WILTSHIRE & GRANNIS LLP

February 15, 2013

REDACTED — FOR PUBLIC INSPECTION

Ex Parte

Ms. Marlene H. Dortch
Secretary
Federal Communications Commission
445 12th Street, SW
Washington, DC 20554

Katie King
Telecommunications Access Policy Division
Wireline Competition Bureau
Federal Communications Commission
445 12th Street, SW
Washington, DC 20554

Re: *Connect America Fund, WC Docket No. 10-90*

Dear Ms. Dortch and Ms. King:

On behalf of General Communication, Inc. ("GCI"), the undersigned counsel submits the attached model pursuant to the *Second Protective Order*.[1] As required by the *Order*, we have requested and received written approval to designate a portion of the attached presentation as Highly Confidential. Pursuant to the *Order*, we submit (a) one copy of the filing containing Highly Confidential Information to the Secretary's Office along with this cover letter; (b) two copies of the filing in redacted form to the Secretary's Office along with the redacted cover letter; and (c) two copies of the filing containing Highly Confidential information to Katie King, of the Telecommunications Access Policy Division of the Wireline Competition Bureau. We will also file a redacted copy of this letter via ECFS.

[1] *See Connect America Fund, High-Cost Universal Service Support*, Second Protective Order, DA 12-192, 27 FCC Rcd. 1494 (2012).

Please contact me if you have any questions.

Sincerely,

John T. Nakahata
Counsel to General Communication, Inc.

cc: Susan Singer
Paroma Sanyal
Margaret Wiener

Enclosure

REDACTED FOR PUBLIC INSPECTION

Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of	)	
	)	
Connect America Fund	)	WC Docket No. 10-90
	)	
Universal Service Reform – Mobility Fund	)	WT Docket No. 10-208A

Alaska Mobile Broadband Cost Model

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The Brattle Group

February 2013

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Figures and Tables

I. INTRODUCTION

GCI requested that *The Brattle Group* develop a model that estimated the incremental cost of providing mobile broadband service specifically to residents of the State of Alaska.[1] This request was founded on the understanding that the geography, population and infrastructure of Alaska are unique compared to most, if not all, of the rest of the U.S., consequently more generalized cost models may not be fully applicable to estimating the costs of providing mobile broadband service in Alaska.

By design, cost models that can be applied to multiple regions nationwide are designed so that assumptions and inputs that vary nationwide can be modified to reflect geographically unique circumstances. However, the proposed national model estimates the costs of deploying mobile broadband utilizing two important static conventions that may make good sense for the continental U.S., but which are less applicable to Alaska.[2] First, the national model uses road miles as an indicator of target census blocks for high speed mobile broadband deployments. Second, the national model assumes that fiber based backhaul is widely and relatively inexpensively available, especially along roadways. These keys modeling assumptions are not applicable to Alaska because the State has a unique distribution of population and roads, and has a much less developed wireline infrastructure than is the case elsewhere in the Lower 48.

The State of Alaska encompasses a very large area (by itself equal to 20% of the land mass of the Lower 48 States combined), is sparsely populated (with roughly 1.2 people per square mile, compared with over 100 people per square mile on average in the Lower 48) and has a limited road system. Many of Alaska's communities are remote, located completely off-road (accessible only by airplane, boat, or snow machine).

[1] For the purposes of this analysis, we consider mobile broadband service to have an average data speed in the cell site of 768 kilobits per second (kbps) downlink and 256 kbps uplink. Some tables included in this report may use a shorthand and refer to these data speeds as "3G/4G" and speeds below this level of service as "2G."

[2] A prominent national model is the U.S. Ubiquitous Mobility Study, September 21, 2011 developed by CostQuest Associates for the CTIA.

An equally important consideration is the absence of fiber backhaul in Alaska. This is generally not the case in the Lower 48 where such wireline infrastructure is largely in place. Alternate backhaul options add substantial cost to providing mobile broadband. In many areas in Alaska, backhaul can only be completed over many miles of microwave transport or by satellite, which tend to be considerably more costly than the fiber based options available throughout much of the continental U.S. An additional cost that is incurred by carriers in Alaska is transport to an Internet peering site. Unlike the Lower 48, peering sites are not even in Alaska; instead data must be transported via undersea cable from Alaska to Seattle, Washington, or Portland, Oregon.

The Alaska Mobile Broadband Cost Model estimates the incremental cost of providing mobile broadband service (i.e., at speeds of at least 768 kbps downlink and 256 kbps uplink on average speed in the cell site) to specific areas within the State of Alaska. Roadways as well as local community locations were considered in defining the areas targeted for mobile broadband service. In summary, the cost model:

- Segments the State of Alaska into: 1) areas that currently receive wireless broadband at average speed of 768 kbps down / 256 kbps up; 2) areas that currently receive wireless services at lesser speeds; 3) areas that do not receive any wireless services, but receive a form of wireline communications services; and, 4) areas that currently do not receive any communications services.

- Aggregates detailed census block demographic and geographic data (i.e., population, area, road miles, existing cell sites and backhaul infrastructure) to the borough (the geographic organization of the State of Alaska) and census area level.

- Estimates the capital costs associated with building-out the network and the present value (PV) of five years of operations and management (O&M) costs. Costs are estimated for geographic areas based on the physical network infrastructure currently in place.[3] For

[3] We used this "brownfield" approach, because the wireless broadband infrastructure is relatively new, built in the last several years in many cases, and additional built-out or upgrades would likely take advantage of the existing infrastructure locations.

instance, absence of any wireless facilities necessitates building-out 768 kbps down / 256 kbps up infrastructure "from scratch." Where wireless facilities are in place but at less than broadband speeds, costs reflect the incremental investment and O&M expenses associated with upgrading services to reach the average 768 kbps down / 256 kbps up level.

In addition, the Alaska Mobile Broadband Cost Model estimates the PV of five years of backhaul costs, based on the type of backhaul currently accessible for the specific geographic areas considered. The PV of transport costs (from the primary hubs of Juneau, Fairbanks and Anchorage to the aggregation points in Seattle, Washington, or Portland, Oregon) was also estimated. Transport costs are reported separately, and not included in the total cost estimate. The bandwidth associated with backhaul and transport was determined at the borough / census area level to ensure economies of scale and/or volume discounts.

Finally, anticipated incremental annual marginal revenues from new and upgraded services are also estimated. These incremental revenues may be considered to be an offset to the cost requirements associated with deploying mobile broadband services.

This report provides an overview of the Alaska Mobile Broadband Cost Model and summarizes key model results (based on our recommended assumptions, set as default values in the model). Figures included in this report explain the organization of the cost model. This report is also designed to accompany the model in electronic format (i.e., Microsoft Excel). An overview of the cost model from the perspective of a user of the Excel format is provided in Section X.

Section II of the report presents our results from the cost modeling, including the detailed costs for network build-out and operations, cost of undersea transport, and the marginal revenue from updated build-out. Section III describes the cost model methodology, including our assumptions on the scope of build-out, the coverage analysis, and costs. Next, sections IV and V describe our simulation of the existing level of wireless coverage in Alaska, as well as a determination of requirements to build-out infrastructure to provide mobile broadband services. Sections VI and VII describe our estimates cell site costs and backhaul costs, respectively. Section VIII provides an estimate of the cost of undersea transport from points in Alaska to peering points in the Lower

48. (This cost is presented in order to provide full scope of costs associated with deploying mobile broadband, but are not included in the total cost estimate summarized in Section II below.) Section IX provides additional context for the results presented in Section II by estimating the marginal revenue (to carriers) from the new and upgraded services. Finally, Section X provides a brief overview of the Alaska Mobile Broadband Cost Model for prospective model users. Additional details concerning model output is included in an Appendix to the report.

II. SUMMARY OF RESULTS

The cost of providing mobile broadband services in Alaska is a function of: 1) the scope of the geographic areas covered; 2) the costs (capital and O&M) of building new cell towers and upgrading existing cell towers, plus the costs of building out or upgrading common network facilities and satellite ground stations where needed; and, 3) the costs of backhaul.

In this summary, as well as throughout this report, the costs of providing mobile broadband are presented in total, as well as by geographic segment. Specifically, as indicated above, the cost model segments the State of Alaska into: 1) areas that currently receive wireless broadband at average speed of 768 kbps down / 256 kbps up; 2) areas that currently receive wireless services but at lesser speeds; and, 3) areas that do not receive any wireless services, but receive a form of wireline communications services. These three geographic segments cover 17,434 census blocks in Alaska.

These segments can also be compared to the list of potentially eligible areas (i.e., census blocks) that the FCC provided in Mobility Fund Phase I.[4] The total cost and a break down among a matrix of geographic segments is summarized in the table below.

[4] In the *Auction 901 Comment Public Notice*, the FCC's Wireless Telecommunications and Wireline Competition Bureaus provided a list of census blocks that would be eligible for Mobility Fund Phase I support based on American Roamer data.

Summary of Cost of Providing Mobile Broadband to Targeted Areas

	No Wireline Telecom / No Wireless	Wireline Telecom / No Wireless	Current Service < 768 kbps down / 256 kbps up	Total	%
FCC Eligible List	$128,339,993	$59,321,646	$242,611,442	$430,273,081	72%
Non-FCC List - Current Service < 768 kbps down / 256 kbps up			$111,207,657	$111,207,657	19%
Non-FCC List - No Wireless / Telecom Presence		$39,754,565		$39,754,565	7%
Total excl. Common Network Costs	$128,339,993	$99,076,211	$353,819,099	$581,235,303	97%
Common Network Cost (Satellite iHub + MSC)				$14,968,708	3%
Total				$596,204,010	100%
% of Total	22%	17%	59%	100%	

Source: U.S. Census Bureau 2010 Census; GCI Cell Site Data; Carrier Cell Sites from FCC ULS database; Brattle Analysis.

The cost of providing mobile broadband service to all of the targeted areas in Alaska is estimated to be roughly $596 million. The table indicates that roughly 72% of the estimated total costs involved with providing mobile broadband to these areas of Alaska are associated with the census blocks included in the FCC's list of potentially eligible areas. Furthermore, 59% of total estimated costs are associated with upgrading areas that currently receive wireless services.

Further breakdown of the cost of deploying mobile broadband services is presented in Table II-1, which breaks down the estimated $596 million into cost components including capital costs (i.e., the costs of building out and upgrading cell sites, common network and satellite ground stations and equipment), the PV of five years of O&M costs and the PV of five years of backhaul costs. The table indicates that common network costs are nearly $15 million, and another $430 million are associated with providing mobile broadband services in the census blocks included in the FCC's list of potentially eligible areas. Roughly 50% of the cost of providing mobile broadband service to the FCC eligible census blocks is associated with backhaul (roughly $213 million on a present value basis), with the remaining 50% associated with upgrading and building new cell sites (roughly $217 million).

The table also indicates that the PV of upgrading existing and building new cell sites, and investing in common network elements required for satellite based backhaul and operating this infrastructure for 5 years is approximately $330 million. The cost for upgrading and building new cell sites, and

operating the cell sites and other non-backhaul equipment in the areas included under the FCC's list of potentially eligible census blocks is estimated to be approximately $217 million, with the remaining areas estimated to cost slightly less than $113 million. The total cost of providing backhaul from these cell sites to the carrier's network control points are estimated to be approximately $267 million for the full scope of targeted areas, with $213 million alone associated with the census blocks included in the FCC's list of potentially eligible areas.

The cost of providing mobile broadband service in Alaska can also be presented in terms of summary metrics, such as costs per cell site and road mile. These statistics are provided in **Table II-2**.

While **Table II-1** and **Table II-2** summarize the total cost of bringing wireless areas of Alaska, there is an additional cost of transport to connect the Alaska wireless network with the Lower 48 states. The cost of transport, approximately $47 million on a PV basis, is summarized in **Table II-3**.

For comparison purposes, the PV estimated for the total cost (excluding undersea transport) of bringing mobile broadband to the targeted areas in Alaska of $596 million exceeds the individual PVs of the Remote Alaska High Cost Support and CETC support in Alaska. The Remote Alaska High Cost Support (at $78 million per year for five years) has a PV of roughly $315.6 million, and the PV for the CETC support in Alaska as of October 1, 2013 (at roughly $105 million per year for five years) is roughly $426 million.

III. COST MODEL – METHODOLOGY AND PROCESS FLOW

The Alaska Mobile Broadband Cost Model begins with a detailed data set of each of the 45,292 census block in Alaska, which includes demographic data (i.e., population, land area and road miles at the census block level), geographic coordinates for cell towers currently in place, and an indication of the extent (if any) of wireline and/or wireless services currently provided.[5]

[5] These data are summarized in the cost model (in the "CB" "CB_Cov" and "Sites" tabs).

These data provide the basis for segmenting the State's geographic area into areas that already receive mobile broadband, areas with wireless services but at speeds slower than mobile broadband standards, and other areas that are unserved by wireless carriers. The Alaska Mobile Broadband Cost Model then estimates the cost of providing mobile broadband service (i.e., at least 768 kbps downlink and 256 kbps uplink as the average speed in the cell site) to specific areas within the State of Alaska based on the geographic data, and on historic and projected Alaska-specific costs.

Cost estimates are broken down in terms of major cost areas (capital costs for cell sites, other areas of capital costs, PV of O&M expenses and PV of backhaul costs), and are also summarized by geographic area (at the borough / census area level). Cost estimates are also presented by aggregated geographic segments; e.g., areas that currently receive wireless services at slower than mobile broadband speeds.

The general methodology used in estimating the costs of providing mobile broadband to the targeted areas in Alaska is summarized in schematic form in **Figure III-1**.

A. GEOGRAPHIC SCOPE

The most current data concerning population and other demographics are included in the 2010 Census, conducted and reported by the U.S. Census Bureau. Data is collected at the census block level, the most detailed level of dis-aggregation, which can then be aggregated into census blocks and census tracks or areas.

As presented in **Table III-1**, the U.S. Census Bureau has broken Alaska down into 45,292 census blocks for the 2010 U.S. Census. The State of Alaska divides itself into 18 boroughs (a form of organization similar to counties), which cover much of the more populated areas of the State. The less populated areas are not included within the borough designations, but are divided into an additional 11 census areas defined by the Census Bureau. Overall, the State of Alaska can be segmented into 29 boroughs / census areas.

Census data also include road mileages (developed from TIGER/Line Shapefiles) by category of road.

To estimate the presence and level (i.e. speed) of mobile service currently in Alaska, cell site locations together with reported wireless coverage were considered. Wireless coverage for the State of Alaska by borough / census area, along with associated population and road miles, is included in **Table III-2**. The table indicates that:

- 54% of Alaska's census blocks currently receive some level of wireless service; these cover 97% of the State's population, but only 7% of the State's land area;

- 31% of the State's census blocks currently receive mobile broadband service at 768 kbps down / 256 kbps up average for the cell site; these cover 83% of the population, but only 1% of the land area.

The Alaska Mobile Broadband Cost Model estimates the cost of providing mobile broadband service to defined geographic areas in Alaska, based on groups of census blocks. A breakdown of the census blocks in Alaska, including a comparison of the FCC list of potentially eligible census blocks in Alaska and the census blocks for the State overall, is provided in the table below. In addition to showing the detailed breakdowns described above, the table indicates that approximately 23% of the State's census blocks currently receive wireless services at average speeds of less than 768 kbps down / 256 kbps up.roughly. Meanwhile 9% of census blocks currently receive some type of wireline communications services, but do not receive commercial wireless communication services at broadband or lesser speeds.

Matrix of Alaska Census Blocks

	No Wireline Telecom / No Wireless	Wireline Telecom / No Wireless	Current Service < 768 kbps down / 256 kbps up	Current Service at 768 kbps down / 256 kbps up	Total	%
FCC Eligible List	2,728	1,541	3,798	79	8,146	18%
Non-FCC List - Current Service At 768 kbps down / 256 kbps up				14,152	14,152	31%
Non-FCC List - Current Service < 768 kbps down / 256 kbps up			6,607		6,607	15%
Non-FCC List - No Wireless / Telecom Presence		2,760			2,760	6%
Non-FCC List - No Telecom Presence	13,627				13,627	30%
Total	16,355 36%	4,301 9%	10,405 23%	14,231 31%	45,292 100%	100%

Source: U.S. Census Bureau 2010 Census; GCI Cell Site Data; Carrier Cell Sites from FCC ULS database; Brattle Analysis.

The "target" census blocks in this model are those that may be considered possible recipients of support from the FCC Mobility Fund. These include the census blocks included in the FCC list of potentially eligible census blocks (except for the 79 that appear to already receive mobile broadband services at average speeds of 768 kbps down / 256 kbps up); an additional 6,607 census blocks that are not included in the FCC list, but which currently receive wireless services at levels less than 768 kbps down / 256 kbps up; and the 2,760 census blocks that currently have a non-wireless telecom presence. This breakdown of census blocks is summarized in the table below.

Summary of Census Blocks Included In Cost Analysis

	Census Blocks	%
FCC Eligible List (excluding census blocks currently receiving services at 768 kbps down / 200 kbps up	8,067	46%
Non-FCC List - Current Service < 768 kbps down / 200 kbps up	6,607	38%
Non-FCC List - No Wireless / Telecom Presence	2,760	16%
Total	17,434	100%
Total Census Blocks In Alaska	45,292	
% Included In Cost Analysis	38%	

B. Infrastructure Requirements

The infrastructure required for carriers to provide mobile broadband service in Alaska was determined through the coverage analysis. The coverage analysis involves determining the number of cell sites (i.e., existing and new) needed to cover the specified geographic areas, and the type of backhaul (e.g., satellite, fiber, microwave, etc.) that is available to connect these cell sites to network facilities.

