Economically Feasible and Prudent Alternative Evaluation of Alternatives

To

United Utilities, Inc. TERRA-SW Project

FINAL REPORT

DRG-UUI20110210-01

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Prepared for

U.S. Fish and Wildlife Services

Anchorage, AK

by

DavidROSSGroup

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EXECUTIVE SUMMARY

The David Ross Group, Inc. (DRG) was contracted by United Utilities, Inc. (UUI) of Alaska to perform a feasibility study for the U.S. Fish & Wildlife Service (FWS) to determine whether or not there is an economically feasible and prudent alternative to a section of a proposed project that would locate microwave towers in the Togiak Wildlife Refuge pursuant to Title XI of the Alaska National Interest Lands Conservation Act. The proposed project would replace existing satellite service that currently provides telecommunication connectivity to a local network that serves the Bristol Bay and Yukon-Kuskokwim Regions of Southwest Alaska. The project, Terra-SW, would upgrade telecommunication service to these regions by delivering terrestrial broadband service through extension of the telecommunications backbone from Anchorage.

Four Submarine Cable System Alternatives (Alternatives) were developed and analyzed as options to replace the proposed microwave towers within the Togiak Wildlife Refuge. The Alternatives were developed using input provided by UUI, FWS, and Requests for Quotes from credible suppliers, and then evaluated on Technical Performance, Implementation Schedule, and Price/Financial Performance. All four developed alternatives meet the required Technical Performance Criteria. The required Implementation Schedule(s) for each system is very aggressive and will require a near term decision on the Project implementation, and immediate execution of Program Initiation tasks such as Proposals, Permitting, and Contracting in order to meet the RUS Grant and Loan requirements. Financial Performance of each submarine cable alternative was evaluated utilizing a business case that replicated UUI's business case to RUS and was based on information supplied by UUI that included revenue assumptions, revenue projections and commercial loan rates and terms. The results of that analysis demonstrates that none of the submarine cable alternatives meet the minimum financial criteria of Internal Return on Revenue, Payback Period, and Net Present Value of the System over the 12 year projection horizon.

INTRODUCTION

The David Ross Group, Inc. (DRG) was contracted by United Utilities, Inc. (UUI) of Alaska to perform a feasibility study for the U.S. Fish & Wildlife Service (FWS) to determine whether or not there is an economically feasible and prudent alternative to a section of a proposed project that would locate microwave towers in the Togiak Wildlife Refuge pursuant to Title XI of the Alaska National Interest Lands Conservation Act. The proposed submarine cable would connect the Alaskan communities of Dillingham (Kanakanak), Togiak, Platinum and Quinhagak and would be part of a larger telecommunications project by UUI called TERRA-SW, to replace the current satellite connectivity for southwest Alaska with a hybrid microwave and fiber optic cable backbone extending from Anchorage. As a result, DRG has evaluated four submarine cable alternatives which eliminate the microwave towers in the Togiak National Wildlife Refuge, to determine which alternative is best and whether or not an undersea system alternative is economically feasible and prudent. This report is a summarized version of a comprehensive Appendix 1.0, DRG_UUI20110113-01, "Terra-SW Alternatives Feasibility Study Project Report", which in turn is supported by a series of 2nd level Appendices A through K.

EVALUATION METHODOLOGY

To perform the feasibility study, the four alternatives were designed to meet specific system requirements and developed to a point so that the technical performance and costs could be adequately understood. The designs for the four alternatives allowed cost estimates to be made for both the initial capital expense and the expected operating expenses over a 25-year time horizon. To support the cost estimates, DRG developed RFQs which were sent to various suppliers, and then analyzed the responses. The designs and cost estimates for the four alternatives then allowed for an evaluation from both technical and commercial standpoints using a set of evaluation criteria agreed upon by FWS, UUI, and DRG. As part of the commercial analysis, a business case was constructed using the revenue projections provided by UUI. During the whole process of performing the feasibility study, there was extensive exchange of information between DRG, UUI and FWS.

CONSIDERED ALTERNATIVES

The four considered alternatives are as shown and described below. Each alternative was designed to meet the following requirements:

1. Minimum initial capacity of 2.5 Gb, upgradeable to a minimum of 10 Gbps
2. System availability of at least 99.98% assuming a four-hour window for repair
3. End-point and mid-point connectivity
4. Interoperability with planned local services
5. Ability to restore capacity in the event of a single undersea fault
6. Design life of 25 years

Alternative B.1 is a festoon architecture, with single cable landings at the endpoints of Kanakanak and Quinhagak, and dual cable landings at the midpoints of Togiak and Platinum. Each cable segment is equipped with 2 fiber pairs. The Route Map and undersea cable connectivity diagram (Segment lengths shown in km) for Alternative B.1 are shown in Figures 1 and 2 respectively.

