging students to attend evening campus and social events).
- **Service to Forrestal campus:** Although overall responses indicate relatively low predicted usage of a weekday service to Forrestal, students in those few departments that have offices on the Forrestal campus predict fairly substantial use of such a service.

Predicted usage patterns of various shuttle extensions are shown on the next page. Responses were aggregated thus: *Use rarely* (“Somewhat rarely,” “Rarely,” “Extremely rarely”), *Neutral* (“Neutral or unsure”), and *Use often* (“Somewhat often,” “Often,” “Extremely often”).

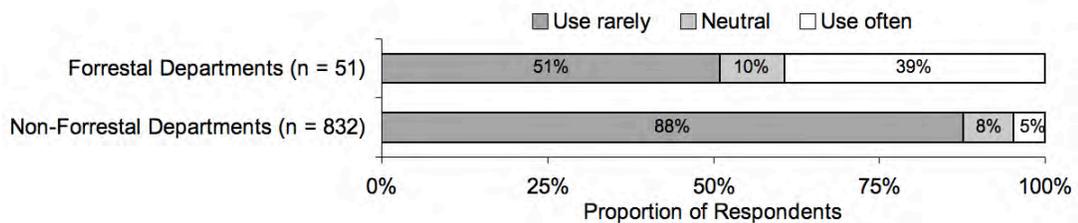
Predicted Use of Potential Transit Innovations  
(All Respondents)



Predicted Use of Potential Transit Innovations  
(Respondents in University Housing with No Car)



Predicted Use of Forrestal Shuttle  
(by Respondent Department)



## Section V: An Alternative Proposal

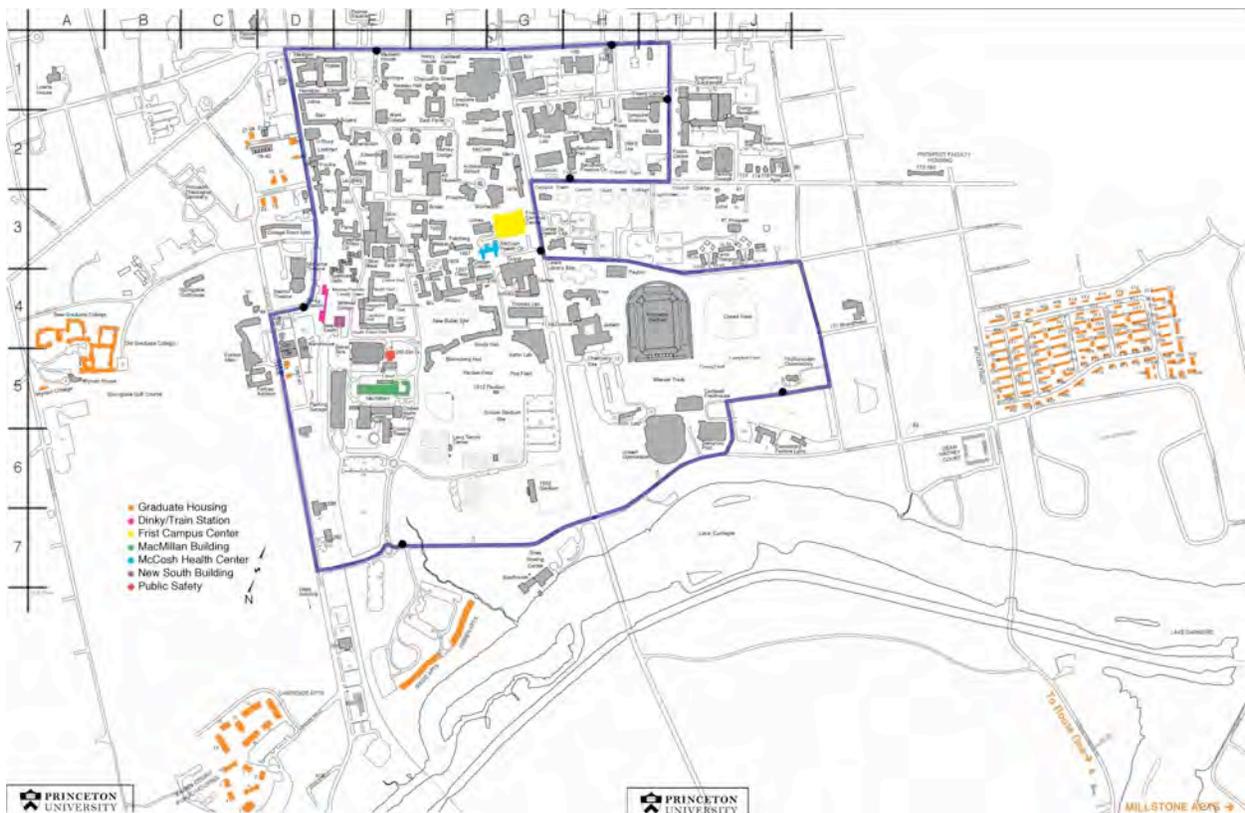
**There is a better solution for all parties: Return the Green Line to last year's routes using quiet, environmentally friendly buses and expand the Blue Line to form a campus loop.**

This survey shows that graduate students are neither averse to change nor to the stated Administration goals, but that the graduate student response to the specific changes that have been proposed in the Campus Plan will generate student reactions that are counterproductive to the stated goals of the proposal. There are, however, other changes that could be made to the existing system that meet the needs of all campus communities by providing an integrated and sustainable route without worsening the commute of a substantial portion of graduate students.