The number of cell sites needed to cover the selected areas was determined as follows:

- For areas currently receiving mobile wireless service at levels below 768 kbps down / 256 kbps up, existing wireless carrier cell site locations were assumed to be efficient, and were used as the locations for upgraded cell sites. In certain cases multiple carriers had separate cell sites providing service to the same area. When cell sites overlapped, one cell site was assigned in the cost model and the other was dropped from the analysis.[6]

[6] We received the coordinates for GCI's current cell sites and other locations at which GCI offers other telecom services. To supplement this list, we included the registered locations of other carriers' cellular towers. To estimate the coverage areas around these sites, we assumed each cell site had a 7.5 mile coverage radius.

- For areas not currently receiving mobile wireless service, but currently receiving some telecom services from GCI, we assumed that the locations of other telecom services could become efficient locations for the cell sites that would be used to provide mobile broadband service.

- Finally, for areas not currently receiving mobile wireless or other telecom service, coverage ranges for existing cell sites were used as a proxy. Specifically, the number of road miles covered by wireless services per cell site for currently served areas was estimated for each borough / census area. These average road miles per cell site coverage ratios were used to estimate the number of new cell sites needed to cover currently unserved areas, based on road miles, within the same borough / census area.

A schematic of the methodology used to determine cell site requirements is included as **Figure III-2**.

C. Cost Elements

To determine the cost of additional infrastructure requirements, and with the help of GCI, we collected the following cost elements. The cost of providing mobile broadband service includes both the cost of capital investment as well as ongoing O&M expenses. The primary areas of costs for a mobile broadband network in Alaska include cell sites and backhaul from the cell site to the hub points (Fairbanks, Anchorage or Juneau). Costs can be categorized as: capital (i.e., investments in cell sites, common network and satellite ground stations), O&M, and backhaul and transport. There is also an additional cost of the undersea cable transport from the hub points in Alaska to aggregation points in either Seattle, Washington or Portland, Oregon.

Unit costs include the capital and O&M costs required to construct and operate a cell site and to connect it to a carrier's network. Unit costs were developed based on the actual experience and costs incurred by GCI.[7] The model estimates both one time and ongoing costs over the course of

[7] Since the GCI wireless network has largely been constructed in the last few years, historical costs and current backhaul lease rates were assumed to be applicable.

service life. Costs are converted to PVs in order to allow estimation of a total cost on a consistent basis. These cost elements are summarized below.

1. Capital Costs – Cell Sites

Cell site related capital costs include upgrades and new construction.

- Existing cell sites (costs to upgrade antennas and shelters from current wireless service levels to 768 kbps down / 256 kbps up levels);

- New cell sites (costs to construct towers and shelters and deploy radio equipment necessary to provide average speeds of 768 kbps down / 256 kbps up);

2. Capital Costs – Network and Satellite

Additional capital costs required to complete a mobile broadband network include:

- Network controls (MSC server);

- Satellite ground station upgrades and new installations for cell sites served by satellite backhaul;

- Satellite costs (HUB iDirect Satellite);

3. O&M Costs

Annual O&M expenses required to operate and maintain cell sites, including the costs of providing backhaul (discussed further below), are also estimated. O&M expenses include electric power, leases and maintenance costs.

4. Backhaul Costs

Backhaul costs were estimated based on the type of backhaul deployed and population covered. Wireline fiber backhaul options are only available in the more densely populated areas of the State. Many communities have low populations and are located off of the road system; options for such less populated areas are limited to microwave or satellite. For this analysis, fiber and microwave

backhaul are considered to be "terrestrial" options. The other option, satellite, is considered separately. Microwave and satellite backhaul are both considered "remote" backhaul options.

Backhaul was assigned to cell sites based on the infrastructure currently in place in Alaska for those regions.[8] Specifically, the most cost efficient backhaul option was applied to cell site based on throughput requirements and options currently available. Construction of new wireline or microwave backhaul infrastructure was not modeled or considered. Backhaul costs are based on average distance to the hub points at the borough / census area level, and were provided by GCI.

A schematic of the methodology used to determine backhaul costs is included as **Figure III-3**. Backhaul costs are summarized in Section VI and corresponding Tables VI-5 and VI-6 below.

5. Undersea Transport Costs

One additional unique feature of Alaska is that it has no transport aggregation points within the state. Rather, data must be carried by undersea cable from one of the three data hubs in Alaska (i.e., Anchorage, Fairbanks–via–Anchorage, and Juneau) to an aggregation point in the Lower 48 States. Specifically, from these hubs data can be transported over T1 or T3 cables to Seattle, Washington or Portland, Oregon. To estimate the total undersea transport cost, we estimate the total number of cables required based on the cumulative amount of data passing through each hub. Hub points were designated by borough based on the closest proximity. Rates were provided by GCI and based on current published rates.

IV. TARGETED COVERAGE AREAS

The total cost of providing mobile broadband service to portions of the State of Alaska depends on which (and how many) census blocks are targeted for service. We estimated the costs of providing mobile broadband service for the three categories listed below:

[8] Generally, backhaul was defined by borough. However, for some boroughs with varied terrain, multiple backhaul types were applied based on regional designations.

- FCC Potentially Eligible Census Blocks – **Table IV-1** indicates that the areas in Alaska eligible for Mobility Fund Phase 1 include 8,146 census blocks of which 3,877 currently have some level of wireless service and 4,269 currently do not receive wireless service.[9]

- Additional Areas Currently Served In Alaska, Not Included As FCC Potentially Eligible Census Blocks – **Table IV-2** indicates that an additional 20,759 census blocks in Alaska already receive some level of mobile wireless service, 14,152 of which are at 768 kbps down / 256 kbps up levels and 6,607 are at 2G levels.[10]

- Areas Not Currently Receiving Mobile Wireless Services In Alaska But Covered By Other Telecom Services By Census Block – **Table IV-3** indicates that at least another 2,760 census blocks receive some level of non-wireless telecom service, based on GCI served locations.

Table IV-4 summarizes the breakdown of areas in terms of census blocks covered. In addition to the breakdown summarized above, the table references two additional groupings of census blocks:

- 14,152 census blocks are not eligible for FCC support and already receive mobile broadband service and would not need to upgrade (unless to upgrade to levels above 768 kbps down / 256 kbps up). As discussed below and shown in **Table IV-1**, there are also another 79 census blocks on FCC's potentially eligible list that have already receive average service at 768 kbps down / 256 kbps up;

- 13,627 census blocks are not targeted for coverage, because they do not fall into the FCC's list of potentially eligible areas or currently receive wireless or wireline services.

[9] Wireless service includes data speeds at and below 768 kbps down / 256 kbps up on average in the cell site, and services by other carrier assumed to be below 768 kbps down / 256 kbps up. According to GCI representatives, there are no locations at which services at 768 kbps down / 256 kbps up is offered by another carrier and not GCI. Census blocks not served by wireless services include census blocks with some GCI non-wireless telecom presence and are not currently served by other wireless carriers.

[10] Since no upgrade is necessary, areas already served by mobile broadband are excluded from the cost analysis.

As shown in **Table IV-5**, this "untargeted" area covers a sizable portion of Alaska's total land area (201,339 out of a total of 570,641 square miles (see **Table III-1**) but only a very small percentage of the State's population (roughly 0.3% or 1,867 people).

V. CELL SITE REQUIREMENTS

We estimate that there are currently 647 cell sites in Alaska, as of Q2 2012, as is summarized in **Table V-1**. The table shows that 222 cell sites are located within the FCC eligible census blocks and 291 cell sites provide service outside of this area. Also, the table indicates that an additional 134 cell sites already provide mobile broadband services in the more populated areas within Alaska.

The service breakdown of these 647 cell sites is also shown in **Table V-2**.[11] There are 511 cell sites (220 FCC eligible + 291 additional areas) with service at levels below 768 kbps down / 256 kbps up and 134 cell sites provide service at the 768 kbps down / 256 kbps up level. The table indicates that 220 cell sites that are located within the FCC's eligible census blocks currently provide service at levels below 768 kbps down / 256 kbps up and 136 cell sites located in Alaska currently provide service at the 768 kbps down / 256 kbps up level.[12] These 647 cell sites cover the 24,636 census blocks (54% of total Alaska census blocks), 688,978 people (97% of the State's population) and 42,154 square miles (7% of the State's land area).[13]

Existing cell sites were used to estimate coverage for upgrading existing services that are below the 768 kbps down / 256 kbps up level to mobile broadband levels.[14]

[11] In this table, we make an adjustment to the cell sites located within the FCC eligible census blocks because we estimate that 2 cell sites have already been upgraded to provide service at the 768 kbps down / 256 kbps up level.

[12] Table IV-1 indicates that 222 cell sites are located within the FCC eligible census blocks, and that 134 additional cell sites provide 3G/4G service. We estimate that 2 cell sites, covering 79 FCC eligible census blocks have been upgraded to provide 3G/4G service. Thus, 220 of the 222 cell sites located within the FCC eligible census blocks currently provide 2G service. Furthermore, these 2 3G/4G cell sites can be added to the 134 3G/4G cell sites that are located outside of the FCC eligible census blocks, for a total of 136 cell sites in Alaska that are used to provide 3G/4G service.

[13] GCI currently provides wireless service to 23,181 of the 24,636 census blocks that currently receive wireless services. The remaining 1,455 are served by at least one other wireless carrier.

[14] According to GCI representatives, there are no 3G/4G locations in which GCI does not offer 3G/4G service and another carrier does.

- To estimate the additional cell sites required to cover the unserved census blocks included in the FCC's list of potentially eligible census blocks, we calculated the average road miles covered per existing cell site for each borough / census area. We applied this average to the total unserved road miles located within each borough / census area. Road miles were calculated by using the GIS coordinates for roads included in the 2010 census.[15] A summary of road miles by borough / census area is included in **Table V-3**. Based on this road mile analysis, as indicated in **Table V-4**, we estimate that an additional 168 cell sites will be required to provide mobile wireless service to the 2,728 census blocks that are included in the list of the FCC's potentially eligible census blocks and that do not currently receive any telecom service (see **Table IV-1** for a breakdown of the FCC's list of potentially eligible census blocks).

- Cell sites required to cover the areas that currently receive some non-wireless service were based on engineering and planning analysis conducted by GCI. We then compared the GCI cell site planning analysis with cell site coverage provided by other carriers to remove any duplicative cell sites. We estimate that 153 additional cell sites will be needed to fully serve these areas. **Table V-5** compares GCI's estimate to the final cell site requirements, once the coverage analysis was completed, by borough / census area,

In total, there are another 321 cell sites that must be built to bring mobile broadband coverage to the FCC potentially eligible areas and select other locations. A breakdown of the new sites required by borough / census area is shown in **Table V-6**. With these additional cell sites, 832 new and upgraded cell sites are required to provide mobile broadband service to the areas targeted in Alaska, as is summarized in **Table V-7**.

Based on these cell site requirements, cost estimates are developed for:

[15] The 2010 census provides road data in TIGER/Line Shapefiles which provide the line layer of roads in Alaska. We input these data into a geographic information system (GIS) mapping software (TransCAD) to determine the location and distances of roads for each census block in Alaska.

- Upgrading 511 existing cell sites (220 of which are located in FCC eligible census blocks, and 291 of which are located in non-FCC eligible census blocks);

- Building an additional 321 new cell sites (168 of which would be located in FCC eligible census blocks, and 153 of which would be located in non-FCC eligible census blocks that currently receive some non-wireless telecom service).

These 832 cell sites (511 upgrades + 321 new sites) are in addition to the 136 existing cell sites that already receive wireless service of 768 kbps down / 256 kbps up.[16] The total number of cell sites in Alaska needed to provide mobile broadband service (excluding those that already provide mobile broadband service) would thus be 968 (511 upgrades + 321 new sites + 136 existing cell sites).

VI. UNIT COSTS

Determining the total costs to provide mobile broadband service for the targeted areas is accomplished by multiplying the costs per unit by the number of units. The costs involved in providing mobile broadband service includes capital costs as well as ongoing expenses associated with operations and maintenance:

- Cell site capital costs include the one time investments necessary to: upgrade existing cell sites to 768 kbps down / 256 kbps up levels; and, to construct new mobile broadband cell sites. Related capital costs also include investments in network controls (e.g., MSC servers).

- Backhaul capital costs include the costs associated with remote VSAT ground stations and the cost for a central hub point (i.e., HUB iDirect Satellite).

[16] These cell sites are not included in the estimate of cost to provide mobile broadband service to the targeted areas in Alaska, but would need to be if an estimate of providing services at levels greater than 768 kbps down / 256 kbps up were to be developed.

- O&M expenses for cell sites are the ongoing costs for power, leases, labor and other recurring costs involved in running a cell site.

- Satellite backhaul operations and maintenance expenses are the monthly lease charges for using satellite capacity.

- Terrestrial backhaul operations and maintenance expenses are the monthly lease charges for using microwave, fiber and/or TERRA capacity.

- Data transport costs are the monthly lease charges for transporting from the hub point to the aggregation point in the Lower 48 states.

A summary of the unit costs involved in upgrading and/or building out cell sites and in providing terrestrial and satellite based backhaul is included in **Figure VI-1**.[17]

Cost data was based on the actual recent experiences (e.g., within the last three years) of GCI in upgrading and/or building out cell sites, ground stations and central hubs in Alaska. Backhaul lease costs are based on rates and tariffs paid by GCI for backhaul services.

Capital costs are presented as one-time expenditures and are therefore in present value terms. Operations and maintenance expenses are incurred over the course of the term of analysis and are therefore presented in present values of the cash flow over 5 years.

The derivations of the various unit costs are included in Tables VI-1 through VI-7:

- Capital Costs To Upgrade Existing Cell Sites To 768 kbps down / 256 kbps up And Build-Out New Mobile Broadband Cell Sites (Cost Per Cell Site) – **Table VI-1**;

- Capital Costs of Satellite Backhaul – **Table VI-2**;

[17] Figure IV-1 excludes transport costs, which were also excluded from the total cost estimates. Transport costs are provided separately below.

- Present Value of Cell Site O&M Expenses (PV Per Cell Site) – **Table VI-3**;

- Present Value of O&M Expenses Of Upgrading To 768 kbps down / 256 kbps up Or New VSAT Ground Stations (PV Per Station) – **Table VI-4**;

- Present Value of O&M Expenses Of HUB iDirect Satellite For Mobile Broadband Cell Sites Satellite Backhaul (PV For Central Hub) – **Table VI-5**. This table provides the cost to cover a population of 3,000. The actual backhaul costs are based on actual population covered by satellite areas and presented in Section VII;

- Present Value of O&M Expenses For Terrestrial Backhaul (PV For Fiber, Microwave and per Mbps Leases) – **Table VI-6**. This table provides unit costs based on a hypothetical population of 500 for each of the various terrestrial backhaul options. The backhaul costs used in cost estimates were based on the populations located within the specific census blocks served by a cell site.

- Undersea Cable Lease Rate per Month and Present Value of 5 Years – **Table VI-7**.

The calculations of capital costs and the present value of O&M costs for cell sites, common network and satellite ground stations – that is, the product of unit costs and the numbers of cell sites and satellite ground stations – are shown in Appendix **Table A-1** through **Table A-6**. These calculations exclude the costs of backhaul and undersea transport (each discussed below).

VII. BACKHAUL COSTS

Cell sites provide the communications link between customers and the edge of the mobile network. Traffic then needs to be transported from the cell site to network control points and eventually to its final destination. This backhaul of traffic is frequently conducted over fiber optic lines or microwave facilities in much of the continental U.S. Use of these backhaul options requires that terrestrial fiber or microwave networks be physically in place. When they are not, alternatives, notably satellites, must be used. Terrestrial backhaul facilities tend to be in place in populated

areas, where the costs of construction is justified by high utilization of facilities. Satellite transport is typically leased from satellite companies (instead of launching a dedicated satellite), and tends to be more expensive than fiber and microwave based backhaul. Despite the expense of satellite transport, the costs of constructing greenfield terrestrial backhaul options without some other external funding to serve isolated areas with low populations is rarely cost efficient.

As shown in **Table VII-1**, backhaul for the majority of census blocks in Alaska that currently receive wireless services is provided over fiber infrastructure (17,919 out of 24,636) with the remainder provided over "remote" terrestrial (3,618) or satellite (3,100).[18] Of these, **Table VII-2** provides a breakdown of the type of backhaul (terrestrial or satellite) used at the cell sites within a borough /census area. The type of backhaul was assigned to cell sites based on current usage in the case of existing cell sites and availability in the case of new cell sites.