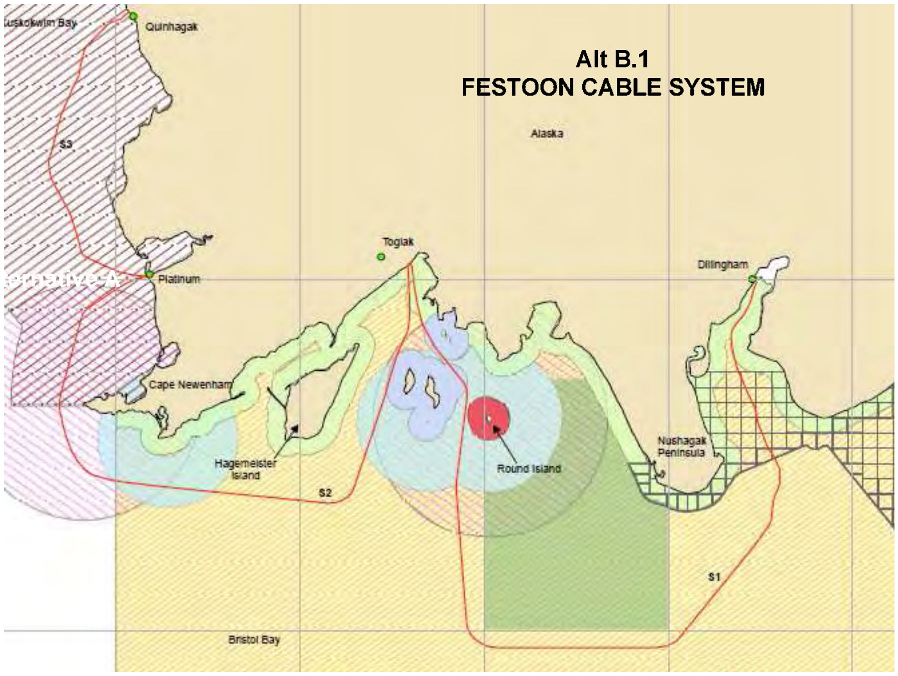


Figure 1: Alternative B.1 - Route Map

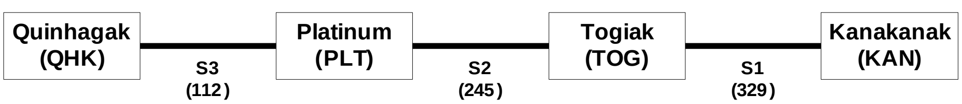


Figure 2: Alternative B.1 – Undersea Cable Connectivity Diagram

Alternative B.2 is a passive branching unit architecture, with a single cable landing at each of the four communities. Each cable segment is equipped with 2 fiber pairs. The Route Map and undersea cable connectivity diagram (Segment lengths shown in km) for Alternative B.2 are shown in Figures 3 and 4 respectively.

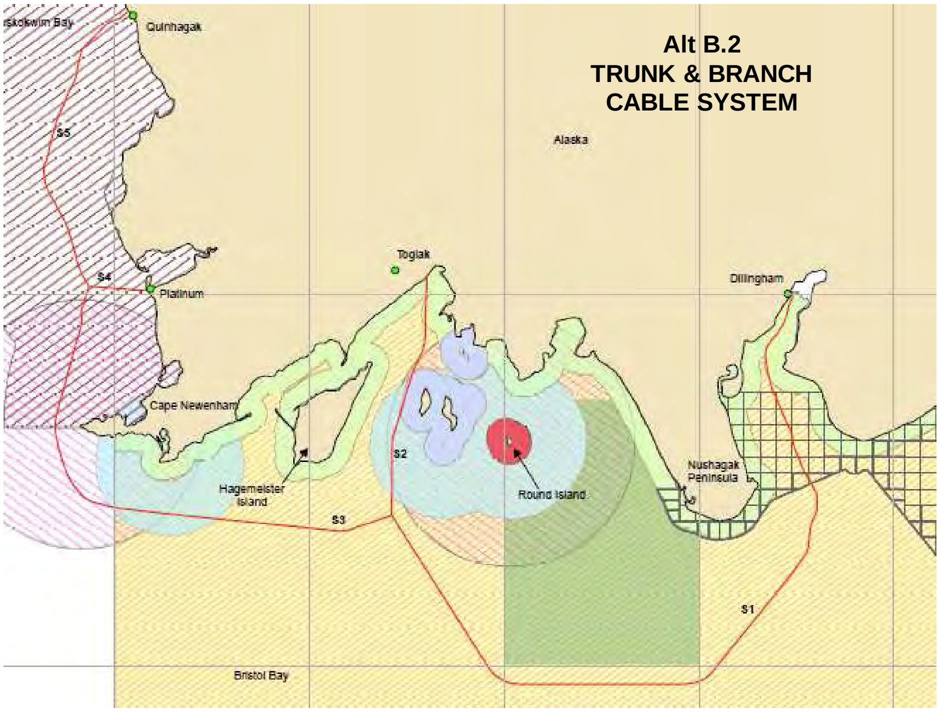


Figure 3: Alternative B.2 - Route Map

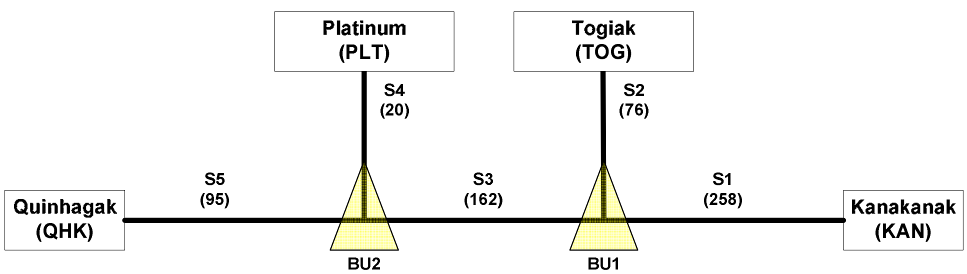


Figure 4: Alternative B.2 - Undersea Cable Connectivity Diagram

Alternative C.1 is similar to that of Alternative B.1 in that they are both festoon architectures. The difference, however, is that Alternative C.1 is a redundant festoon architecture, with an additional cable to support an architecture that provides redundancy in the event of a single undersea fault anywhere on the system. Alternative C.1 has dual cable landings at each of the four communities. Each cable segment is equipped with 2 fiber pairs. The Route Map and undersea cable connectivity diagram (Segment lengths shown in km) for Alternative C.1 are shown in Figures 5 and 6 respectively.