In particular, if the goal of campus integration necessitates a loop route that goes by Palmer Square and along Nassau Street, this objective can be met without disrupting the Green Line service that constitutes the core of graduate student transportation.

One proposal would expand the Blue Line to loop around Alexander Road, University Place, and Nassau Street, and while the Green Line would be maintained in something similar to its current form, increased efficiency would be gained by re-routing the trip to/from Butler away from the heavily traveled Washington Road. This possibility is mapped out and described in detail below.

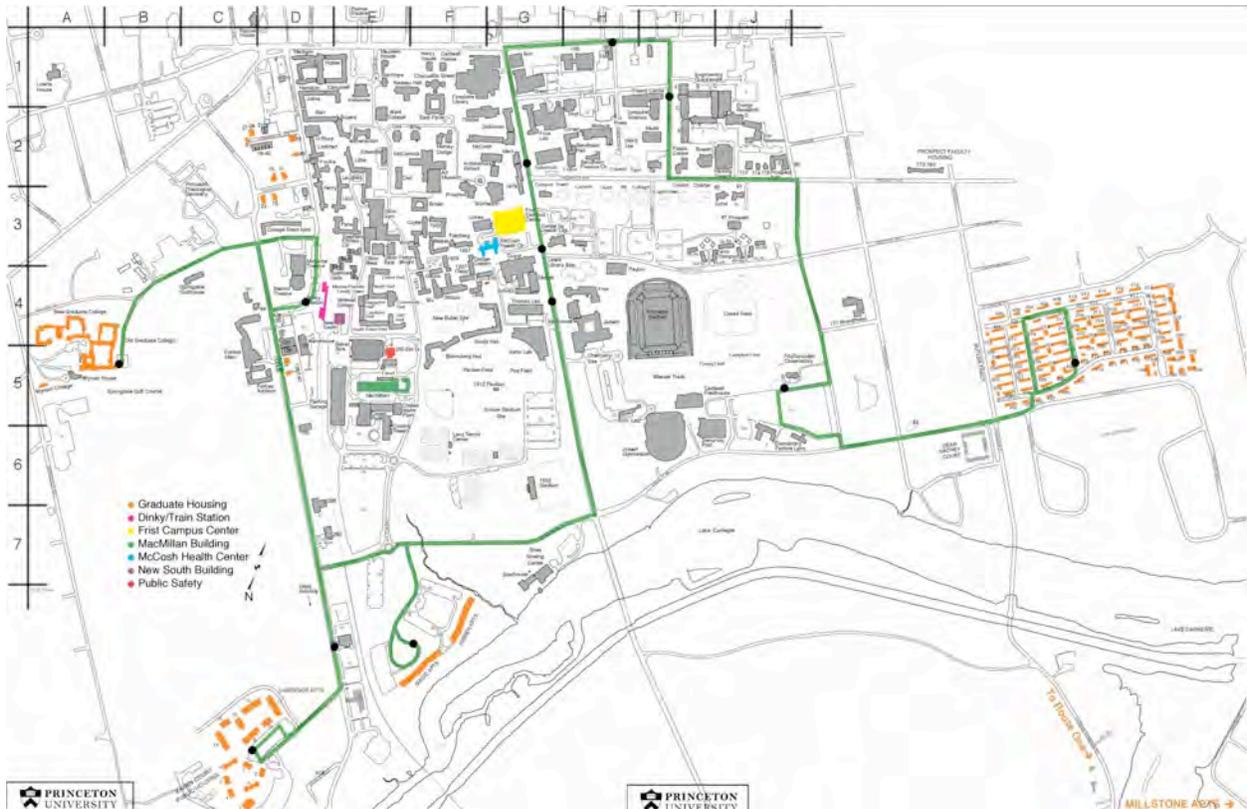
### **Proposed Blue Line Route:**



**Advantages of alternative Blue Line proposal relative to proposed 2008-2009 routes:**

- As the Blue Line does not operate on a fixed schedule, extra shuttles (in the appropriate direction) could easily be added at peak times to maintain adequate frequency.
- No timed transfers or scheduled departure times are involved, enabling shuttles to travel this loop rapidly without accruing delays.