As shown in the **Table VII-2**, 614 of the required cell sites will use terrestrial backhaul (405 sites served by fiber backhaul and 209 served by remote terrestrial backhaul). Of the 405 required fiber sites, 274 are existing sites requiring upgrades (83 in FCC eligible census blocks and 191 in non-FCC eligible census blocks) and 131 are new sites (68 in FCC eligible census blocks and 63 in non-FCC eligible census blocks). Another 209 are considered remote terrestrial, including 120 existing sites requiring upgrades and 89 new sites. Additionally, 218 of the cell sites use satellite backhaul (117 existing sites and 101 new sites). These various categories sum to the total cell site requirement (832) as discussed above. (The 136 existing cell sites that provide service at 768 kbps down / 256 kbps up all use terrestrial fiber backhaul.)

The table also breaks down the location of cell sites (existing and additional) in terms of whether it is located in the census blocks identified by the FCC as potentially eligible under Mobility Fund Phase I; areas that are currently serviced with wireless service at levels below 768 kbps down / 256 kbps up, but which do not fall under the FCC's eligibility list; or other areas with a telecom presence other than mobile wireless.

[18] "Remote" terrestrial backhaul in Alaska consists of microwave and TERRA, which uses a combination of fiber and microwave technologies.

Backhaul requirements (i.e., throughput) are estimated by considering the population served, upstream and downstream data rates, oversubscription rate, and traffic factor. The throughput requirements for satellite based backhaul were developed on a system wide basis. That is, satellite throughput was estimated based on the total population of the targeted areas served by cell sites which use satellite backhaul. This allowed the realization of scale economies, instead of incurring minimum fees for areas with low population. Our cost analysis is based on the assumption that sufficient satellite capacity exists to serve all satellite areas at average speeds of 768 Mbps down / 256 Mbps up. To the extent that limited supply drives the prices up, the cost of satellite based services would increase.

There are several options for terrestrial backhaul depending upon the location of the cell site: microwave, fiber and "TERRA," a microwave and fiber optic network connecting many communities in western Alaska to Anchorage. TERRA is owned by GCI's wholly owned subsidiary United Utilities, Inc.[19] All options, except fiber, are considered remote. Each of these terrestrial backhaul options involves leasing capacity on the backhaul carrier's network,[20] at various levels of capacity (i.e., microwave at T-1 and T-3; fiber at T-1, T-3 and 1 Mbps; and Terra at 1 Mbps). The specific terrestrial option to be used at each cell site was based on availability and cost efficiency.

The calculations of the present value of terrestrial backhaul costs are shown in Appendix **Table A-7** through **Table A-9** and the calculations of the present value of satellite backhaul costs are shown in Appendix **Table A-10** through **Table A-12.**

[19] TERRA is a terrestrial based broadband network that is owned by GCI's subsidiary United Utilities, Inc. TERRA serves a range of businesses, including wireless and wireline broadband for residential, commercial, educational and health facilities. GCI plans to expand the TERRA network in stages, depending on funding. The first section of TERRA was built in the southwest corner of the State's northwestern quadrant and is referred to as "TERRA-SW"; it includes 400 miles of new fiber-optic cable and 13 new microwave towers connecting 65 communities.

[20] GCI's wireless operations lease network capacity on TERRA-SW from its wholly owned subsidiary UUI, based on defined rates and terms available to any carrier on a non-discriminatory basis, subject to standard volume and term discounts.

VIII. UNDERSEA TRANSPORT COSTS

To be comprehensive in estimating the costs of providing mobile broadband services in Alaska, the cost of transport (as a category separate from backhaul) is also presented. Unlike many locations in the Lower 48 states, there is no Internet peering location in Alaska. Therefore, an additional layer of middle mile transport is required to provide broadband services. This is accomplished through undersea cables that connect Alaska with Internet peering locations in Seattle, Washington and Portland Oregon. The cost associated with this layer of transport is not included in the total estimate of providing mobile broadband service in Alaska. The PV of five years of undersea transport costs is estimated to be approximately $47 million. Adding this cost to the total estimated cost of providing mobile broadband service to the roughly 17,434 census blocks targeted in this analysis (i.e., approximately $596 million) would bring the total cost of providing mobile broadband service to these areas up to roughly $643 million, with the cost of backhaul plus undersea transport constituting about $289 million, or approximately 45% of the total cost of providing mobile broadband to these areas.

Estimates of the cost of undersea transport from points in Alaska to peering points in the Lower 48 for the three geographic segments are provided in the tables below:

- Present Value of Undersea Transport Cost FCC Eligible Areas – **Table VIII-1**;
- Present Value of Undersea Transport Cost FCC Eligible + Additional Currently Served Areas – **Table VIII-2**;
- Present Value of Undersea Transport Cost FCC Eligible + Additional Currently Served Areas + Other Areas with Presence – **Table VIII-3**.

IX. ESTIMATED MARGINAL REVENUE

Expansion of a wireless network in Alaska will produce additional revenues for the wireless carrier. Such revenues will be realized in two ways: incremental revenues resulting from the upgrading of services to mobile broadband levels from lesser speed wireless levels; and new

revenue streams resulting from the introduction of wireless service. Assuming that all three categories of census blocks were upgraded, the coverage model estimates that:

- 102,690 people currently in areas covered by wireless service would be upgraded to mobile broadband levels; and,

- 19,386 people in areas that are currently unserved would be served by mobile broadband after network deployment.

These populations, as well as the estimates of marginal revenues discussed below, are summarized in **Table IX-1**. The PV of 5 years of these marginal revenues, assuming that all would be realized is roughly $63.5 million. For context, the total estimated cost (PV) of providing mobile broadband services to the targeted areas is approximately $596 million. (The estimated PV of undersea transport costs of approximately $31 million is not included in this PV.)

A. Marginal Revenues - Upgrades to Mobile Broadband

GCI's current subscriber data indicates that data plan penetration in 2G areas is [redacted] and voice service penetration in these areas is [redacted] GCI expects the penetration for voice services will stay at the current level, but that the penetration for data services will rise to roughly [redacted] after 3G/4G service is offered.

We estimated that, in areas currently receiving wireless services at less than mobile broadband levels:

- [redacted] of the population will upgrade from a voice/text only plan to a mobile broadband data plan, bringing the penetration for data services up to [redacted]. The average revenue per user (ARPU) per month for adding a mobile broadband data plan is [redacted]

- [redacted] of the [redacted] of existing data subscribers will upgrade their data plan to mobile broadband levels. Upgrading to such a data plan is an additional [redacted] per month.

The total revenue impact to GCI from new and upgrading data services customers will be $6.2 million per year. On a per population basis, this is an additional $60 per year.

B. New Revenue Streams

In areas previously unserved by wireless, all subscriber revenues are attributed to the mobile broadband network. We assume [redacted] of the population in these areas will subscribe to a data plan, and [redacted] will subscribe to a voice plan.

- [redacted] of the population in the newly served areas will have a data only plan, based on GCI's history. Specifically [redacted] of GCI customers with data plans currently have data-only plans. [redacted] of the [redacted] that will subscribe to a data service = [redacted]. The monthly ARPU for a mobile broadband data-only plan is currently [redacted] per month.

- The remainder of new data customers ([redacted] of the population of the newly served areas, or [redacted] less [redacted] will subscribe to a combination voice/text and data plan, at [redacted] per month ARPU.

- [redacted] of the population of the newly served areas will have a voice/text plan only (i.e., no data plan; [redacted] less the [redacted] that will have a data plan), and pay an ARPU of [redacted] per month.

The new revenue streams estimated to be realized from these new customers is nearly $9.5 million per year, or $492 on a per population basis.

X. OVERVIEW OF COST MODEL – USER PERSPECTIVE

The Alaska Mobile Broadband Cost Model is based in a Microsoft Excel workbook organized around eight color coded sets of tabs: four sets of tabs involve model input and assumption tabs; two sets of tabs provide summary level output; one set of tabs provides detailed model output; and a Read Me tab that also includes assumptions for discount rates, penetration and bandwidth requirements.

- **Geographic Data Inputs** are a listing of the demographic, presence of cell towers and extent of wireless services for each of the 45,292 census blocks in Alaska.

- **Infrastructure Requirements – Coverage Analysis** uses the geographic input data to determine: 1) the number of cell sites that need to be upgraded and built new and 2) the type of back haul available at specific locations. This module of the Alaska Mobile Broadband Cost Model eliminates duplicative cell towers (i.e., when more than one cell tower is serving the same geographic area) to ensure that costs of upgrading cell towers (that currently provide wireless services at speeds slower than mobile broadband levels) is not overstated. It also aggregates the cell tower requirements to cover the targeted areas into boroughs / census areas and identifies the type of backhaul available in those areas. The infrastructure requirements are used as inputs into the cost analysis.

- **Cost Assumptions** are a series of tabs concerning capital costs, O&M costs and backhaul costs. These costs are set to default values (which reflect our estimate of appropriate values to be included in this analysis) which can be modified by users. Also included in this section is a **ReadMe** tab which includes additional assumptions (such as discount rate) as well as assumptions concerning bandwidth requirements for backhaul.

- **Incremental Revenue** estimates the additional revenues that may accrue to carriers by offering mobile broadband services.

- **Model Output** is organized into three sections: **Cost Summary** provides a breakdown of the total cost of providing mobile broadband in Alaska into cost elements and/or geographic summaries. **Coverage Summary** provides a breakdown of cell site requirements and the populations and road miles they cover by borough / census area. **Detailed Output** provides cost breakdowns at the geographic area and borough /census area levels.

A summary of the sections and specific tabs included in the cost model are included in **Figure X-1**, Alaska Mobile Broadband Cost Model Architecture.

Table II-1
Summary of Capital Costs and Present Value of O&M Costs
by Network and Backhaul Costs

	Network Costs to Build and Upgrade 3G Sites			Backhaul			Total
	Capital Costs	Present Value (5 Years) of O&M Costs	Total	Capital Costs	Present Value (5 Years) of O&M Costs	Total	
Common Network Costs	$18,033	$41,976	$60,009	$14,908,699	$0	$14,908,699	$14,968,708
FCC Potentially Eligible Areas	$145,379,720	$71,468,716	$216,848,436	$7,406,240	$206,018,405	$213,424,645	$430,273,081
Additional Areas Currently Served	$51,838,173	$30,881,793	$82,719,966	$1,941,880	$26,545,811	$28,487,691	$111,207,657
Areas (Non-Wireless) Presence	$21,215,532	$8,668,920	$29,884,452	$496,760	$9,373,353	$9,870,113	$39,754,565
Total Costs	**$218,451,457**	**$111,061,405**	**$329,512,862**	**$24,753,579**	**$241,937,569**	**$266,691,148**	**$596,204,010**

Note: O&M bandwidth costs for satellite and terrestrial backhaul are calculated on an incremental basis. The costs for Additional Areas Currently Served and Areas (Non-Wireless) Presence assume the previously listed costs are already being incurred.
Source: U.S. Census Bureau 2010 Census; GCI Cell Site Data; Carrier Cell Sites from FCC ULS database; Brattle Analysis.

Table II-2
Cost Metrics
For 3G/4G Service in Targeted Area

					Cost Metrics							
					Cell Sites		Population		Area (Square Miles)		Road Miles	
	Capital Costs	Present Value (5 Years) of O&M Costs	Backhaul Costs	Total Cost	Cell Sites	Marginal Cost Per Cell Site	Population	Cost Per Pop	Area	Cost Per Sq. Mile	Road Miles	Cost Per Road Mile
Common Network Costs	$18,033	$41,976	$14,908,699	$14,968,708	832	$17,991	122,076	$123	365,310	$41	25,048	$598
FCC Potentially Eligible Areas	$145,379,720	$71,468,716	$213,424,645	$430,273,081	476	$903,935.04	82,277	$5,230	335,694	$1,282	19,401	$22,178
Additional Areas Currently Served	$51,838,173	$30,881,793	$28,487,691	$111,207,657	291	$382,156.90	34,188	$3,253	24,956	$4,456	4,460	$24,932
Areas (Non-Wireless) Presence	$21,215,532	$8,668,920	$9,870,113	$39,754,565	65	$611,608.69	5,611	$7,085	4,660	$8,531	1,186	$33,520
Total Costs	**$218,451,457**	**$111,061,405**	**$266,691,148**	**$596,204,010**	**832**	**$716,591.36**	**122,076**	**$4,884**	**365,310**	**$1,632**	**25,048**	**$23,803**

Note: O&M bandwidth costs for satellite and terrestrial backhaul are calculated on an incremental basis. The costs for Additional Areas Currently Served and Areas (Non-Wireless) Presence assume the previously listed costs are already being incurred. The common network cost per cell site is an average cost and not a marginal cost.
Source: U.S. Census Bureau 2010 Census; GCI Cell Site Data; Carrier Cell Sites from FCC ULS database; Brattle Analysis.

Table II-3
Transport Costs
Summary of Transportation Costs by Hub

	Satellite (Anchorage)		Anchorage		Fairbanks		Juneau			
	Population Served	NPV (5 Years)	Population Served	NPV (5 Years)	Population Served	NPV (5 Years)	Population Served	NPV (5 Years)	Total NPV	Cumulative Total
FCC Potentially Eligible Areas	19,306	$14,031,129	18,077	$13,205,768	806	$1,553,620	2,950	$2,330,430	$31,120,947	$31,120,947
Additional Areas Currently Served	1,379	$825,361	9,533	$6,602,884	3,010	$4,660,859	3,173	$2,330,430	$14,419,534	$45,540,480
Areas (Non-Wireless) Presence	196	$0	1,292	$825,361	184	$0	1,134	$776,810	$1,602,170	$47,142,651
Total	**20,881**	**$14,856,489**	**28,902**	**$20,634,013**	**4,000**	**$6,214,479**	**7,256**	**$5,437,669**	**$47,142,651**	

Figure III-1
State of Alaska
Cost Model Schematic

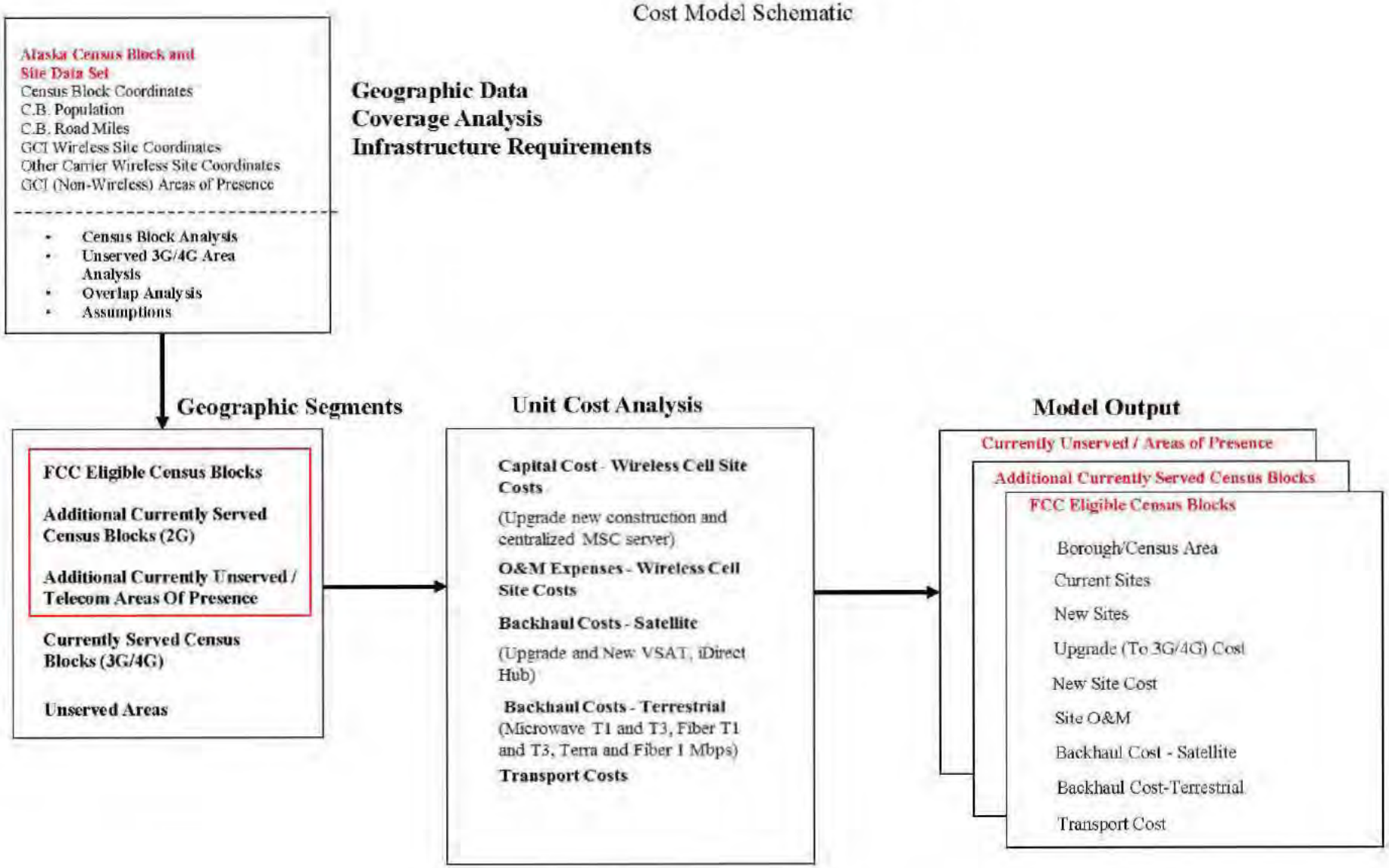

Table III-1
State of Alaska
Demographics Data
by Census Block

Borough / Census Area	No. of Census Blocks	Population	Area *(miles²)*	Road Miles *(miles)*
Aleutians East	1,105	3,141	6,982	170
Aleutians West	1,206	5,561	4,390	540
Anchorage	4,337	291,826	1,705	1,854
Bethel	1,710	17,013	40,570	1,305
Bristol Bay	177	997	504	130
Denali	690	1,826	12,751	1,004
Dillingham	816	4,847	18,569	239
Fairbanks North Star	4,499	97,581	7,338	3,102
Haines	758	2,508	2,319	261
Hoonah-Angoon	873	2,150	7,525	1,062
Juneau	928	31,275	2,702	745
Kenai Peninsula	4,024	55,400	16,075	3,056
Ketchikan Gateway	904	13,477	4,858	418
Kodiak Island	1,561	13,592	6,550	314
Lake and Peninsula	837	1,631	23,652	404
Matanuska-Susitna	4,590	88,995	24,608	4,707
Nome	1,471	9,492	22,962	2,022
North Slope	1,263	9,430	88,695	3,792
Northwest Arctic	793	7,523	35,573	878
Petersburg	705	3,815	3,282	619
Prince of Wales-Hyder	1,614	5,559	3,923	877
Sitka	1,325	8,881	2,870	637
Skagway	198	968	452	71
Southeast Fairbanks	1,994	7,029	24,769	2,257
Valdez-Cordova	2,194	9,636	34,240	2,356
Wade Hampton	952	7,459	17,081	436
Wrangell	428	2,369	2,541	295
Yakutat	683	662	7,649	475
Yukon-Koyukuk	2,657	5,588	145,505	5,937
Total	45,292	710,231	570,641	39,962

Source: U.S. Census Bureau 2010 Census; GCI Cell Site Data; Carrier Cell Sites from FCC ULS database; Brattle Analysis.