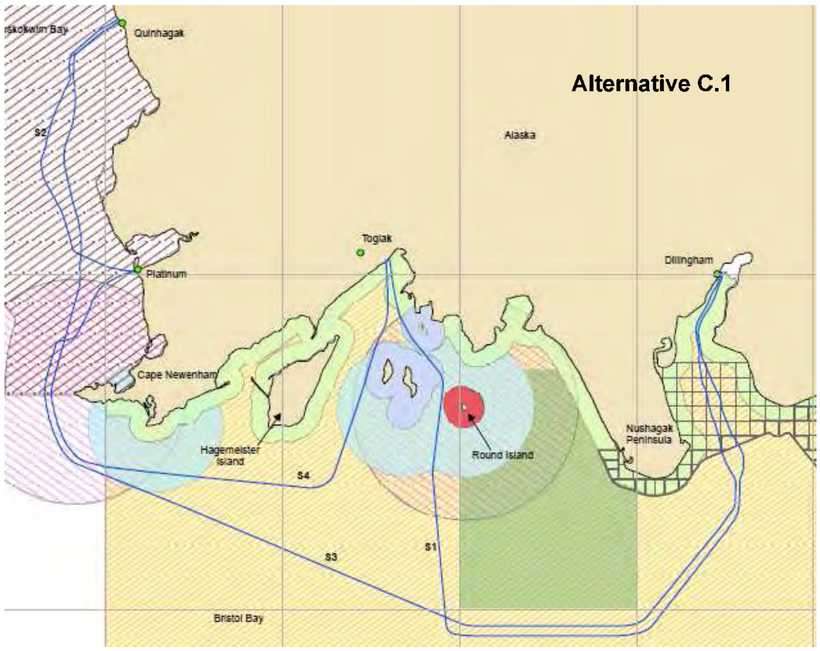


Figure 5: Alternative C.1 - Route Map

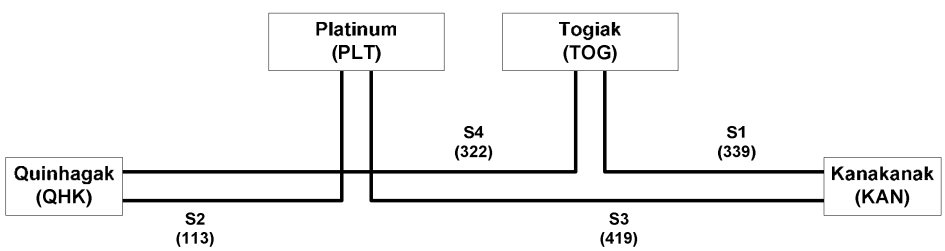


Figure 6: Alternative C.1 - Undersea Cable Connectivity Diagram

Alternative C.2 is similar to that of Alternative B.2 in that they are both trunk and branch architectures. The difference, however, is that Alternative C.2 is comprised of redundant trunk and branch systems. If there is a single undersea fault in either one of the cables systems, the other cable system will provide redundancy. Cable segments 1, 3, 4 and 6 are equipped with 2 fiber pairs while the branch cable segments 2 and 5 are equipped with 4 fiber pairs. The Route Map and undersea cable connectivity diagram (Segment lengths shown in km) for Alternative C.2 are shown in Figures 7 and 8 respectively.

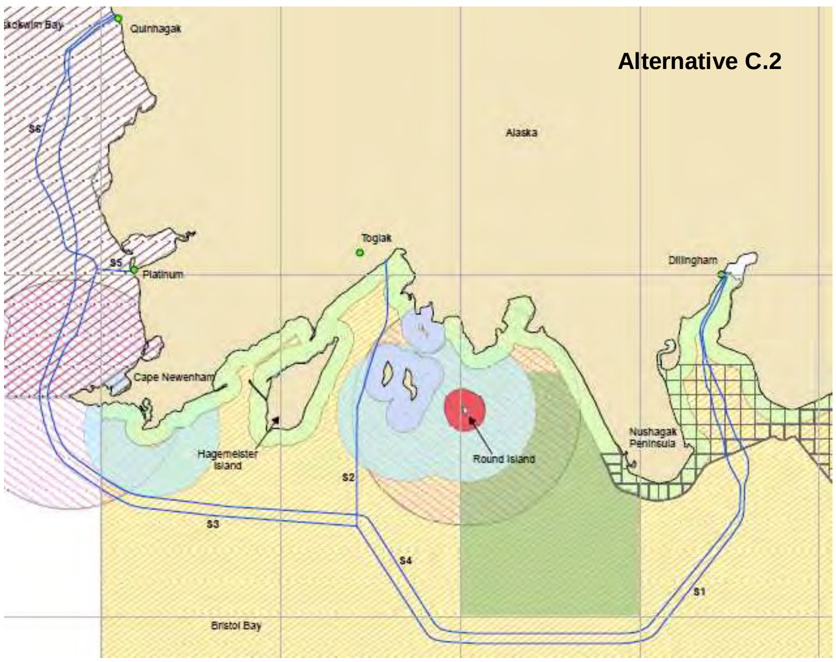


Figure 7: Alternative C.2 - Route Map

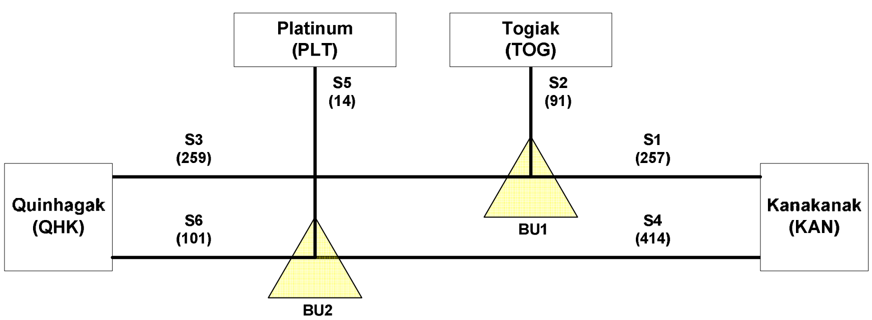


Figure 8: Alternative C.2 - Undersea Cable Connectivity Diagram

Since Alternatives B.1 and B.2 are not redundant, a single fault in the submarine cable system will isolate one or more communities, depending upon where the break occurs. For example, in alternative B.1, if Segment 1 is cut, all communities west of Dillingham would lose service, and therefore, all four of these communities would require satellite in order to restore service. The amount of bandwidth required would be that needed to support all communities west of Dillingham. In the case of a failure of segment S2 in alternative C.2, only Togiak would be cut off. Similarly, a failure of segment S5 would only cut off Platinum (and Goodnews Bay). The other communities have redundant paths, so they would not be isolated by a single failure. Therefore, only Togiak and Platinum require satellite back-up in alternative C.2, and only for the amount of bandwidth they require. Alternative C.1 is a fully redundant submarine cable architecture using a SONET ring approach. As such, there is at most a 50ms loss of service in the event of a cable failure.

DEVELOPMENT OF ALTERNATIVES

This section will discuss some of the key factors that influenced the design and costing of the alternatives.

Wet Plant Design

As part of this feasibility study, Fugro Pelagos investigated the major factors that would influence the routing and protection of the undersea cable for each alternative. The outcome of the investigation resulted in the specification by Fugro of a route for each alternative, as well as burial and armoring recommendations to ensure the safety of the cable.

The major risks that could potentially affect the cable were identified as ice scouring and the presence of Nearshore Bristol Bay Trawling Area (NBBTA), the only area where trawling is allowed along the routes of any of the four configurations. The risk of the cable being damaged by a trawler has been mitigated by having the routes for all four configurations routed outside of the zone where trawling is permitted. The risk of damage to the cable by ice scouring has been mitigated by the use of double armor cable, burial, and split pipe. Fishing and shipping activities are not expected to pose a significant risk to the cable.