**Proposed Green Line Route:**



**Advantages of alternative Green Line proposal relative to current 2007-2008 routes:**

- Total route is 0.55 miles shorter, making it more efficient.
- Creates less traffic congestion on Washington Road.
- Quicker link between Butler Apts/Lot 21 and North Campus/E-Quad area.
- Removing North Campus loop reduces directional confusion.
- (Note: If quieter, environmentally friendly hybrid shuttles were used, the Green Line could return to Williams Street, thus further reducing congestion and delays on Nassau Street and shortening the route.)

This alternative proposal, or a similar variant, meets the goals of multiple communities:

- **University Goals** of campus integration and improved environmental sustainability
  - *Campus Integration.* This alternative proposal fosters an integrated transportation system by producing links with New Jersey Transit train and bus services. Furthermore, this proposal would avoid harming community integration by not creating a system that would encourage graduate students to stay at home.
  - *Environmental Sustainability.* This plan would likely reduce the University's carbon footprint relative to both the current system and the proposal in the Campus Plan for several reasons. This alternative proposal:
    - would not require high frequency that would otherwise be required to make transfers work;
    - would increase the efficiency of routes both by reducing the redundancy between Blue and Green routes and by reducing the total distance traveled; and
    - would encourage rather than discourage use of public transportation.
- **Graduate Student Goals** of reliable, efficient, timely service for graduate students, reducing need for cars on campus.
  - *Efficiency.* This alternative proposal avoids redundancy in the routes and thereby provides a more efficient point-to-point transit system from campus to graduate student housing.
  - *Reduced Need for Cars.* Furthermore, this alternative would enable increasing services targeted at graduate student needs (weekend, nighttime, D-Bar) without requiring buses to run routes that are not otherwise needed.
- **Undergraduate Student Goals** of campus integration, access to transit:
  - This alternative proposal provides Forbes residents quick service to all parts of campus and provides shuttle service to Nassau street and all major transit connections.
- **University Employee Goals** of timely service from parking lots to place of employment
  - An expanded Blue Line, supplemented by the Green Line with direct service from Lot 21 to the North campus area, provides more efficient service to all major campus centers and Nassau street than does either the current system or the system proposed in the Campus Plan.
- **Town Resident Goals** of quiet bus service and reduced congestion on main streets
  - Quiet, environmentally-friendly buses would reduce noise pollution.
  - This alternative proposal would not increase parking and traffic congestion by incentivizing graduate students to park on city streets.

In total, this alternative proposal represents an **integrative solution** that meets the needs of all the stake-holding communities, producing benefits for many and losses for none. A transit system need not achieve the goals of one group at the expense of others. This proposal shows one of many ways by which research-informed planning can improve the outcome for all.

## Section VI: Future Uses for this Survey Data

**We should not hastily implement the routes like those proposed in the Campus Plan (or minor variations on those routes), but rather keep the current system while we use these survey data to carefully design a system that both meets student needs and fulfills the twin goals of campus integration and environmental sustainability.**

These data represent the most current, most representative, and most detailed assessment of student needs, opinions, and reactions to possible changes assembled to date. This survey provides an accurate assessment of point-to-point commutes (not what poorly-kept ridership data gives us), which is uniquely useful for designing a transportation system. This type of data is an absolute requirement for determining an optimal transportation system, because it is the best measure of actual demand, and unlike the ridership data it is both reliably collected and not conditioned upon the existing transportation system. This survey also offers open-ended responses, in effect creating the largest focus group ever assembled on the issue of transit needs.

Furthermore, this survey also establishes a baseline for future program evaluation by providing measures of shuttle usage, car usage, and perceptions of campus friendliness to bike riders and non-drivers.

However, fully analyzing these quantitative and qualitative data—and thus creating an optimal system—will take more time than the July 2008 start date projected for the new system. Thus, the University can best serve its goals by maintaining the current system, (potentially with small innovations such as weekend, late-nights, or on-demand service added) until complete analysis of this unique dataset has been completed, and then optimizing service with that analysis.

### **Methodological Notes**

- The survey had 1078 complete responses, 62 partial responses, and an overall response rate of 48% among currently enrolled Princeton graduate students. All participants were cross-checked against GSG voting eligibility records to verify their eligibility.
- All enrolled graduate students were invited to participate in this survey. Recruitment into the sample was two staged. First, individualized links were sent to all current graduate students. Second, follow-up emails were sent by the GSG to all graduate students and by GSG departmental reps and housing complex committees to their constituencies.
- The survey was conducted on-line using the KeySurvey survey administration tool, and all survey respondents were informed that their responses would be confidential.
- The error bars on graphs in this report indicate  $\pm 1$  standard error of the mean.
- The survey was conducted March 21-31, 2008.