Table III-2
Alaska Mobile Wireless Service Coverage 2012
by Census Block

	Census Block			% with 3G/4G Served				% Unserved			
Borough / Census Area	2G Served	3G/4G Served	Unserved	% CB served	% Population served	% Area served	% Road Miles served	% CB Unserved	% Population Unserved	% Area Unserved	% Road Miles Unserved
Aleutians East	275	0	830	0%	0%	0%	0%	75%	0%	95%	36%
Aleutians West	267	0	939	0%	0%	0%	0%	78%	7%	94%	69%
Anchorage	138	4,143	56	96%	100%	27%	96%	1%	0%	46%	1%
Bethel	1,049	0	661	0%	0%	0%	0%	39%	2%	94%	74%
Bristol Bay	167	0	10	0%	0%	0%	0%	6%	5%	48%	15%
Denali	414	0	276	0%	0%	0%	0%	40%	58%	96%	73%
Dillingham	437	0	379	0%	0%	0%	0%	46%	0%	87%	36%
Fairbanks North Star	158	3,759	582	84%	99%	14%	69%	13%	1%	78%	28%
Haines	210	0	548	0%	0%	0%	0%	72%	21%	98%	70%
Hoonah-Angoon	266	8	599	1%	0%	0%	0%	69%	37%	80%	47%
Juneau	84	674	170	73%	99%	8%	50%	18%	0%	51%	31%
Kenai Peninsula	694	1,878	1,452	47%	84%	5%	48%	36%	5%	77%	25%
Ketchikan Gateway	52	891	461	43%	100%	4%	31%	51%	0%	91%	63%
Kodiak Island	21	402	1,138	26%	92%	3%	54%	73%	7%	96%	34%
Lake and Peninsula	374	0	463	0%	0%	0%	0%	55%	15%	77%	51%
Matanuska-Susitna	729	2,395	1,466	52%	94%	4%	41%	32%	2%	83%	40%
Nome	811	0	660	0%	0%	0%	0%	45%	0%	92%	74%
North Slope	519	7	737	1%	0%	0%	0%	58%	7%	99%	89%
Northwest Arctic	443	0	350	0%	0%	0%	0%	44%	5%	95%	56%
Petersburg	50	134	521	19%	79%	1%	19%	74%	19%	89%	68%
Prince of Wales-Hyder	151	15	1,448	1%	0%	0%	0%	90%	66%	91%	83%
Sitka	4	425	896	32%	99%	8%	48%	68%	1%	92%	52%
Skagway	187	0	11	0%	0%	0%	0%	6%	1%	65%	22%
Southeast Fairbanks	677	0	1,317	0%	0%	0%	0%	66%	15%	91%	69%
Valdez-Cordova	1,059	0	1,135	0%	0%	0%	0%	52%	5%	82%	55%
Wade Hampton	469	0	483	0%	0%	0%	0%	51%	0%	94%	49%
Wrangell	132	0	296	0%	0%	0%	0%	69%	27%	99%	16%
Yakutat	0	0	683	0%	0%	0%	0%	100%	100%	100%	100%
Yukon-Koyukuk	568	0	2,089	0%	0%	0%	0%	79%	54%	99%	94%
Total	10,405	14,231	20,656	31%	83%	1%	21%	46%	3%	93%	58%

Source: U.S. Census Bureau 2010 Census; GCI Cell Site Data; Carrier Cell Sites from FCC ULS database; Braille Analysis

Figure III-2
Cell Site Requirement Schematic

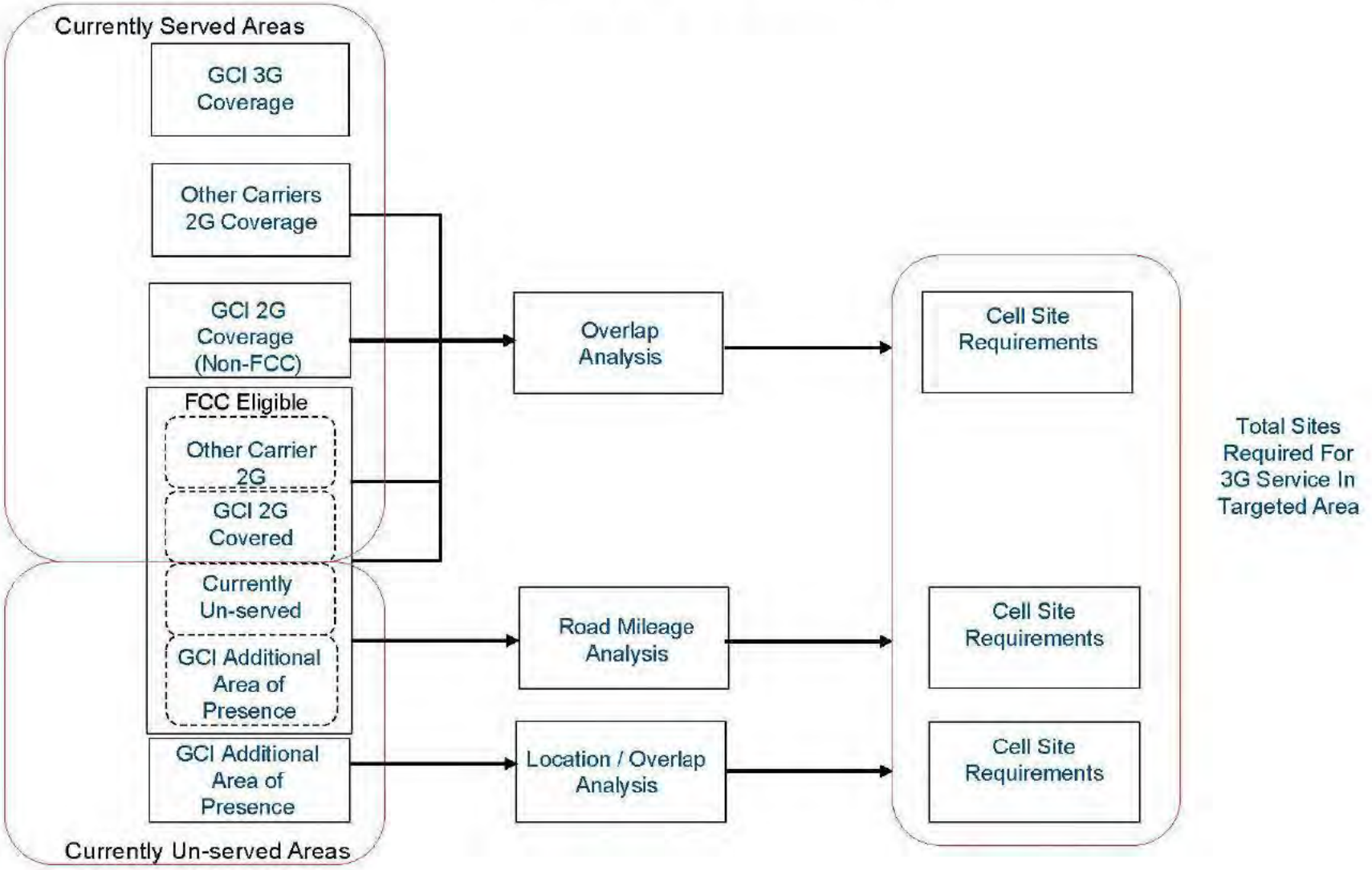

Figure III-3
Determination of Backhaul Costs

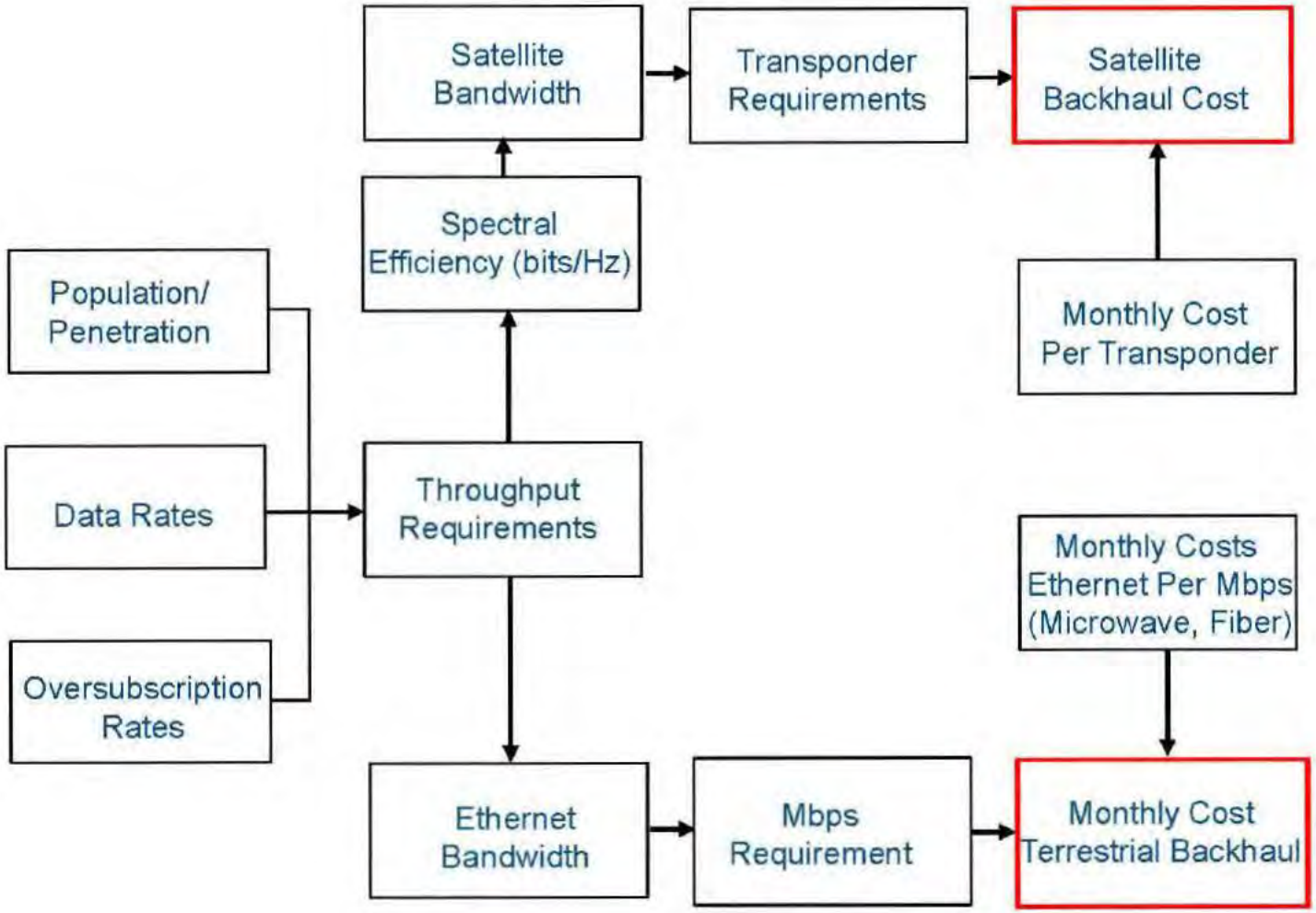

Table IV-1
FCC Potentially Eligible Areas in Alaska
by Census Block

Borough / Census Area	3G/4G Served	2G Served	Non-Wireless Presence	Currently Unserved	Wireless Served	Wireless Unserved	Total	Area	Population
					(Census Blocks)			*(miles^2)*	
Aleutians East	0	99	1	5	99	6	105	2,837	3,089
Aleutians West	0	186	24	58	186	82	268	645	5,556
Anchorage	5	7	0	4	12	4	16	910	495
Bethel	0	524	66	138	524	204	728	21,921	15,973
Bristol Bay	0	109	0	4	109	4	113	344	997
Denali	0	275	46	69	275	115	390	8,299	903
Dillingham	0	208	13	5	208	18	226	1,434	4,814
Fairbanks North Star	13	20	93	121	33	214	247	4,621	1,001
Haines	0	29	81	8	29	89	118	680	1,338
Hoonah-Angoon	0	35	35	24	35	59	94	5,749	776
Juneau	1	1	0	11	2	11	13	909	131
Kenai Peninsula	16	116	52	83	132	135	267	8,598	2,802
Ketchikan Gateway	11	9	4	28	20	32	52	870	106
Kodiak Island	11	3	35	35	14	70	84	1,296	960
Lake and Peninsula	0	171	22	19	171	41	212	3,764	1,541
Matanuska-Susitna	0	63	26	152	63	178	241	247	868
Nome	0	533	3	269	533	272	805	14,451	9,471
North Slope	0	296	7	294	296	301	597	77,792	6,754
Northwest Arctic	0	268	1	88	268	89	357	20,108	6,881
Petersburg	4	11	46	23	15	69	84	1,698	903
Prince of Wales-Hyder	0	26	230	29	26	259	285	1,875	2,253
Sitka	18	0	0	12	18	12	30	2,723	465
Skagway	0	18	0	6	18	6	24	208	31
Southeast Fairbanks	0	36	124	197	36	321	357	17,663	1,296
Valdez-Cordova	0	124	21	130	124	151	275	22,162	738
Wade Hampton	0	240	3	84	240	87	327	8,554	7,330
Wrangell	0	0	0	5	0	5	5	206	592
Yakutat	0	0	72	38	0	110	110	7,534	661
Yukon-Koyukuk	0	391	536	789	391	1,325	1,716	98,100	5,315
Total	79	3,798	1,541	2,728	3,877	4,269	8,146	336,196	84,040

Source: U.S. Census Bureau 2010 Census; GCI Cell Site Data; Carrier Cell Sites from FCC ULS database; Brattle Analysis.

Table IV-2
Additional Areas Currently Served in Alaska
Not Included as FCC Potentially Eligible Areas
by Census Block

Borough / Census Area	3G/4G Served	2G Served	Total Served	Area	Population
Aleutians East	0	176	176	280	47
Aleutians West	0	81	81	56	0
Anchorage	4,138	131	4,269	537	291,197
Bethel	0	525	525	1,573	1,014
Bristol Bay	0	58	58	66	0
Denali	0	139	139	148	57
Dillingham	0	229	229	2,053	31
Fairbanks North Star	3,746	138	3,884	1,096	96,221
Haines	0	181	181	4	1,134
Hoonah-Angoon	8	231	239	1,149	907
Juneau	673	83	756	1,273	31,098
Kenai Peninsula	1,862	578	2,440	2,587	51,207
Ketchikan Gateway	380	43	423	336	13,362
Kodiak Island	391	18	409	97	12,509
Lake and Peninsula	0	203	203	5,343	75
Matanuska-Susitna	2,395	666	3,061	4,028	87,169
Nome	0	278	278	914	21
North Slope	7	223	230	456	2,369
Northwest Arctic	0	175	175	649	331
Petersburg	130	39	169	235	2,901
Prince of Wales-Hyder	15	125	140	74	1,495
Sitka	407	4	411	34	8,413
Skagway	0	169	169	13	936
Southeast Fairbanks	0	641	641	933	5,577
Valdez-Cordova	0	935	935	4,105	8,570
Wade Hampton	0	229	229	191	123
Wrangell	0	132	132	38	1,726
Yakutat	0	0	0	0	0
Yukon-Koyukuk	0	177	177	181	223
Total	14,152	6,607	20,759	28,446	618,713

Source: U.S. Census Bureau 2010 Census; GCI Cell Site Data; Carrier Cell Sites from FCC ULS database; Brattle Analysis.