The maximum Digital Line Section (DLS) length between any two of the communities is 440 km for DLS2 (S1+S3+S4) of Alternative B.2. This means that all of the segments can be implemented without repeaters with un-repeatered cable and terminal equipment. This results in a simpler design with significant cost savings compared to a repeatered system.

Dry Plant Design

Terminal equipment has been selected for transmission over the undersea cable that provides an initial 10 Gbps of capacity for each fiber pair of the segments, upgradeable to a minimum of 200 Gbps. This is four times greater than the initial requirement of 2.5 Gbps and will provide sufficient margin for any foreseeable future requirements. An additional bay of equipment will be required in each cable station to provide the SONET equipment to interface with the terrestrial network.

There is enough room in the existing cable stations to install the two additional bays required for undersea transmission and interface to the terrestrial network. Additional battery plant will be required, however, to provide sufficient back-up power for these two additional bays.

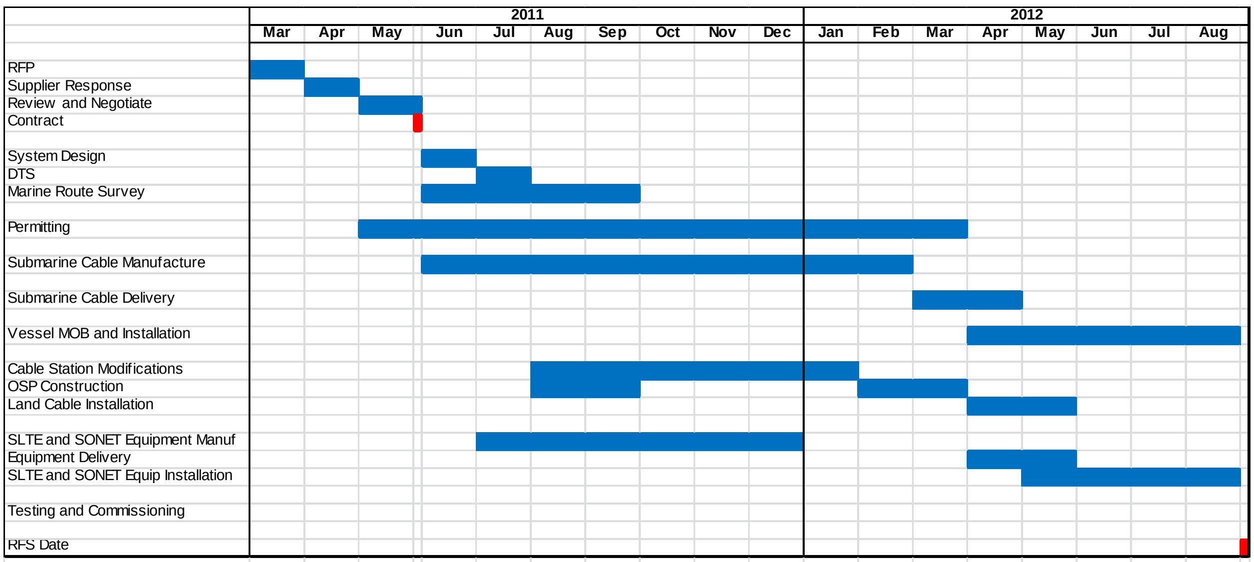
Satellite Restoration

As mentioned above, three out of the four alternative configurations require the use of satellite restoration to meet the system availability requirement in the event of a fault in the undersea cable. Alternatives B.1 and B.2 require satellite restoration at each of the four communities, and Alternative C.2 requires satellite restoration at Togiak and Platinum for branch cable failures. For each of these alternatives the cost of initial satellite equipment purchases and services has been included to provide coverage during a wet plant out-of-service fault.

Implementation

With aggressive program management, all four of the alternatives can be implemented by the required operations date of May 2013 as depicted in Figure 9 below. This assumes that the permitting and procurement start by March 2011. The major factor affecting the schedule will be the marine service weather window from late April to mid to late September, after the ice melts, and before the weather starts to worsen again.

All respondents to marine services, both Marine Survey and Marine Installation indicated that the required services could be performed within the available weather windows.



	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug
Payment Schedule %				15%	15%		15%			10%		10%	15%		10%		5%	5%
Cumulative Payment %				15%	30%	30%	45%	45%	45%	55%	55%	65%	80%	80%	90%	90%	95%	100%

Figure 9: Implementation and Billing Schedule

There are two main strategies that can be used to approach the implementation. One approach is to use a single "turn-key" contractor who will be responsible for everything. Another approach is for UUI to function as a general contractor (or hire a consultant to assist), procuring the various parts of the project from different companies, and making sure that everything fits together. The general contractor approach results in a less costly system, but there will be more risk in the coordination of independent organizations and suppliers. In addition, the general contractor approach offers the ability to sequence contracting to suppliers in order to prioritize required early start services. The advantage of the turn-key approach is that one company will have a financial incentive to complete the work efficiently and effectively. The disadvantage of the turn-key approach is that UUI will have to pay more to minimize the financial risk, and contracting negotiations will be more complex and difficult.

Operations and Maintenance

The costs for operations and maintenance of the wet plant, dry plant, and satellite equipment required to realize each alternative have been factored into the analysis.

For wet plant maintenance, two repairs to the undersea cable will be required for each alternative over the system lifetime based on historical fault data and analysis of the likely risks. The cost of using a vessel of opportunity to make these repairs at the time of the fault has been factored into the maintenance cost.

For dry plant operations and maintenance, costs associated with staffing a Network Operations Center and the cable stations have been included. In addition, maintenance contracts for the SONET equipment and equipment to interface with the wet plant have also been included.

It should be noted, that once the magnitude of the satellite restoration services were understood, and determined to be prohibitively expensive, efforts were suspended to determine the required Operations and Maintenance costs for Earthstation Equipment.

Pricing

Budgetary quotes were requested from various suppliers for each of the four alternatives for the desktop study, marine survey, turn-key supply of the alternative, and the separate supply of the major parts of the alternative. The quotes were evaluated, and where necessary, interpreted and adjusted to reflect continuing development of the alternative designs utilizing DRG experience from previous projects so that valid comparisons can be made.

A range of prices were obtained for each of the Alternatives from the three turnkey providers and a mixed supplier approach. A summary of the pricing is shown in the table below.

	Turnkey Supplier Pricing				**Comments**
Alternative	**Alter "A"**	**Alter "B"**	**Alter "C"**	**Mixed Pricing***	
B.1	$75.4M	$46.4M	$50.3M	$39.0M	Incl Satellite Earth Station Equipment
B.2	No Bid	$45.5M	No Bid	$37.4M	Incl Satellite Earth Station Equipment
C.1	$92.1M	$46.6M	$54.4M	$35.9M	Satellite Earth Station Equipment is not required.
C.2	$88.3M	$54.2M	No Bid	$37.3M	Incl Satellite Earth Station Equipment

Table 1: Summary of CapEx Pricing for Alternatives

<u>*Mixed Pricing:</u> The mixed pricing consists of pricing obtained from various suppliers (Marine Survey, Environmental Assessment, Cable Manufacture, Installation, Terminal Equipment, etc.) required to provide all of the materials and services to implement the Alternative Submarine Cable System. The Mixed Pricing shown in Table 1 is an aggregation of those prices which would result in a minimum cost for the associated Alternative Submarine Cable System so that a lower limit for the Price could be established for Financial Analysis. This does not constitute a recommendation of these Suppliers by DRG.

The corresponding compilation of NPV CapEx and OpEx (Operations and Maintenance) Pricing is shown in Table 2 below.

	Turnkey Supplier Pricing				Comments
Alternative	**Alter "A"**	**Alter "B"**	**Alter "C"**	**Mixed Pricing***	
B.1	$123.8M	$94.8M	$98.7M	$87.4M	Incl Satellite Earth Station Equipment and Satellite restoration costs.
B.2	No Bid	$93.9M	No Bid	$85.7M	Incl Satellite Earth Station Equipment and Satellite restoration costs.
C.1	$95.6M	$50.2M	$57.9M	$39.4M	Satellite restoration is not required.
C.2	$96.4M	$62.2M	No Bid	$45.4M	Incl Satellite Earth Station Equipment and Satellite restoration costs.

Table 2: Summary of CapEx and OpEx Pricing for Alternatives

As shown in Table 2 above, the addition of Satellite Restoration costs as part of OpEx results in C.1 as the "Best Candidate" Alternative Submarine Cable solution.

Focusing on Alternative C.1, an assessment of the Pricing was conducted consisting of expected negotiation discounts, Impact of Performance Bonding, allocation of Contingency Funds, and possible System Cost savings through reduction of test equipment and management systems and implementation of minimal upgrade capability. Table 3 below provides the pricing adjustments and the expected final pricing.

	Alter "A"	**Alter "B"**	**Alter "C"**	**Mixed**
CapEx	$92,078,974	$46,626,756	$54,362,649	$35,882,408
Anticipated Negotiating Dis	30%	15%	20%	10%
Negotiation Target	$64,455,282	$39,632,743	$43,490,119	$32,294,167
Performance Bonding %	0.50%	0.50%	0.50%	1.50%
Performance Bonding Adj	$644,553	$396,327	$434,901	$968,825
Contingencies	$2,800,970	$2,800,970	$2,800,970	$3,800,970
SubTotal	$67,900,805	$42,830,040	$46,725,990	$37,063,962
Potential Cost Savings	($1,402,000)	($1,402,000)	($1,402,000)	($1,402,000)
Total Projected Cost	**$69,302,805**	**$41,428,040**	**$45,323,990**	**$35,661,962**

Table 3: Adjusted Alternative C.1 Pricing

The Mixed Pricing is the minimum reasonable price that one might expect for Alternative C.1. As changes to selected Suppliers are made this price would change accordingly. Note that the Contingency Funds allocated for the Mixed Pricing (11.8%) is greater than that allocated to a Turnkey implementation to account for additional risks to the program.

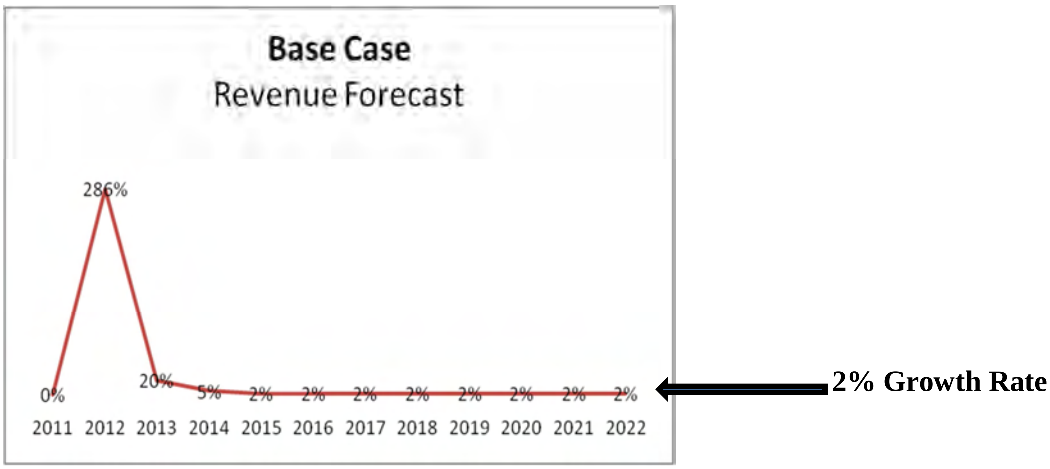
FINANCIAL ANALYSIS

Business Case Development

With focus on "Beat Candidate" Alternative C.1, a financial analysis was performed utilizing a business case that replicated the UUI business case used in support of the Baseline Microwave System for the RUS Grant and Loan Application. The business case was then modified to the extent necessary to implement Alternative C.1. Implementation of Alternative C.1 requires more capital than currently provided by the RUS Grant and Loan. A commercial loan was included in the business case to cover the differential in capital. The Business Case with a 12 year projection horizon was constructed around the following Input Parameters and Assumptions based on the UUI microwave only business case.