Table IV-3
Areas Not Currently Receiving Mobile Wireless Services in Alaska
But Covered By Other Telecom
by Census Block

Borough / Census Area	Non-Wireless Presence *(Census Block)*	Area *(Square Miles)*	Population
Aleutians East	23	1	0
Aleutians West	49	3	5
Anchorage	1	0	0
Bethel	58	201	9
Bristol Bay	1	0	0
Denali	106	173	795
Dillingham	42	12	0
Fairbanks North Star	86	104	268
Haines	270	531	29
Hoonah-Angoon	82	323	463
Juneau	0	0	0
Kenai Peninsula	183	324	1,159
Ketchikan Gateway	33	6	4
Kodiak Island	181	94	64
Lake and Peninsula	42	59	6
Matanuska-Susitna	297	758	339
Nome	32	30	0
North Slope	0	0	0
Northwest Arctic	1	69	309
Petersburg	57	3	0
Prince of Wales-Hyder	469	271	1,751
Sitka	55	0	0
Skagway	0	0	0
Southeast Fairbanks	187	374	124
Valdez-Cordova	141	378	249
Wade Hampton	12	20	0
Wrangell	45	1	20
Yakutat	57	8	1
Yukon-Koyukuk	250	916	16
Total	2,760	4,660	5,611

Source: U.S. Census Bureau 2010 Census; GCI Cell Site Data; Carrier Cell Sites from FCC ULS database; Brattle Analysis.

Table IV-4
Scope of 3G/4G Mobile Wireless Services in Alaska
by Census Block

Borough / Census Area	FCC Eligible Areas	Non-FCC Currently Served 2G	Non-FCC Non-Wireless Presence	Non-FCC Currently Served 3G/4G	Not Targeted	Total
			(Census Blocks)			
Aleutians East	105	176	23	0	801	1,105
Aleutians West	268	81	49	0	808	1,206
Anchorage	16	131	1	4,138	51	4,337
Bethel	728	525	58	0	399	1,710
Bristol Bay	113	58	1	0	5	177
Denali	390	139	106	0	55	690
Dillingham	226	229	42	0	319	816
Fairbanks North Star	247	138	86	3,746	282	4,499
Haines	118	181	270	0	189	758
Hoonah-Angoon	94	231	82	8	458	873
Juneau	13	83	0	673	159	928
Kenai Peninsula	267	578	183	1,862	1,134	4,024
Ketchikan Gateway	52	43	33	380	396	904
Kodiak Island	84	18	181	391	887	1,561
Lake and Peninsula	212	203	42	0	380	837
Matanuska-Susitna	241	666	297	2,395	991	4,590
Nome	805	278	32	0	356	1,471
North Slope	597	223	0	7	436	1,263
Northwest Arctic	357	175	1	0	260	793
Petersburg	84	39	57	130	395	705
Prince of Wales-Hyder	285	125	469	15	720	1,614
Sitka	30	4	55	407	829	1,325
Skagway	24	169	0	0	5	198
Southeast Fairbanks	357	641	187	0	809	1,994
Valdez-Cordova	275	935	141	0	843	2,194
Wade Hampton	327	229	12	0	384	952
Wrangell	5	132	45	0	246	428
Yakutat	110	0	57	0	516	683
Yukon-Koyukuk	1,716	177	250	0	514	2,657
Total	8,146	6,607	2,760	14,152	13,627	45,292

Source: U.S. Census Bureau 2010 Census; GCI Cell Site Data; Carrier Cell Sites from FCC ULS database; Brattle Analysis.

Table IV-5
Areas in Alaska Excluded From 3G/4G Build-Out Scope
by Census Block

Borough / Census Area	Census Blocks	Area	Population	% of Total Population
Aleutians East	801	3,864	5	0.2%
Aleutians West	808	3,686	0	0.0%
Anchorage	51	258	134	0.0%
Bethel	399	16,875	17	0.1%
Bristol Bay	5	94	0	0.0%
Denali	55	4,132	71	3.9%
Dillingham	319	15,069	2	0.0%
Fairbanks North Star	282	1,518	91	0.1%
Haines	189	1,104	7	0.3%
Hoonah-Angoon	458	304	4	0.2%
Juneau	159	520	46	0.1%
Kenai Peninsula	1,134	4,566	232	0.4%
Ketchikan Gateway	396	3,646	5	0.0%
Kodiak Island	887	5,063	59	0.4%
Lake and Peninsula	380	14,485	9	0.6%
Matanuska-Susitna	991	19,575	619	0.7%
Nome	356	7,567	0	0.0%
North Slope	436	10,447	307	3.3%
Northwest Arctic	260	14,747	2	0.0%
Petersburg	395	1,346	11	0.3%
Prince of Wales-Hyder	720	1,703	60	1.1%
Sitka	829	114	3	0.0%
Skagway	5	231	1	0.1%
Southeast Fairbanks	809	5,799	32	0.5%
Valdez-Cordova	843	7,595	79	0.8%
Wade Hampton	384	8,317	6	0.1%
Wrangell	246	2,297	31	1.3%
Yakutat	516	108	0	0.0%
Yukon-Koyukuk	514	46,309	34	0.6%
Total	13,627	201,339	1,867	0.3%

Source: U.S. Census Bureau 2010 Census; GCI Cell Site Data; Carrier Cell Sites from FCC ULS database; Brattle Analysis.

Table V-1
Analysis of Current Cell Sites in Alaska
by Sites in Place In 2012

Borough / Census Area	FCC Eligible Served Sites	Additional Area Currently Served 2G Sites	Additional Area Currently Served 3G/4G Sites	Total Sites
Aleutians East	5	6	0	11
Aleutians West	4	6	0	10
Anchorage	13	8	51	72
Bethel	22	13	0	35
Bristol Bay	4	0	0	4
Denali	6	6	0	12
Dillingham	10	8	0	18
Fairbanks North Star	5	6	21	32
Haines	2	5	0	7
Hoonah-Angoon	3	12	0	15
Juneau	3	15	8	26
Kenai Peninsula	9	27	17	53
Ketchikan Gateway	1	18	5	24
Kodiak Island	1	4	6	11
Lake and Peninsula	10	12	0	22
Matanuska-Susitna	0	35	23	58
Nome	17	12	0	29
North Slope	17	13	0	30
Northwest Arctic	13	4	0	17
Petersburg	3	3	1	7
Prince of Wales-Hyder	6	1	0	7
Sitka	1	1	2	4
Skagway	2	2	0	4
Southeast Fairbanks	10	11	0	21
Valdez-Cordova	33	51	0	84
Wade Hampton	11	6	0	17
Wrangell	0	5	0	5
Yakutat	0	0	0	0
Yukon-Koyukuk	11	1	0	12
Total	222	291	134	647

Source: U.S. Census Bureau 2010 Census; GCI Cell Site Data; Carrier Cell Sites from FCC ULS database; Brattle Analysis.

Table V-2
Determination of Cell Site Requirements
Areas Currently Covered by Wireless Service

Borough / Census Area	FCC Eligible 2G Served Sites	Additional Area Currently Served 2G Sites	Currently Served 3G/4G Sites	Total Sites	Total Census Blocks Covered	Total Area	Total Population
Aleutians East	5	6	0	11	275	367	3,136
Aleutians West	4	6	0	10	267	276	5,181
Anchorage	13	8	51	72	4,281	920	291,652
Bethel	22	13	0	35	1,049	2,573	16,667
Bristol Bay	4	0	0	4	167	263	949
Denali	6	6	0	12	414	531	770
Dillingham	10	8	0	18	437	2,344	4,838
Fairbanks North Star	5	6	21	32	3,917	1,645	96,699
Haines	2	5	0	7	210	37	1,982
Hoonah-Angoon	3	12	0	15	274	1,473	1,363
Juneau	3	15	8	26	758	1,330	31,210
Kenai Peninsula	9	27	17	53	2,572	3,708	52,602
Ketchikan Gateway	1	18	5	24	443	430	13,443
Kodiak Island	1	4	6	11	423	265	12,585
Lake and Peninsula	10	12	0	22	374	5,553	1,383
Matanuska-Susitna	0	35	23	58	3,124	4,105	87,513
Nome	17	12	0	29	811	1,896	9,446
North Slope	16	13	1	30	526	1,133	8,796
Northwest Arctic	13	4	0	17	443	1,902	7,158
Petersburg	3	3	1	7	184	372	3,105
Prince of Wales-Hyder	6	1	0	7	166	366	1,872
Sitka	0	1	3	4	429	226	8,822
Skagway	2	2	0	4	187	159	957
Southeast Fairbanks	10	11	0	21	677	2,137	5,969
Valdez-Cordova	33	51	0	84	1,059	6,243	9,165
Wade Hampton	11	6	0	17	469	1,006	7,431
Wrangell	0	5	0	5	132	38	1,726
Yakutat	0	0	0	0	0	0	0
Yukon-Koyukuk	11	1	0	12	568	859	2,558
Total	220	291	136	647	24,636	42,154	688,978

Source: U.S. Census Bureau 2010 Census; GCI Cell Site Data; Carrier Cell Sites from FCC ULS database; Brattle Analysis.

Table V-3
Alaska Road Miles
2010 U.S. Census

Borough / Census Area	S1100/S1200/ S1400 *(Miles)*	Other Types of Roads *(Miles)*	Total Roads *(Miles)*
Aleutians East	67	103	170
Aleutians West	431	109	540
Anchorage	1,681	173	1,854
Bethel	206	1,099	1,305
Bristol Bay	86	44	130
Denali	606	398	1,004
Dillingham	119	120	239
Fairbanks North Star	2,220	882	3,102
Haines	138	124	261
Hoonah-Angoon	232	830	1,062
Juneau	324	420	745
Kenai Peninsula	2,410	646	3,056
Ketchikan Gateway	109	309	418
Kodiak Island	249	65	314
Lake and Peninsula	146	258	404
Matanuska-Susitna	2,909	1,798	4,707
Nome	448	1,574	2,022
North Slope	558	3,233	3,792
Northwest Arctic	181	697	878
Petersburg	396	223	619
Prince of Wales-Hyder	720	157	877
Sitka	380	258	637
Skagway	45	26	71
Southeast Fairbanks	1,500	757	2,257
Valdez-Cordova	1,399	958	2,356
Wade Hampton	89	348	436
Wrangell	89	206	295
Yakutat	245	229	475
Yukon-Koyukuk	1,809	4,128	5,937
Total	19,790	20,172	39,962

Source: U.S. Census Bureau 2010 Census; GCI Cell Site Data; Carrier Cell Sites from FCC ULS database; Brattle Analysis.

Table V-4
Determination of Cell Site Requirements
Un-served Areas within FCC Potentially Eligible Areas

Borough / Census Area	FCC Eligible Unserved Sites	Total Area	Total Population	Total Road Miles	Avg Road Miles/ Site
Aleutians East	3	2,747	0	41	14
Aleutians West	4	288	301	204	51
Anchorage	1	526	40	3	3
Bethel	13	20,546	30	476	37
Bristol Bay	1	147	48	20	20
Denali	4	7,829	158	332	83
Dillingham	3	1,131	5	27	9
Fairbanks North Star	5	3,567	210	390	78
Haines	1	12	46	5	5
Hoonah-Angoon	3	5,305	9	167	56
Juneau	1	852	19	12	12
Kenai Peninsula	5	7,141	53	234	47
Ketchikan Gateway	13	775	25	209	16
Kodiak Island	2	1,015	430	43	21
Lake and Peninsula	6	3,420	5	107	18
Matanuska-Susitna	3	166	515	236	79
Nome	14	13,423	46	946	68
North Slope	26	77,072	327	3,205	123
Northwest Arctic	7	18,555	54	350	50
Petersburg	1	1,543	90	38	38
Prince of Wales-Hyder	1	1,044	121	75	75
Sitka	1	2,531	56	15	15
Skagway	1	62	10	14	14
Southeast Fairbanks	11	14,759	245	1,102	100
Valdez-Cordova	20	19,844	138	551	28
Wade Hampton	8	7,711	22	187	23
Wrangell	1	206	592	6	6
Yakutat	0	4,770	0	167	-
Yukon-Koyukuk	9	95,622	467	3,968	441
Total	168	312,607	4,062	13,128	78

Source: U.S. Census Bureau 2010 Census; GCI Cell Site Data; Carrier Cell Sites from FCC ULS database; Brattle Analysis.

Table V-5
Determination of Cell Site Requirements
Areas with Non-Wireless Presence in Alaska

Borough / Census Area	Locations with Non-Wireless Presence	Locations with Overlap	Total Sites Required
Aleutians East	2	0	2
Aleutians West	6	0	6
Anchorage	0	0	0
Bethel	10	4	6
Bristol Bay	4	3	1
Denali	6	1	5
Dillingham	5	3	2
Fairbanks North Star	7	3	4
Haines	5	0	5
Hoonah-Angoon	5	0	5
Juneau	0	0	0
Kenai Peninsula	19	5	14
Ketchikan Gateway	2	0	2
Kodiak Island	9	2	7
Lake and Peninsula	7	1	6
Matanuska-Susitna	13	5	8
Nome	2	0	2
North Slope	1	0	1
Northwest Arctic	1	0	1
Petersburg	2	0	2
Prince of Wales-Hyder	14	0	14
Sitka	0	0	0
Skagway	0	0	0
Southeast Fairbanks	9	0	9
Valdez-Cordova	13	2	11
Wade Hampton	2	0	2
Wrangell	1	0	1
Yakutat	5	0	5
Yukon-Koyukuk	35	3	32
Total	185	32	153

Source: U.S. Census Bureau 2010 Census; GCI Cell Site Data; Carrier Cell Sites from FCC ULS database; Brattle Analysis.

Table V-6
Additional Cell Sites Required
to Complete 3G/4G Build-Out in Alaska

Borough / Census Area	Additional Sites to Serve FCC Eligible Areas	Additional Sites to Serve Non-Wireless Presence	Total Sites
Aleutians East	3	2	5
Aleutians West	4	6	10
Anchorage	1	0	1
Bethel	13	6	19
Bristol Bay	1	1	2
Denali	4	5	9
Dillingham	3	2	5
Fairbanks North Star	5	4	9
Haines	1	5	6
Hoonah-Angoon	3	5	8
Juneau	1	0	1
Kenai Peninsula	5	14	19
Ketchikan Gateway	13	2	15
Kodiak Island	2	7	9
Lake and Peninsula	6	6	12
Matanuska-Susitna	3	8	11
Nome	14	2	16
North Slope	26	1	27
Northwest Arctic	7	1	8
Petersburg	1	2	3
Prince of Wales-Hyder	1	14	15
Sitka	1	0	1
Skagway	1	0	1
Southeast Fairbanks	11	9	20
Valdez-Cordova	20	11	31
Wade Hampton	8	2	10
Wrangell	1	1	2
Yakutat	0	5	5
Yukon-Koyukuk	9	32	41
Total	168	153	321

Source: U.S. Census Bureau 2010 Census; GCI Cell Site Data; Carrier Cell Sites from FCC ULS database; Brattle Analysis.

Table V-7
Summary of Cell Site Requirements
to Complete 3G/4G Build-Out in Alaska

Borough / Census Area	FCC Eligible Served Sites	FCC Eligible Unserved Sites	Additional Area Currently Served 2G Sites	Areas with GCI Non-Wireless Presence	Total Sites
Aleutians East	5	3	6	2	16
Aleutians West	4	4	6	6	20
Anchorage	13	1	8	0	22
Bethel	22	13	13	6	54
Bristol Bay	4	1	0	1	6
Denali	6	4	6	5	21
Dillingham	10	3	8	2	23
Fairbanks North Star	5	5	6	4	20
Haines	2	1	5	5	13
Hoonah-Angoon	3	3	12	5	23
Juneau	3	1	15	0	19
Kenai Peninsula	9	5	27	14	55
Ketchikan Gateway	1	13	18	2	34
Kodiak Island	1	2	4	7	14
Lake and Peninsula	10	6	12	6	34
Matanuska-Susitna	0	3	35	8	46
Nome	17	14	12	2	45
North Slope	16	26	13	1	56
Northwest Arctic	13	7	4	1	25
Petersburg	3	1	3	2	9
Prince of Wales-Hyder	6	1	1	14	22
Sitka	0	1	1	0	2
Skagway	2	1	2	0	5
Southeast Fairbanks	10	11	11	9	41
Valdez-Cordova	33	20	51	11	115
Wade Hampton	11	8	6	2	27
Wrangell	0	1	5	1	7
Yakutat	0	0	0	5	5
Yukon-Koyukuk	11	9	1	32	53
Total	220	168	291	153	832

Source: U.S. Census Bureau 2010 Census; GCI Cell Site Data; Carrier Cell Sites from FCC ULS database; Brattle Analysis.

Figure VI-1
Summary of Cost Areas For
Upgrading / Building-Out A
3G/4G Mobile Wireless Network in Alaska

	Network Element	Comment	Capital Costs	O&M Expenses
Cell Sites	Existing 2G Cell Site	Upgrade To 3G	Equipment and other upgrade costs	Electric power, leases and maintenance
	New 3G Cell Site	Build For 3G Requirements	Facilities, equipment, electrical and labor related costs	Electric power, leases and maintenance
	Central Network Controls	Located at Network Control Area	MSC server	Electric power, leases and maintenance
Backhaul	Satellite Backhaul	Transport leased on Satellite	Upgrade Remote VSAT Ground Station from 2G to 3G Site or New Remote VSAT Ground Station for New 3G Site. Also, cost of materials, equipment, installation and labor of HUB iDirect for satellite	Cost of leasing satellite transponders
Backhaul	Terrestrial Backhaul	Leasing of terrestrial based (microwave or fiber) transport	None; leasing arrangement on microwave and	Cost of leasing ethernet capacity

Table VI-1
Capital Costs to
Upgrade Existing Cell Sites to 3G
and Build-Out New 3G/4G Cell Sites
(Cost per Cell Site)

	New Construction of 3G/4G Site	Upgrade non-Wireless Site to 3G/4G Site	Upgrade Wireless 2G Site to 3G/4G Site	MSC Server in Anchorage for Wireless 3G/4G Sites
Facility Materials, Equipment and Electrical	[redacted]	[redacted]	[redacted]	[redacted]
Labor for Installation				
Other Construction Costs (Contracting, etc.)				
Travel and Shipping				
Regulatory Costs (FCC Permits, Site Tests, etc.)				
Total	[redacted]	[redacted]	[redacted]	[redacted]

Table VI-2
Capital Costs
Satellite Backhaul

	Remote VSAT Ground Station (Cost per Site)	HUB iDirect Satellite (Cost for Central Hub)
Facility Materials, Equipment and Electrical	[redacted]	[redacted]
Labor for Installation		
Other Construction Costs (Contracting, etc.)		
Travel and Shipping		
Regulatory Costs (FCC Permits, Site Tests, etc.)		
Total	[redacted]	[redacted]

Table VI-3
Present Value of 3G/4G Cell Site
O&M Expenses
(PV per Cell Site)

	New Construction of 3G/4G Site	Upgrade non-Wireless Site to 3G/4G Site	Upgrade Wireless 2G Site to 3G/4G Site	MSC Server in Anchorage for Wireless 3G/4G Sites
Power, Lease, Other Recurring Costs	[redacted]	[redacted]	[redacted]	[redacted]
Contracted Maintenance				
GCI Labor				
Total	[redacted]	[redacted]	[redacted]	[redacted]

Table VI-4
Present Value of O&M Expenses of
Upgraded to 3G/4G or New 3G
VSAT Ground Stations
(PV per Station)

	New Remote VSAT Ground Station for New 3G/4G Site	Upgrade Remote VSAT Ground Station from 2G Site to 3G/4G Site
Power, Lease, Other Recurring Costs	[redacted]	[redacted]
Contracted Maintenance		
GCI Labor		
Total	[redacted]	[redacted]

Table VI-5
Present Value of O&M Expenses Of
HUB iDirect Satellite For 3G/4G Cell Sites
(PV for Central Hub)

Population at Non-Terrestrial Locations		3,000
Population Peneration Rate		50%
Population Served (using penetration rate)		1,500
User Traffic Rate		50%
Downstream Data Rate (per user)	*kbps*	768
Upstream Data Rate (per user)	*kbps*	256
Downstream Oversubscription Rate		[redacted]
Upstream Oversubscription Rate		
Upstream Throughput Required	*Gbps*	
Downstream Throughput Required	*Gbps*	
Downstream Spectral Efficiency	*bits/Hz*	
Upstream Spectral Efficiency	*bits/Hz*	
Downstream Bandwidth Required	*MHz*	
Upstream Bandwidth Required	*MHz*	
Transponder Monthly Cost (per MHz)	*$*	
Cost (per month for space segment)	***$***	[redacted]
Annual Cost (for space segment)	***$***	
Present Value (5 Years) of Bandwidth Co	***$***	5,230,343

Table VI-6
Present Value of O&M Expenses
for Terrestrial Backhaul
(PV for Fiber, Microwave and per Mbps Leases)

		Microwave T1	Microwave T3	Fiber T1	Fiber T3	Terra 1Mbps	Fiber 1Mbps
Population at Non-Terrestrial Locations	*pops*	500	500	500	500	500	500
Population Peneration Rate		50%	50%	50%	50%	50%	50%
Population Served (using penetration rate)	*pops*	250	250	250	250	250	250
User Traffic Rate		50%	50%	50%	50%	50%	50%
Downstream Data Rate (per user)	*kbps*	768	768	768	768	768	768
Upstream Data Rate (per user)	*kbps*	256	256	256	256	256	256
Downstream Oversubscription Rate		[redacted]					
Upstream Oversubscription Rate							
Downstream Throughput Required	*Gbps*						
Upstream Throughput Required	*Gbps*						
Usable Bandwidth per Unit	*Gbps*						
Bits per Pop	*bits/pop*						
Units Required							
Cost per Unit per Month at 50 Miles	*$*						
Cost (per month)	***$***	[redacted]					
Annual Cost	***$***						
Present Value (5 Years) of Bandwidth Co	***$***	618,195	906,197	363,134	359,760	1,942,025	08,551

Table VI-7
Undersea Cable Lease Rate per Month
and Present Value of 5 Years

	Monthly Cost per T3	5 Year Present Value - T3
Usable Bandwidth per Unit (Gbps)		
Lena Pt (Juneau) - Seattle or Portland		
Anchorage - Seattle or Portland		
Anchorage - Fairbanks		
Fairbanks - Seattle or Portland		

Table VII-1
Alaska Mobile Wireless Backhaul 2012
by Census Block

Borough / Census Area	Fiber Backhaul	Remote Terrestrial Backhaul	Satellite Backhaul	Total Census Blocks	Total Currently Served CB	Total Currently Served Area	Total Currently Served Population
Aleutians East	0	0	275	275	275	367	3,136
Aleutians West	0	0	267	267	267	276	5,181
Anchorage	4,281	0	0	4,281	4,281	920	291,652
Bethel	0	1,025	24	1,049	1,049	2,573	16,667
Bristol Bay	0	167	0	167	167	263	949
Denali	414	0	0	414	414	531	770
Dillingham	0	437	0	437	437	2,344	4,838
Fairbanks North Star	3,917	0	0	3,917	3,917	1,645	96,699
Haines	0	210	0	210	210	37	1,982
Hoonah-Angoon	0	274	0	274	274	1,473	1,363
Juneau	758	0	0	758	758	1,330	31,210
Kenai Peninsula	2,488	0	84	2,572	2,572	3,708	52,602
Ketchikan Gateway	443	0	0	443	443	430	13,443
Kodiak Island	423	0	0	423	423	265	12,585
Lake and Peninsula	0	167	207	374	374	5,553	1,383
Matanuska-Susitna	3,124	0	0	3,124	3,124	4,105	87,513
Nome	0	0	811	811	811	1,896	9,446
North Slope	34	0	492	526	526	1,133	8,796
Northwest Arctic	0	0	443	443	443	1,902	7,158
Petersburg	184	0	0	184	184	372	3,105
Prince of Wales-Hyder	0	166	0	166	166	366	1,872
Sitka	0	429	0	429	429	226	8,822
Skagway	0	187	0	187	187	159	957
Southeast Fairbanks	662	0	15	677	677	2,137	5,969
Valdez-Cordova	1,059	0	0	1,059	1,059	6,243	9,165
Wade Hampton	0	404	65	469	469	1,006	7,431
Wrangell	132	0	0	132	132	38	1,726
Yakutat	0	0	0	0	0	0	0
Yukon-Koyukuk	0	152	416	568	568	859	2,558
Total	17,919	3,618	3,100	24,636	24,636	42,154	688,978

Source: U.S. Census Bureau 2010 Census; GCI Cell Site Data; Carrier Cell Sites from FCC ULS database; Brattle Analysis.

Table VII-2
Breakdown of Backhaul per Borough

Borough / Census Area	Fiber					Remote Terrestrial				
	FCC Eligible Served Sites	FCC Eligible Unserved Sites	Additional Area Currently Served 2G Sites	Areas with Non-Wireless Presence	Total Fiber Terrestrial Sites	FCC Eligible Served Sites	FCC Eligible Unserved Sites	Additional Area Currently Served 2G Sites	Areas with Non-Wireless Presence	Total Remote Terrestrial Sites
Aleutians East	0	0	0	0	0	0	0	0	0	0
Aleutians West	0	0	0	0	0	0	0	0	0	0
Anchorage	13	1	8	0	22	0	0	0	0	0
Bethel	0	0	0	0	0	20	13	13	6	52
Bristol Bay	0	0	0	0	0	4	1	0	1	6
Denali	6	4	6	5	21	0	0	0	0	0
Dillingham	0	0	0	0	0	10	3	8	2	23
Fairbanks North Star	5	5	6	4	20	0	0	0	0	0
Haines	0	0	0	0	0	2	1	5	5	13
Hoonah-Angoon	0	0	0	0	0	3	3	12	5	23
Juneau	3	1	15	0	19	0	0	0	0	0
Kenai Peninsula	8	4	27	14	53	0	0	0	0	0
Ketchikan Gateway	1	13	18	2	34	0	0	0	0	0
Kodiak Island	1	2	4	7	14	0	0	0	0	0
Lake and Peninsula	0	0	0	0	0	4	4	8	5	21
Matanuska-Susitna	0	3	35	8	46	0	0	0	0	0
Nome	0	0	0	0	0	0	0	0	0	0
North Slope	2	4	3	1	10	0	0	0	0	0
Northwest Arctic	0	0	0	0	0	0	0	0	0	0
Petersburg	3	1	3	2	9	0	0	0	0	0
Prince of Wales-Hyder	0	0	0	0	0	6	1	1	14	22
Sitka	0	0	0	0	0	0	1	1	0	2
Skagway	0	0	0	0	0	2	1	2	0	5
Southeast Fairbanks	8	9	10	8	35	0	0	0	0	0
Valdez-Cordova	33	20	51	11	115	0	0	0	0	0
Wade Hampton	0	0	0	0	0	10	7	6	2	25
Wrangell	0	1	5	1	7	0	0	0	0	0
Yakutat	0	0	0	0	0	0	0	0	0	0
Yukon-Koyukuk	0	0	0	0	0	2	3	1	11	17
Total	83	68	191	63	405	63	38	57	51	209

Source: U.S. Census Bureau 2010 Census; GCI Cell Site Data; Carrier Cell Sites from FCC ULS database; Brattle Analysis.

Table VII-2 cont.
Breakdown of Backhaul per Borough

Borough / Census Area	Satellite					Total
	FCC Eligible Served Sites	FCC Eligible Unserved Sites	Additional Area Currently Served 2G Sites	Areas with Non-Wireless Presence	Total Satellite Sites	Total Sites
Aleutians East	5	3	6	2	16	16
Aleutians West	4	4	6	6	20	20
Anchorage	0	0	0	0	0	22
Bethel	2	0	0	0	2	54
Bristol Bay	0	0	0	0	0	6
Denali	0	0	0	0	0	21
Dillingham	0	0	0	0	0	23
Fairbanks North Star	0	0	0	0	0	20
Haines	0	0	0	0	0	13
Hoonah-Angoon	0	0	0	0	0	23
Juneau	0	0	0	0	0	19
Kenai Peninsula	1	1	0	0	2	55
Ketchikan Gateway	0	0	0	0	0	34
Kodiak Island	0	0	0	0	0	14
Lake and Peninsula	6	2	4	1	13	34
Matanuska-Susitna	0	0	0	0	0	46
Nome	17	14	12	2	45	45
North Slope	14	22	10	0	46	56
Northwest Arctic	13	7	4	1	25	25
Petersburg	0	0	0	0	0	9
Prince of Wales-Hyder	0	0	0	0	0	22
Sitka	0	0	0	0	0	2
Skagway	0	0	0	0	0	5
Southeast Fairbanks	2	2	1	1	6	41
Valdez-Cordova	0	0	0	0	0	115
Wade Hampton	1	1	0	0	2	27
Wrangell	0	0	0	0	0	7
Yakutat	0	0	0	5	5	5
Yukon-Koyukuk	9	6	0	21	36	53
Total	74	62	43	39	218	832

Source: U.S. Census Bureau 2010 Census; GCI Cell Site Data; Carrier Cell Sites from FCC ULS database; Brattle Analysis.

Table VIII-1
Present Value of Undersea Transport Costs
FCC Eligible Areas

		Satellite (Anchorage)	Anchorage	Fairbanks	Juneau	Total
Downstream Throughput	*Gbps*	[redacted]				
Upstream Throughput	*Gbps*					
Lines Required	*Units*					
Monthly Underwater Transport Cost	*$/Unit*					
Total Cost per Month	*$*	$289,000	$272,000	$32,000	$48,000	$641,000
PV (5 Years)		$14,031,129	$13,205,768	$1,553,620	$2,330,430	$31,120,947
Population Served	*Pops.*	19,306	18,077	806	2,950	41,139
Throughput per User	*Kbps/Pop.*	40	40	56	46	

Table VIII-2
Present Value of Undersea Transport Costs
FCC Eligible Areas + Additional Currently Served Areas

		Satellite (Anchorage)	Anchorage	Fairbanks	Juneau	Total
Downstream Throughput	*Gbps*	[redacted]				
Upstream Throughput	*Gbps*					
Lines Required	*Units*					
Monthly Underwater Transport Cost	*$/Unit*					
Total Cost per Month	*$*	$306,000	$408,000	$128,000	$96,000	$938,000
PV (5 Years)		$14,856,489	$19,808,652	$6,214,479	$4,660,859	$45,540,480
Population Served	*Pops.*	20,685	27,610	3,816	6,122	58,233
Throughput per User	*Kbps/Pop.*	39	39	47	44	

Table VIII-3
Present Value of Undersea Transport Costs
FCC Eligible Areas + Additional Currently Served Areas + Other Areas with Presence

		Satellite (Anchorage)	Anchorage	Fairbanks	Juneau	Total
Downstream Throughput	*Gbps*	[redacted]				
Upstream Throughput	*Gbps*					
Lines Required	*Units*					
Monthly Underwater Transport Cost	*$/Unit*					
Total Cost per Month	*$*	$306,000	$425,000	$128,000	$112,000	$971,000
PV (5 Years)		$14,856,489	$20,634,013	$6,214,479	$5,437,669	$47,142,651
Population Served	*Pops.*	20,881	28,902	4,000	7,256	61,038
Throughput per User	*Kbps/Pop.*	39	39	45	43	

Table IX-1
Estimated Marginal Revenue

Annual Revenue Increase	**$**	**15,699,312**				
PV of Revenue Increase (5 Years)	**$**	**63,517,609**				
Population currently served with wireless 2G	Annual Revenue Increase	PV of Revenue (5 Years)	Subscribers	Population	Ann. Rev / Pop	Ann. Rev / Sub
FCC Eligible Areas	$4,110,120	$16,629,072	[redacted]	68,502	$60	[redacted]
Additional Areas Currently Covered	$2,051,280	$8,299,243		34,188	$60	
Other Areas with Some Presence	$0	$0		0	-	
Areas currently served with wireless 2G	**$6,161,400**	**$24,928,315**		**102,690**	$60	
Population currently unserved with wireless 2G						
FCC Eligible Areas	$6,777,300	$27,420,176		13,775	$492	
Additional Areas Currently Covered	$0	$0		0	-	
Other Areas with Some Presence	$2,760,612	$11,169,118		5,611	$492	
Areas currently unserved with wireless 2G	**$9,537,912**	**$38,589,294**		**19,386**	$492	