- Uses the UUI Revenue Projections without alteration
- Input Parameters:
    - Inflation Rate 2.73%
    - Discount Rate 9%
    - RUS Loan Interest 5%
    - RUS Loan Amortization Period 20 years
    - Commercial Loan Interest 9%
    - Commercial Loan Amortization Period 20 years
    - Cost of Capital 9%
- RUS Grant $44M
- RUS Loan $44M
- Commercial Loan $ differential required in Capital
- Asset (based on Debt) Depreciation 20 years
- Income Tax 40% Payable on Positive EBT

- Key Assumptions
  - The IRR and MPV calculation considers only the Debt portion of the required capital with no Tax payment, and no Loan Principal or interest payment.
  - Revenue from the TERRA-SW Project is used to reduce required capital using Average Revenue
  - Equal and Simultaneous utilization of the RUS Grant and Loan Funds (50% / 50%)
  - Any additional capital requirements are covered using a commercial bank loan with a 9% interest rate payable the first year, NO principal payment, and payback period of 20 years.



Business Case Evaluation Criteria

Three financial criteria were considered to assess the feasibility of Alternative C.1. These are:

Internal Rate of Return (IRR): Rate of return used in capital budgeting to measure and compare the profitability of investments - calculated on Debt only.

Criteria: IRR > Cost of Money

Payback Period: Period of Time required for the return on an investment to "repay" the sum of the original investment.

Criteria: Payback should be Net Positive projection horizon of 12 years.

Net Present Value (NPV): Indicator of the value of an investment in terms of today's dollars.

Criteria: NPV should be Net Positive over the project horizon.

A Time Interest Earned Ratio (TIER) was also calculated over the project horizon to determine if the project met RUS requirements for TIER.

Business Case Evaluation Results

Table 4 below contains the key Input Parameters and Results for both the Baseline and C.1 Submarine Cable System implementation.

Parameter	**Baseline Case Microwave Only Scenario**		**Implementation of Alternative C.1 Submarine Cable System**	
Input				
Total CapEx	$95.9M		$113.9M ($35M Subsea, $78.9M Remainder)	
Total OpEx	$34,8M		$33.7M ($5.7M Subsea, $27.9M Remainder)	
Total Revenue	$102M		$102M	
Required Capital	$92.1M ($4M RUS Grant, $44M RUS Loan, $4.1M Commercial Loan)		$109.9M ($4M RUS Grant, $44M RUS Loan, $21.9M Commercial Loan)	
Results		**Criteria Met**		**Criteria Met**
IRR	6.51%	No	0.65%	No
NPV	-$4.1M	No	-$17.0M	No
Payback Period	9 Years	Yes	11 Years	Yes

Table 4: Business Case Evaluation Results

Neither the Baseline Case nor the Submarine Cable System implementation cases meet all of the financial criteria defined earlier.

Figure 10 below shows the results of the TIER calculation for both the Baseline Microwave-only and Submarine Cable System implementation case. The Baseline Microwave-only case meets the RUS criteria for TIER of TIER > 1.5 through 2018, and > 1.0 thereafter, while the Submarine Cable System case does not. Note: The significant drop in the Submarine Cable System TIER in year 2020 reflects a presumed cable repair that year.

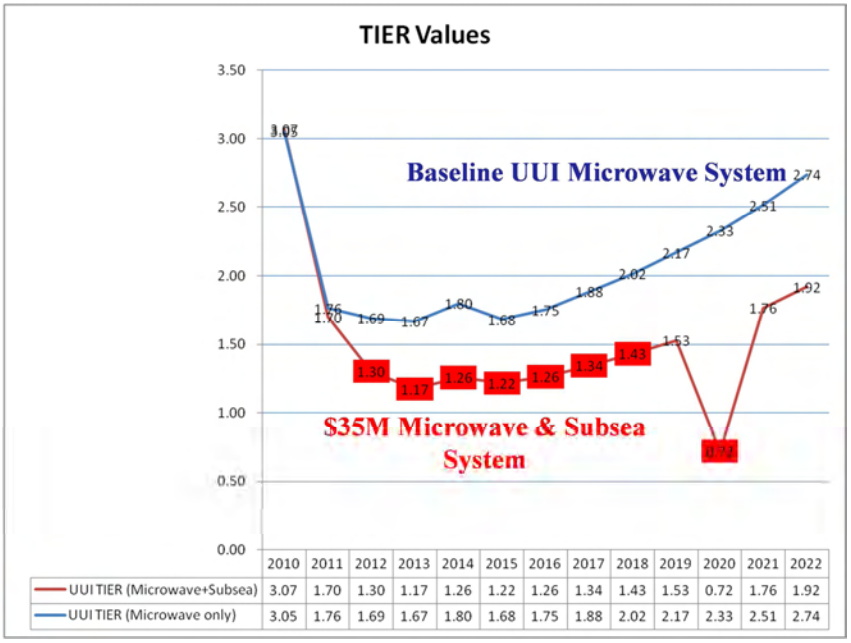


Figure 10: TIER Value Results for Baseline Microwave Case and Submarine Cable System Implementation Cases

In addition to the results provided above, other business case scenarios were executed to determine the level of Revenue increase to meet the three financial criteria and RUS TIER requirements. The results of these sensitivity studies are shown in Table 5 and Figure 11 below.

Link Type (Dillingham to Quinhagak)	Link Cost ($M)	Revenue Tail Constant Growth Rate (%)	OpEx ($M)	IRR (%)	Payback (Yrs)	NPV ($M)	Comment
Microwave	$16.4	2%	$34.8	6.5%	9	($4.1M)	Baseline UUI TERRA-SW Project
Submarine Link	$35.0	5%	$33.7	3.4%	10	($12.5M)	Replace MW Link with Subcable
Submarine Link	$35.0	7%	$33.7	5.5%	9	($8.2M)	Replace MW Link with Subcable
Submarine Link	$35.0	9%	$33.7	7.6%	9	($3.5M)	Replace MW Link with Subcable
Submarine Link	$35.0	11%	$33.7	9.6%	8	$1.7M	Replace MW Link with Subcable
Submarine Link	$35.0	S Curve	$33.7	9.1%	8	$0.3M	Replace MW Link with Subcable

Table 5: Revenue Sensitivity Study Results

(Case highlighted in YELLOW is the Baseline Microwave Case. Cases highlighted in Green meet the Financial Criteria.

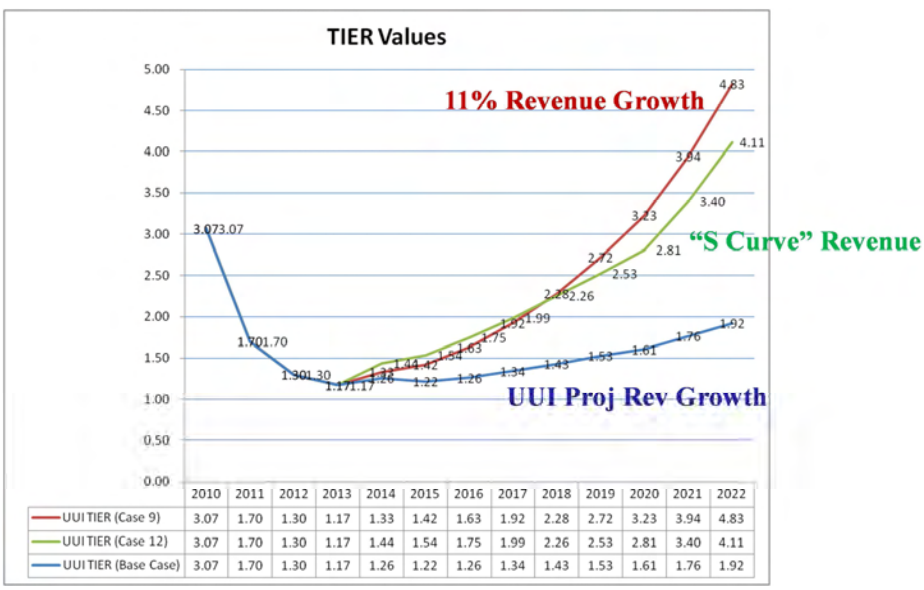


Figure 11: TIER Projections for Baseline Revenue, 11% Revenue Growth, and "S Curve" Revenue Growth

Implementation of the minimum priced C.1 Alternative Submarine Cable System as an alternative to the microwave link between Dillingham, AK and Quinhagak, AK would require a significant increase in Projected Revenues to meet the financial criteria defined above and the RUS TIER requirements.

COMPARISON WITH EVALUATION CRITERIA

Data gathered and results generated from the development of the submarine cable system alternatives as well as the financial analysis were in a comparison with a set of 12 agreed upon Evaluation Criteria. That comparison is provided below.

				Submarine System Alternative				Explanation
#	Criterion	Parameter of Measure	Quantitative	B.1	B.2	C.1	C.2	
5	Critical Backup Service	Can Critical Backup Services be implemented within 4 hours	Yes / No	Yes	Yes	Yes	Yes	In all all alternatives, there are redundant transmission equipment that provide transmission protection in the event of a card failure. In addition, it is well within the ability of local staff to reach the site and replace any defective card within 4 hours (local sparing was included in the pricing). For wet plant faults, In the case of B.1 and B.2, all critical restoration services are provided by Satellite Backup, and can be achieved within 4 hours. In the case of C.1, critical restoration services are provided by means of the ring architecture approach of the implementation, which is resilient to a single fault scenario, and consequenty, critical services can be restored within 4 hours. For C.2, the primary trunk of C.2 is redundant and resilient to a single fault. Cable Landing spurs into Togiak and Platinum are not redundant, but restoration of services to these local communities is via satellite.
6	Cost of Critical Backup Services	CapEx & OpEx $/bit for restoration	Present Value $	N/A	N/A	$0.00	N/A	Not relevant since submarine cable repair can not be accomplished in 48 hours, therefore restoral bandwidth must be reserved on the satellites.
7	Restoral Backup Service	Can Restoral Backup Services be implemented within 48 hours	Yes / No	Yes	Yes	Yes	Yes	Same rationale for Critical Backup Services applies to complete restoral services.

				Submarine System Alternative				Explanation
#	Criterion	Parameter of Measure	Quantitative	B.1	B.2	C.1	C.2	
7a	Restoral Backup Service	MTTR	Yes / No	No	No	Yes	No*	Only System Alternative C.1 can be assured to meet a full service restoration in 15 days, because it can tolerate a wet plant fault without loss functionality. Systems B.1, B.2, and C.2 require a cable repair to return to full service. Given ship availability, good weather, and depending on ship berth location and wet plant spares location, a cable repair could be achieved between 12 and 15 days. If however,a fault occurred immediately before the operation weather window closed, repairs could be delayed by 6 months. In addition, if the repair was required in shallow water, a barge would need to be mobilized and provisioned with splicing equipment to make the repair, and this could reasonable take 8 weeks. C.1, because of its redundant design and resiliency to a cable fault is the only alternative that can "wait" for a cable repair to an impacted segment. Consequently, it is also a good candidate for "Spot Market" repair scenario.
8	Cost of Restoral Backup Services	CapEx & OpEx for restoration	Present Value $	$50.4M	$50.4M	$0	$6.03M	NPV of Satellite Restoration Costs over 25 year life.

				Submarine System Alternative				Explanation
#	Criterion	Parameter of Measure	Quantitative	B.1	B.2	C.1	C.2	
9	Total Availability	Calculate System Availability compared to desired values: 99.98% for Alternative B 99.98% for Alternative C	Calculated Value	99.99726	99.99728	99.98597	99.98651	Availability based on 3 Month MTTR
10	Wet Plant Faults	Number of Faults and Outage Time	Calculated Value	0.700	0.658	0.904	0.891	Probability of 1 fault over 25 years. MTTR of 3 months.

				Submarine System Alternative				Explanation
#	Criterion	Parameter of Measure	Quantitative	B.1	B.2	C.1	C.2	
11	System Cost	Total CapEx and Total OpEx $s	Present Value $M	39.0 48.4 87.4	37.4 48.4 85.8	35.9 3.5 39.4	37.3 8.1 45.4	CapEx OpEx Total System costs using Mixed vendor solution

RISK ANALYSIS

Technical Risk

There is little technical risk regarding the implementation and performance of any alternative submarine cable system, and specifically C.1.

Third-party suppliers have demonstrated the ability to provide the required non-repeatered transmission capacity on the system (and much greater) over the longest DLS for C.1, and in fact is the best candidate as a supplier of the SLTE equipment.

While there can never be a guarantee that external aggression events have been entirely avoided, the analysis of the region indicates that the two of the three primary external aggression causes – anchoring and fishing do not pose significant threat, and ice scouring threat has been mitigated by near shore Split Pipe (500m) and 1 meter burial and use of Double Armor cable to the 10 meter water depth mark.