Figure X-1
Model Architecture

Input	
Mapping	Census Block/ Borough/Census Area mapping
Auction_901	FCC Mobility Fund Phase I Eligibility List for the State of Alaska
Backhaul	Backhaul data by Borough/Census Area
CB	Population/Road Miles/Area data by Census Block
Sites	Existing Sites and non-wireless Presence
CB_CDV	Coverage data by Census Block
Overlap Analysis	
Overlap GCI_NFCC	Overlap Analysis (GCI and Other Non-FCC Eligible Census Blocks)
Overlap GCI_FCC	Overlap Analysis (GCI and Other FCC Eligible Census Blocks)
Overlap Plan_NFCC	Overlap Analysis (Planned and GCI/Other Non-FCC Eligible Census Blocks)
Overlap Plan_FCC	Overlap Analysis (Planned and GCI/Other FCC Eligible Census blocks)
Coverage Analysis	
Summary_FCC	Coverage Analysis (FCC Eligible Census Blocks)
Summary_All	Coverage Analysis (FCC and Non-FCC Eligible Census Blocks)
Summary_NFCC	Coverage Analysis (Non-FCC Eligible Census Blocks)
FOR_COST	Coverage Analysis Output for Cost Analysis
Cost Assumptions	
Facility_Cost	Circuit Charges
Opex_TER	Bandwidth Cost of Operating Terrestrial Backhaul
Opex_Hub iDirect	Bandwidth Cost of Operating the Hub iDirect Satellite
Backhaul_Opex_SAT	Satellite Backhaul Operations and Maintenance
Backhaul_Capex_SAT	Satellite Backhaul Capital Expenditures
Network_Opex	Network Operations and Maintenance
Network_Capex	Network Capital Expenditures
Revenue	Marginal Revenue Calculations
Cost Summary	
II_1	Summary of Capital Costs and Present Value of O&M Costs
II_2	Cost Metrics For 3G/4G Service In Targeted Area by Network and Backhaul Costs
II_3	Summary of Transportation Costs by Hub
Summ_PV_Capital_Cost	Summary of Present Value of Capital Costs
Summ_Incr_Rev	Summary of Present Value of Incremental Revenue
Summ_PV_CandM	Summary of Present Value of O&M Costs
Summ_PV_Backhaul	Summary of Present Value of Backhaul
Summ_TOTAL	Summary of Present Value of Total Costs
Coverage Summary	
III_1	State of Alaska Demographics Data by Census Block
III_2	Alaska 3G/4G Mobile Wireless Service Coverage 2012 By Census Block
IV_1	FCC Potentially Eligible Areas in Alaska by Census Block
IV_2	Additional Areas Currently Served In Alaska not Included As FCC Potentially Eligible Areas By Census Block
IV_3	Areas Not Currently Receiving Mobile Wireless Services In Alaska but Covered By Other Telecom by Census Block
IV_4	Scope of 3G/4G Mobile Wireless Services In Alaska by Census Block
IV_5	Areas In Alaska Excluded From 3G/4G Build-Out Scope by Census Block
V_1	Analysis of Current Cell Sites In Alaska by Sites In Place In 2012
V_2	Determination of Cell Site Requirements for Areas Currently Covered by Wireless Service
V_3	Alaska Road Miles 2010 U.S. Census
V_4	Summary of Cell Site Required for Un-served Areas Within FCC Potentially Eligible Areas
V_5	Summary of Cell Sites required for Areas with Non-Wireless Presence in Alaska
V_6	Additional Cell Sites Required to Complete 3G/4G Build-Out In Alaska
V_7	Summary of Cell Site Required to Complete 3G/4G Build-Out In Alaska
VII-1	Alaska Mobile Wireless Backhaul 2012 by Census Block
VII-2	Breakdown of Backhaul per Borough
Summ_CB	Summary of Census Blocks
Summ_Pop	Summary of Population
Detailed Output	
A_1	Capital Costs and Present Value of O&M Costs for FCC Eligible Areas
A_2	Capital Costs and Present Value of O&M Costs for FCC Eligible Areas Currently With 2G Service
A_3	Capital Costs and Present Value of O&M Costs for FCC Eligible Areas Currently With Non-Wireless Presence
A_4	Capital Costs and Present Value of O&M Costs for FCC Eligible Areas Currently Unserved
A_5	Capital Costs and Present Value of O&M Costs for Additional Areas Currently Served (2G)
A_6	Capital Costs and Present Value of O&M Costs for Areas With Non-Wireless Presence
FCC_TER_2G	Present Value of Terrestrial Backhaul Cost for FCC Eligible 2G Served Areas
FCC_TER_2G_Plan	Present Value of Terrestrial Backhaul Cost for FCC Eligible 2G Served Areas + FCC Eligible Areas With Non-Wireless Presence
A_7	Present Value of Terrestrial Backhaul Cost for FCC Eligible Areas
A_8	Present Value of Terrestrial Backhaul Cost for FCC Eligible + Additional Currently Served Areas
A_9	Present Value of Terrestrial Backhaul Cost for FCC Eligible + Additional Currently Served Areas + Other Areas with Presence
FCC_SAT_2G	Present Value of Satellite Backhaul Cost for FCC Eligible 2G Served Areas
FCC_SAT_2G_Plan	Present Value of Satellite Backhaul Cost for FCC Eligible 2G Served Areas + FCC Eligible Areas With Non-Wireless Presence
A_10	Present Value of Satellite Backhaul Cost for FCC Eligible Areas
A_11	Present Value of Satellite Backhaul Cost for FCC Eligible + Additional Currently Served Areas
A_12	Present Value of Satellite Backhaul Cost for FCC Eligible + Additional Currently Served Areas + Other Areas with Presence
VIII_1	Present Value of Undersea Transport Costs for FCC Eligible Areas
VIII_2	Present Value of Undersea Transport Costs for FCC Eligible Areas + Additional Currently Served Areas
VIII_3	Present Value of Undersea Transport Costs for FCC Eligible Areas + Additional Currently Served Areas + Other Areas with Presence

APPENDIX: DETAILED OUTPUT

Following is a list of the detailed borough / census area output contained in the model and included below.

A. FCC ELIGIBLE AREAS

- Capital Costs and Present Value of O&M Costs For FCC Eligible Areas (Excluding Backhaul Costs) – **Table A-1**;
- Capital Costs and Present Value of O&M Costs For FCC Eligible Areas Currently With 2G Service (Excluding Backhaul Costs) – **Table A-2**;
- Capital Costs and Present Value of O&M Costs For FCC Eligible Areas Currently With Non-Wireless Presence (Excluding Backhaul Costs) – **Table A-3**;
- Capital Costs and Present Value of O&M Costs For FCC Eligible Areas Currently Unserved (Excluding Backhaul Costs) – **Table A-4**.

B. AREAS OTHER THAN FCC ELIGIBLE AREAS

- Capital Costs and Present Value of O&M Costs Additional Areas Currently Served (2G) (Excluding Backhaul Costs) – **Table A-5**;
- Capital Costs and Present Value of O&M Costs Areas With Non-Wireless Presence (Excluding Backhaul Costs) – **Table A-6**.

Cost details concerning the derivation of terrestrial and satellite backhaul costs by borough / census area are also available.

C. TERRESTRIAL BACKHAUL

- Present Value of Terrestrial Backhaul Cost FCC Eligible Areas – **Table A-7**;

- Present Value of Terrestrial Backhaul Cost FCC Eligible + Additional Currently Served Areas – **Table A-8**;

- Present Value of Terrestrial Backhaul Costs FCC Eligible + Additional Currently Served Areas + Other Areas with Presence – **Table A-9**.

D. SATELLITE BACKHAUL

- Present Value of Satellite Backhaul Cost FCC Eligible Areas – **Table A-10**;

- Present Value of Satellite Backhaul Cost FCC Eligible + Additional Currently Served Areas – **Table A-11**;

- Present Value of Satellite Backhaul Cost FCC Eligible + Additional Currently Served Areas + Other Areas with Presence – **Table A-12**.

Table A-1
Capital Costs and Present Value of O&M Costs
for FCC Eligible Areas
(Excluding Backhaul Costs)

	Total FCC Eligible Sites									
	Terrestrial Sites		Satellite Sites		Capital			Present Value (5 years) of O&M		
Borough / Census Area	Sites	Population Covered	Sites	Population Covered	All Cell Sites Cost $	Satellite VSAT Cost $	Total $	All Cell Sites Cost $	Satellite VSAT Cost $	Total $
Aleutians East	0	0	8	3,089	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Aleutians West	0	0	11	5,556						
Anchorage	14	455	0	0						
Bethel	37	15748	2	226						
Bristol Bay	5	997	0	0						
Denali	13	903	0	0						
Dillingham	14	4814	0	0						
Fairbanks North Star	13	523	0	0						
Haines	6	1338	0	0						
Hoonah-Angoon	10	776	0	0						
Juneau	4	106	0	0						
Kenai Peninsula	18	1745	2	516						
Ketchikan Gateway	14	30	0	0						
Kodiak Island	5	864	0	88						
Lake and Peninsula	11	861	9	680						
Matanuska-Susitna	4	868	0	0						
Nome	0	0	32	9,471						
North Slope	7	51	36	6,703						
Northwest Arctic	0	0	20	6,881						
Petersburg	5	717	0	0						
Prince of Wales-Hyder	15	2253	0	0						
Sitka	1	56	0	0						
Skagway	3	31	0	0						
Southeast Fairbanks	24	1038	5	258						
Valdez-Cordova	55	738	0	0						
Wade Hampton	19	6817	2	513						
Wrangell	1	592	0	0						
Yakutat	0	0	3	661						
Yukon-Koyukuk	14	1345	34	3,970						
Total	312	43,664	164	38,613	145,379,720	7,406,240	152,785,960	71,468,716	8,656,308	80,125,024

Source: U.S. Census Bureau 2010 Census; GCI Cell Site Data; Carrier Cell Sites from FCC ULS database; Brattle Analysis.

Table A-2
Capital Costs and Present Value of O&M Costs
for FCC Eligible Areas Currently with 2G Service
(Excluding Backhaul Costs)

	FCC Eligible Areas with Existing 2G Sites									
	Terrestrial Sites		Satellite Sites		Capital			Present Value (5 Years) of O&M		
Borough / Census Area	Sites	Population Covered	Sites	Population Covered	All Cell Sites Cost $	Satellite VSAT Cost $	Total $	All Cell Sites Cost $	Satellite VSAT Cost $	Total $
Aleutians East	0	0	5	3,089	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Aleutians West	0	0	4	5,181						
Anchorage	13	415	0	0						
Bethel	20	15,443	2	210						
Bristol Bay	4	949	0	0						
Denali	6	713	0	0						
Dillingham	10	4,807	0	0						
Fairbanks North Star	5	0	0	0						
Haines	2	848	0	0						
Hoonah-Angoon	3	456	0	0						
Juneau	3	87	0	0						
Kenai Peninsula	8	379	1	475						
Ketchikan Gateway	1	5	0	0						
Kodiak Island	1	68	0	0						
Lake and Peninsula	4	736	6	572						
Matanuska-Susitna	0	344	0	0						
Nome	0	0	17	9,425						
North Slope	2	0	14	6,427						
Northwest Arctic	0	0	13	6,827						
Petersburg	3	18	0	0						
Prince of Wales-Hyder	6	377	0	0						
Sitka	0	0	0	0						
Skagway	2	21	0	0						
Southeast Fairbanks	8	315	2	77						
Valdez-Cordova	33	595	0	0						
Wade Hampton	10	6,796	1	512						
Wrangell	0	0	0	0						
Yakutat	0	0	0	0						
Yukon-Koyukuk	2	414	9	1,921						
Total	146	33,785	74	34,717	39,190,371	3,341,840	42,532,211	23,347,060	697,029	24,044,089

Source: U.S. Census Bureau 2010 Census; GCI Cell Site Data; Carrier Cell Sites from FCC ULS database; Brattle Analysis.

Table A-3
Capital Costs and Present Value of O&M Costs
for FCC Eligible Areas Currently with Non-Wireless Presence
(Excluding Backhaul Costs)

	FCC Eligible Areas with Non-Wireless Presence									
	Terrestrial Sites		Satellite Sites		Capital					
Borough / Census Area	Sites	Population Covered	Sites	Population Covered	All Cell Sites Cost $	Satellite VSAT Cost $	Total $	All Cell Sites Cost $	Satellite VSAT Cost $	Total $
Aleutians East	0	0	0	0	[redacted]					
Aleutians West	0	0	3	74						
Anchorage	0	0	0	0						
Bethel	4	276	0	15						
Bristol Bay	0	0	0	0						
Denali	3	32	0	0						
Dillingham	1	2	0	0						
Fairbanks North Star	3	313	0	0						
Haines	3	444	0	0						
Hoonah-Angoon	4	311	0	0						
Juneau	0	0	0	0						
Kenai Peninsula	6	1,310	0	40						
Ketchikan Gateway	0	0	0	0						
Kodiak Island	2	409	0	45						
Lake and Peninsula	3	122	1	106						
Matanuska-Susitna	1	9	0	0						
Nome	0	0	1	0						
North Slope	1	0	0	0						
Northwest Arctic	0	0	0	0						
Petersburg	1	609	0	0						
Prince of Wales-Hyder	8	1,755	0	0						
Sitka	0	0	0	0						
Skagway	0	0	0	0						
Southeast Fairbanks	7	527	1	132						
Valdez-Cordova	2	5	0	0						
Wade Hampton	2	0	0	0						
Wrangell	0	0	0	0						
Yakutat	0	0	3	661						
Yukon-Koyukuk	9	785	19	1,728						
Total	60	6,912	28	2,801	28,722,566	1,264,480	29,987,046	11,736,384	2,476,220	14,212,604

Source: U.S. Census Bureau 2010 Census; GCI Cell Site Data; Carrier Cell Sites from FCC ULS database; Brattle Analysis.

Table A-4
Capital Costs and Present Value of O&M Costs
for FCC Eligible Areas Currently Unserved
(Excluding Backhaul Costs)

	FCC Eligible Areas that are Unserved									
	Terrestrial Sites		Satellite Sites		Capital			Present Value (5 Years) of O&M		
Borough / Census Area	Sites	Population Covered	Sites	Population Covered	All Cell Sites Cost $	Satellite VSAT Cost $	Total $	All Cell Sites Cost $	Satellite VSAT Cost $	Total $
Aleutians East	0	0	3	0	[redacted]					
Aleutians West	0	0	1	301						
Anchorage	1	40	0	0						
Bethel	13	29	0	1						
Bristol Bay	1	48	0	0						
Denali	4	158	0	0						
Dillingham	3	5	0	0						
Fairbanks North Star	5	210	0	0						
Haines	1	46	0	0						
Hoonah-Angoon	3	9	0	0						
Juneau	1	19	0	0						
Kenai Peninsula	4	52	1	1						
Ketchikan Gateway	13	25	0	0						
Kodiak Island	2	387	0	43						
Lake and Peninsula	4	3	2	2						
Matanuska-Susitna	3	515	0	0						
Nome	0	0	14	46						
North Slope	4	51	22	276						
Northwest Arctic	0	0	7	54						
Petersburg	1	90	0	0						
Prince of Wales-Hyder	1	121	0	0						
Sitka	1	56	0	0						
Skagway	1	10	0	0						
Southeast Fairbanks	9	196	2	49						
Valdez-Cordova	20	138	0	0						
Wade Hampton	7	21	1	1						
Wrangell	1	592	0	0						
Yakutat	0	0	0	0						
Yukon-Koyukuk	3	146	6	321						
Total	106	2,967	62	1,095	77,466,782	2,799,920	80,266,702	36,385,272	5,483,059	41,868,331

Source: U.S. Census Bureau 2010 Census; GCI Cell Site Data; Carrier Cell Sites from FCC ULS database; Brattle Analysis.

Table A-5
Capital Costs and Present Value of O&M Costs
Additional Areas Currently Served (2G)
(Excluding Backhaul Costs)

	Additonal Areas Currently Served									
	Terrestrial Sites		Satellite Sites		Capital					
Borough / Census Area	Sites	Population Covered	Sites	Population Covered	All Cell Sites Cost $	Satellite VSAT Cost $	Total $	All Cell Sites Cost $	Satellite VSAT Cost $	Total $
Aleutians East	0	0	6	47	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Aleutians West	0	0	6	0						
Anchorage	8	303	0	0						
Bethel	13	1014	0	0						
Bristol Bay	0	0	0	0						
Denali	6	57	0	0						
Dillingham	8	31	0	0						
Fairbanks North Star	6	148	0	0						
Haines	5	1134	0	0						
Hoonah-Angoon	12	907	0	0						
Juneau	15	62	0	0						
Kenai Peninsula	27	5030	0	156						
Ketchikan Gateway	18	0	0	0						
Kodiak Island	4	0	0	0						
Lake and Peninsula	8	12	4	63						
Matanuska-Susitna	35	3770	0	0						
Nome	0	0	12	21						
North Slope	3	295	10	2,072						
Northwest Arctic	0	0	4	331						
Petersburg	3	85	0	0						
Prince of Wales-Hyder	1	1495	0	0						
Sitka	1	0	0	0						
Skagway	2	936	0	0						
Southeast Fairbanks	10	5577	1	0						
Valdez-Cordova	51	8570	0	0						
Wade Hampton	6	58	0	65						
Wrangell	5	1726	0	0						
Yakutat	0	0	0	0						
Yukon-Koyukuk	1	221	0	2						
Total	248	31,430	43	2,758	51,838,173	1,941,880	53,780,053	30,881,793	405,030	31,286,823

Source: U.S. Census Bureau 2010 Census; GCI Cell Site Data; Carrier Cell Sites from FCC ULS database; Brattle Analysis.

Table A-6
Capital Costs and Present Value of O&M Costs
Areas with Non-Wireless Presence
(Excluding Backhaul Costs)

	Areas with a Non Wireless Presence									
	Terrestrial Sites		Satellite Sites		Capital			Present Value (5 Years) of O&M		
Borough / Census Area	Sites	Population Covered	Sites	Population Covered	All Cell Sites Cost $	Satellite VSAT Cost $	Total $	All Cell Sites Cost $	Satellite VSAT Cost $	Total $
Aleutians East	0	0	2	0	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Aleutians West	0	0	3	5						
Anchorage	0	0	0	0						
Bethel	2	9	0	0						
Bristol Bay	1	0	0	0						
Denali	2	795	0	0						
Dillingham	1	0	0	0						
Fairbanks North Star	1	268	0	0						
Haines	2	29	0	0						
Hoonah-Angoon	1	463	0	0						
Juneau	0	0	0	0						
Kenai Peninsula	8	1125	0	34						
Ketchikan Gateway	2	1	0	0						
Kodiak Island	5	58	0	6						
Lake and Peninsula	2	4	0	2						
Matanuska-Susitna	7	339	0	0						
Nome	0	0	1	0						
North Slope	0	0	0	0						
Northwest Arctic	0	0	1	309						
Petersburg	1	0	0	0						
Prince of Wales-Hyder	6	1751	0	0						
Sitka	0	0	0	0						
Skagway	0	0	0	0						
Southeast Fairbanks	1	100	0	24						
Valdez-Cordova	9	249	0	0						
Wade Hampton	0	0	0	0						
Wrangell	1	20	0	0						
Yakutat	0	0	2	1						
Yukon-Koyukuk	2	5	2	11						
Total	54	5,219	11	392	21,215,532	496,760	21,712,292	8,668,920	972,801	9,641,721

Source: U.S. Census Bureau 2010 Census; GCI Cell Site Data; Carrier Cell Sites from FCC ULS database; Brattle Analysis.