In addition, the Ring Architecture of the C.1 Alternative results in a very resilient cable system, capable of withstanding a fault while providing the required service.

Schedule Risk

There are three primary risks associated with the implementation schedule for any alternative submarine cable system. These are primarily driven by the RUS Ready for Service date of May 31, 2013 and the limited opportunities for marine services based on the available weather windows (April – September).

As result of these constraints, the following steps need to be executed:

1) A Project Decision needs to be made prior to the completion of 1st Quarter 2011.
2) Project Contract and Negotiations need to be completed by the end of 2nd quarter 2011 with focus and sequencing based on required task dates and durations,
3) Permitting, which is dependent on various federal, state, and local agencies, could take as long as 12 months and is required for installation, and should be initiated as early as possible.

4) Marine Survey (~60 days of marine time) needs to be completed in the available 2011 weather window to support the final cable configurations and permitting process,
5) Installation of the Submarine Cable System requires execution and completion in the 2012 weather window.

Financial Risk

The Financial Analysis presented indicates that the implementation of Alternative C.1, the best alternative submarine cable system, would range in cost from ~$35.7M for the minimum Mixed Supply Implementation to ~$45.3M for Turnkey Implementation.

DRG believes that a Mixed Supply Implementation is the best alternative for the system, primarily due to the availability of an excellent product suite for the SLTE equipment.

HOWEVER, based on UUI Revenue Projections and Business Case Constraints (Loan vs Grant funds usage, commercial paper terms, etc.), even the lowest cost submarine cable system price makes the business case problematic.

CONCLUSIONS

All four of the alternatives evaluated as part of this feasibility study would serve as a satisfactory substitute for the proposed microwave system from a technical standpoint. The four alternatives have a system design life of 25 years, initial capacity of 10Gbps per fiber pair upgradeable to a minimum of 200 Gbps per fiber pair, a SONET interface to the local network, and greater than 99.98% availability.

Three of the alternatives require satellite backup from two or more of the cable stations in the event of a cable fault to meet the availability requirement. Alternative C.1 does not require any satellite backup since it is a ring configuration that is fully redundant. The undersea portion of Alternative C.1 is more expensive than that of the other three configurations. With the significant capital and operating costs of the associated necessary satellite backup factored in for the other three configurations, overall Alternative C.1 is the most cost effective alternative to the proposed microwave system. Alternatives B.1 and B.2 are more than twice as expensive as Alternative C.1 and Alternative C.2 is about 12% more expensive.

Alternative B.1	$87.4M
Alternative B.2	$85.7M
Alternative C.1	$39.4M
Alternative C.2	$45.4M

Table 6: NPV of CapExs and OpEx for Alternatives - General Contractor Approach

Alternative C.1 is the most attractive of the alternatives that were investigated. As can be seen from Table 7 below, the capital expense of Alternative C.1 is more than that of the proposed microwave system and the operating expense is less. The end result is that the overall NPV of Alternative C.1 is more than that of the proposed microwave system, resulting in Alternative C.1 being less attractive than the microwave system from a financial perspective.

	CapEx	OpEx
Alternative C.1	S113.9M	$33.7M
Microwave System	$95.9M	$34.8M

Table 7: CapEx and OpEx Comparison between Alternative C.1 and the Baseline Microwave System

Table 8 below compares Alternative C.1 with the microwave system with respect to IRR, NPV, Payback Period, and TIER Values, assuming the revenue projections provided by UUI.

Financial Criteria	Baseline Case Microwave Only Scenario	Implementation of Alternative C.1 Submarine Cable System
IRR	6.51%	0.65%
NPV	-$4.1M	-$17.0M
Payback Period	9 Years	11 Years
TIER >1.5 thru 2018	Yes	No

Table 8: Business Case Results Comparison between Microwave-only and C.1 Submarine Cable Implementations

As can be seen in the table, Alternative C.1 does not meet any of the three financial criteria, nor does it meet the RUS Tier Value requirements.

In summary, although Alternative C.1 is technically viable and the most financially attractive of the four alternatives to the proposed microwave system, it is not an economically feasible and prudent alternative due to its inability to meet all of the financial evaluation criteria requirements and as a consequence:

None of the Submarine Cable System Alternatives are Economically Feasible or Prudent.

REFERENCES AND APPENDICES

References

1. DRG_UUI20101119-01, Rev A, Evaluation Criteria, December 15, 2010
2. Web Source, www.eia.doe.gov/electricity/epm/table5_6_b.html, U.S. Energy Information Administration, Independent Statistics and Analysis, Average Retail Price of Electricity to Ultimate Customers by End-Use Sector, by State, Report Released November 15, 2010.
3. ICPC Recommendation No. 9, Minimum Technical Requirements for a Desktop Study, Issued by the International Cable Protection Committee, 2008.
4. ICPC Recommendation No.6, Recommended Actions for Effective Cable Protection, (Post Installation), Issued by the International Cable Protection Committee, 2008.
5. GCI Investor Update, Presented by John Lowber, SVP &CFO, October 2010.
6. DRG_UUI20110124, Request for Information on Financial Impact of RUS Wage and RUS Performance Bonding Requirements, January 2011.
7. DRG_UUI20110126-01, UUI Questions on DRAFT Study Report, 20 and 26 Jan 2011, and Study Report Responses", 29Jan2011.

Appendices

1. Appendix 1.0, DRG_UUI20110113-01, "TERRA-SW Alternatives Feasibility Study Project Report", February, 2011.
   a. Appendix A – Request for Quotes
   b. Appendix B – Supplier Responses
   c. Appendix C - Information Sources
   d. Appendix D – Fugro Marine Feasibility Study
   e. Appendix E – Satellite Restoration Development
   f. Appendix F – O&M, Wet Plant Storage and Repair Development
   g. Appendix G – Reliability and Availability Development

    h. Appendix H – Pricing Schedules
    i. Appendix I –Financial Analysis
    j. Appendix J – Applicable Standards
    k. Appendix K – RFP, Proposal, and SOW

2. Appendix 2.0, UUI Comments
    a. DRG_UUI20110126-01, Rev A, UUI Questions on Draft Report, 20 and 26Jan2011, and DRG Responses, 26Jan2011.
    b. UUI Comments to Interim Final Report Conclusion, 3Feb2011
    c. UUI Comments to Interim Final Report, 3Feb2011

3. Appendix 3.0 U.S. Fish & Wildlife Services Comments