Table A-7
Present Value of Terrestrial Backhaul Cost
FCC Eligible Areas

Burrough:		Total	Anchorage	Bethel	Bristol Bay	Denali	Dillingham	Fairbanks North Star	Haines	Hoonah-Angoon (Excludes Angoon Village)	Angoon Village (Hoonah-Angoon)	Juneau	Kenai Peninsula	Ketchikan Gateway	Kodiak Island
Terrestrial Backhaul Type:			Fiber 1Mbps	Terra 1Mbps	Terra 1Mbps	Fiber 1Mbps	Terra 1Mbps	Fiber 1Mbps	Microwave T1	Microwave T1	Fiber T3	Fiber T3	Fiber 1Mbps	Fiber T3	Fiber 1Mbps
Average Miles:			10	80	80	120	80	2	100	50	80	8	160	300	400
Population at Terrestrial Locations	*pops*	43,664	455	15,748	957	903	4,814	523	1,338	716	60	106	1,745	30	864
Population Penetration Rate		50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%
Population Served (using penetration rate)	*pops*	21,832	228	7,874	479	452	2,407	262	669	358	30	53	872	15	432
User Traffic Rate		50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%
Downstream Data Rate (per user)	*kbps*	768	768	768	768	768	768	768	768	768	768	768	768	768	768
Upstream Data Rate (per user)	*kbps*	256	256	256	256	256	256	256	256	256	256	256	256	256	256
Downstream Oversubscription Rate		[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Upstream Oversubscription Rate															
Downstream Throughput Required	*Gbps*														
Upstream Throughput Required	*Gbps*														
Usable Bandwidth per Unit	*Gbps*														
Bits per Pop	*bits/pop*														
Units Required		768													
Cost per Unit per Month	$														
Cost (per month)	$	2,678,504													
Annual Cost	$	32,142,046													
Present Value (5 Years) of Bandwidth Cost	$	130,043,017													

Table A-7 Cont.
Present Value of Terrestrial Backhaul Cost
FCC Eligible Areas

Boroughs		Total	Lake and Peninsula	Matanuska-Susitna	North Slope	Petersburg	Prince of Wales-Hyder	Sitka	Skagway	Southeast Fairbanks (excludes Tok)	Tok (Southeast Fairbanks	Valdez-Cordova	Wade Hampton	Wrangell	Yukon-Koyukuk
Terrestrial Backhaul Type			Terra 1Mbps	Fiber 1Mbps	Fiber T3	Fiber T3	Microwave T1	Microwave T1	Microwave T1	Fiber 1Mbps	Microwave T1	Fiber 1Mbps	Terra 1Mbps	Fiber T3	Microwave T3
Average Miles:			80	80	500	120	200	120	120	150	200	150	80	200	80
Population at Terrestrial Locations	*pops*	43,664	861	868	51	717	2,253	56	31	897	341	733	6,817	592	1,345
Population Penetration Rate		50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%
Population Served (using penetration rate)	*pops*	21,832	430	434	26	359	1,127	28	16	448	171	369	3,409	296	672
User Traffic Rate		50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%
Downstream Data Rate (per user)	*kbps*	768	768	768	768	768	768	768	768	768	768	768	768	768	768
Upstream Data Rate (per user)	*kbps*	256	256	256	256	256	256	256	256	256	256	256	256	256	256
Downstream Oversubscription Rate		[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Upstream Oversubscription Rate															
Downstream Throughput Required	*Gbps*														
Upstream Throughput Required	*Gbps*														
Usable Bandwidth per Unit	*Gbps*														
Bits per Pop	*bits/pop*														
Units Required		768													
Cost per Unit per Month	$														
Cost (per month)	**$**	**2,678,504**													
Annual Cost	**$**	**32,142,046**													
Present Value (5 Years) of Bandwidth Cost	**$**	**130,043,017**													

Table A-8
Present Value of Terrestrial Backhaul Cost
FCC Eligible – Additional Currently Served Areas

Borough:		Total	Anchorage	Bethel	Bristol Bay	Denali	Dillingham	Fairbanks North Star	Haines	Angoon (Excludes Angoon	Village (Hoonah-Angoon)	Juneau	Kenai Peninsula	Ketchikan Gateway	Kodiak Island
Terrestrial Backhaul Type:			Fiber 1Mbps	Terra 1Mbps	Terra 1Mbps	Fiber 1Mbps	Terra 1Mbps	Fiber 1Mbps	Microwave T1	Microwave T1	Fiber T3	Fiber T3	Fiber 1Mbps	Fiber T3	Fiber 1Mbps
Average Miles:			10	80	80	120	80	2	100	50	80	8	160	300	400
Population at Terrestrial Locations	*pops*	75,094	758	16,762	997	960	4,845	671	2,472	1,623	60	168	6,775	30	864
Population Peneration Rate		50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%
Population Served (using penetration rate)	*pops*	37,547	379	8,381	499	480	2,423	336	1,236	812	30	84	3,387	15	432
User Traffic Rate		50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%
Downstream Data Rate (per user)	*kbps*	768	768	768	768	768	768	768	768	768	768	768	768	768	768
Upstream Data Rate (per user)	*kbps*	256	256	256	256	256	256	256	256	256	256	256	256	256	256
Downstream Oversubscription Rate		[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Upstream Oversubscription Rate															
Downstream Throughput Required	*Gbps*														
Upstream Throughput Required	*Gbps*														
Usable Bandwidth per Unit	*Gbps*														
Bits per Pop	*bits/pop*														
Units Required		1,287													
Cost per Unit per Month	$														
Cost (per month)	**$**	**3,117,890**	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Annual Cost	**$**	**37,414,680**													
Present Value (5 Years) of Bandwidth Co	**$**	**151,375,489**													
Incremental PV from Additional Areas Currently Served	**$**	**21,332,472**													

Table A-8 Cont.
Present Value of Terrestrial Backhaul Cost
FCC Eligible – Additional Currently Served Areas

Burrough:		Total	Lake and Peninsula	Matanuska-Susitna	North Slope	Petersburg	Prince of Wales-Hyder	Sitka	Skagway	Fairbanks (excludes Tok)	Tok (Southeast Fairbanks	Valdez-Cordova	Wade Hampton	Wrangell	Yukon-Koyukuk
Terrestrial Backhaul Type:			Terra	Fiber	Fiber	Fiber	Microwave	Microwav	Microwave	Fiber	Microwave	Fiber	Terra	Fiber	Microwave
Average Miles:			1Mbps 80	1Mbps 80	T3 500	T3 120	T1 200	eT1 120	T1 120	1Mbps 150	T1 200	1Mbps 150	1Mbps 80	T3 200	T3 80
Population at Terrestrial Locations	*pops*	**75,094**	872	4,638	346	802	3,748	56	967	5,082	1,533	9,308	6,875	2,318	1,566
Population Penetration Rate		**50%**	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%
Population Served (using penetration rate)	*pops*	**37,547**	436	2,319	173	401	1,874	28	484	2,541	767	4,654	3,438	1,159	783
User Traffic Rate		**50%**	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%
Downstream Data Rate (per user)	*kbps*	**768**	768	768	768	768	768	768	768	768	768	768	768	768	768
Upstream Data Rate (per user)	*kbps*	**256**	256	256	256	256	256	256	256	256	256	256	256	256	256
Downstream Oversubscription Rate		[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Upstream Oversubscription Rate															
Downstream Throughput Required	*Gbps*														
Upstream Throughput Required	*Gbps*														
Usable Bandwidth per Unit	*Gbps*														
Bits per Pop	*bits/pop*														
Units Required		**1,287**													
Cost per Unit per Month	*$*														
Cost (per month)	**$**	**3,117,890**	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Annual Cost	**$**	**37,414,680**													
Present Value (5 Years) of Bandwidth Co	**$**	**151,375,489**													
Incremental PV from Additional Areas Currently Served	**$**	**21,332,472**													

Table A-9
Present Value of Terrestrial Backhaul Cost
FCC Eligible + Additional Currently Served Areas + Other Areas with Presence

Burrough:		Total	Anchorage	Bethel	Bristol Bay	Denali	Dillingham	Fairbanks North Star	Haines	Angoon (Excludes Angoon	Village (Hoonah-Angoon)	Juneau	Kenai Peninsula	Ketchikan Gateway	Kodiak Island
Terrestrial Backhaul Type:			Fiber 1Mbps	Terra 1Mbps	Terra 1Mbps	Fiber 1Mbps	Terra 1Mbps	Fiber 1Mbps	Microwave T1	Microwave T1	Fiber T3	Fiber T3	Fiber 1Mbps	Fiber T3	Fiber 1Mbps
Average Miles:			10	80	80	120	80	2	100	50	80	8	160	300	400
Population at Terrestrial Locations	*pops*	80,313	758	16,771	997	1,755	4,845	939	2,501	2,086	60	168	7,900	34	922
Population Penetration Rate		50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%
Population Served (using penetration rate)	*pops*	40,157	379	8,385	499	878	2,423	470	1,251	1,043	30	84	3,950	17	461
User Traffic Rate		50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%
Downstream Data Rate (per user)	*kbps*	768	768	768	768	768	768	768	768	768	768	768	768	768	768
Upstream Data Rate (per user)	*kbps*	256	256	256	256	256	256	256	256	256	256	256	256	256	256
Downstream Oversubscription Rate		[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Upstream Oversubscription Rate															
Downstream Throughput Required	*Gbps*														
Upstream Throughput Required	*Gbps*														
Usable Bandwidth per Unit	*Gbps*														
Bits per Pop	*bits/pop*														
Units Required		1,371													
Cost per Unit per Month	$														
Cost (per month)	**$**	**3,276,840**	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Annual Cost	**$**	**39,322,080**													
Present Value (5 Years) of Bandwidth Co	**$**	**159,092,610**													
Incremental PV from Areas with Non-Wireless Presence		**7,717,121**													

Table A-9 Cont.

Present Value of Terrestrial Backhaul Cost

FCC Eligible + Additional Currently Served Areas + Other Areas with Presence

Boroughs: / Terrestrial Backhaul Type: / Average Miles:		Total	Lake and Peninsula Terra 1Mbps 80	Matanuska-Susitna Fiber 1Mbps 80	North Slope Fiber T3 500	Petersburg Fiber T3 120	Prince of Wales-Hyder Microwave T1 200	Sitka Microwave T1 120	Skagway Microwave T1 120	Fairbanks (excludes Tok) Fiber 1Mbps 150	Tok (Southeast Fairbanks Microwave T1 200	Valdez-Cordova Fiber 1Mbps 150	Wade Hampton Terra 1Mbps 80	Wrangell Fiber T3 200	Yukon-Koyukuk Microwave T3 80
Population at Terrestrial Locations	*pops*	**80,313**	876	4,977	346	802	5,499	56	967	5,104	1,611	9,537	6,875	2,338	1,571
Population Peneration Rate		**50%**	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%
Population Served (using penetration rate)	*pops*	**40,157**	438	2,489	173	401	2,750	28	484	2,552	806	4,779	3,438	1,169	785
User Traffic Rate		**80%**	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%
Downstream Data Rate (per user)	*kbps*	**768**	768	768	768	768	768	768	768	768	768	768	768	768	768
Upstream Data Rate (per user)	*kbps*	**256**	256	256	256	256	256	256	256	256	256	256	256	256	256
Downstream Oversubscription Rate		[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Upstream Oversubscription Rate															
Downstream Throughput Required	*Gbps*														
Upstream Throughput Required	*Gbps*														
Usable Bandwidth per Unit	*Gbps*														
Bits per Pop	*bit/pop*														
Units Required		**1,371**													
Cost per Unit per Month	*$*														
Cost (per month)	**$**	**3,276,840**	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Annual Cost	**$**	**39,322,080**													
Present Value (5 Years) of Bandwidth Co	**$**	**159,092,610**													
Incremental PV from Areas with Non-Wireless Presence		**7,717,121**													

Table A-10
Present Value of Satellite Backhaul Cost
FCC Eligible Areas

		Total	Aleutians East	Aleutians West	Bethel	Kenai Peninsula	Kodiak Island	Lake and Peninsula	Nome	North Slope	Northwest Arctic	Wade Hampton	Yakutat	Yukon-Koyukuk
Population at Non-Terrestrial Locations		**38,613**	3,089	5,556	226	516	88	680	9,471	6,703	6,881	513	661	3,970
Population Penetration Rate		**50%**	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%
Population Served (using penetration rate)		**19,306**	1,545	2,778	113	258	44	340	4,736	3,352	3,441	257	331	1,985
User Traffic Rate		**50%**	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%
Downstream Data Rate (per user)	*kbps*	**768**	768	768	768	768	768	768	768	768	768	768	768	768
Upstream Data Rate (per user)	*kbps*	**256**	256	256	256	256	256	256	256	256	256	256	256	256
Downstream Oversubscription Rate		[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Upstream Oversubscription Rate														
Downstream Throughput Required	*Gbps*													
Upstream Throughput Required	*Gbps*													
Downstream Spectral Efficiency	*bits/Hz*	**2.2**												
Upstream Spectral Efficiency	*bits/Hz*	**0.9**												
Downstream Bandwidth Required	*MHz*													
Upstream Bandwidth Required	*MHz*													
Transponder Monthly Cost (per MHz)	$	**4,096**												
Cost (per month for space segment)	**$**	**1,386,575**	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Annual Cost (for space segment)	**$**	**16,638,901**												
Present Value (5 Years) of Bandwidth Cost	**$**	**67,319,080**	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

Table A-11
Present Value of Satellite Backhaul Cost
FCC Eligible – Additional Currently Served Areas

		Total	Aleutians East	Aleutians West	Bethel	Kenai Peninsula	Kodiak Island	Lake and Peninsula	Nome	North Slope	Northwest Arctic	Wade Hampton	Yakutat	Yukon-Koyukuk
Population at Non-Terrestrial Locations		41,371	3,136	5,556	226	672	88	744	9,492	8,775	7,212	578	661	3,972
Population Penetration Rate		50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%
Population Served (using penetration rate)		20,685	1,568	2,778	113	336	44	372	4,746	4,388	3,606	289	331	1,986
User Traffic Rate		50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%
Downstream Data Rate (per user)	*kbps*	768	768	768	768	768	768	768	768	768	768	768	768	768
Upstream Data Rate (per user)	*kbps*	256	256	256	256	256	256	256	256	256	256	256	256	256
Downstream Oversubscription Rate		[redacted]												
Upstream Oversubscription Rate														
Downstream Throughput Required	*Gbps*													
Upstream Throughput Required	*Gbps*													
Downstream Spectral Efficiency	*bits/Hz*	2.2												
Upstream Spectral Efficiency	*bits/Hz*	0.9												
Downstream Bandwidth Required	*MHz*													
Upstream Bandwidth Required	*MHz*													
Transponder Monthly Cost (per MHz)	*$*	4,096												
Cost (per month for space segment)	**$**	**1,485,612**	[redacted]											
Annual Cost (for space segment)	**$**	**17,827,346**												
Present Value (5 Years) of Bandwidth Co	**$**	**72,127,389**												
Incremental PV from Additional Areas Currently Served	**$**	**4,808,309**												

Table A-12
Present Value of Satellite Backhaul Cost
FCC Eligible + Additional Currently Served Areas + Other Areas with Presence

		Total	Aleutians East	Aleutians West	Bethel	Kenai Peninsula	Kodiak Island	Lake and Peninsula	Nome	North Slope	Northwest Arctic	Wade Hampton	Yakutat	Yukon-Koyukuk
Population at Non-Terrestrial Locations		41,763	3,136	5,561	226	706	94	746	9,492	8,775	7,521	578	662	3,983
Population Penetration Rate		50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%
Population Served (using penetration rate)		20,881	1,568	2,781	113	353	47	373	4,746	4,388	3,761	289	331	1,992
User Traffic Rate		50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%
Downstream Data Rate (per user)	*kbps*	768	768	768	768	768	768	768	768	768	768	768	768	768
Upstream Data Rate (per user)	*kbps*	256	256	256	256	256	256	256	256	256	256	256	256	256
Downstream Oversubscription Rate		[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Upstream Oversubscription Rate														
Downstream Throughput Required	*Gbps*													
Upstream Throughput Required	*Gbps*													
Downstream Spectral Efficiency	*bits/Hz*	2.2												
Upstream Spectral Efficiency	*bits/Hz*	0.9												
Downstream Bandwidth Required	*MHz*													
Upstream Bandwidth Required	*MHz*													
Transponder Monthly Cost (per MHz)	*$*	4,096												
Cost (per month for space segment)	*$*	1,499,689	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Annual Cost (for space segment)	*$*	17,996,266												
Present Value (5 Years) of Bandwidth Cost	*$*	72,810,821												
Areas with Non-Wireless Presence	*$*	683,431												