

# 3<sup>rd</sup>- Party Surveillance and Broadcast Services

In Conjunction with Federal Aviation Administration Contract  
DTFAWA-07-C-00067

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## ROUGH-ORDER MAGNITUDE (ROM) ESTIMATE FOR

# TRUCKEE-TAHOE ADS-B SERVICE VOLUME

TPSV-2018-0001

May 18, 2018

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### REVISION RECORD

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**1.0 INTRODUCTION**

The Truckee-Tahoe Airport District is working with the Federal Aviation Administration (FAA) and Harris Corporation to improve air traffic surveillance to the Truckee-Tahoe Airport (KTRK) by expanding the existing Harris Surveillance & Broadcast Services (SBS) footprint to provide coverage for the airport respective approach and departure corridors. Under this initiative, the Truckee-Tahoe Airport District and the FAA SBS Program Office will agree on SBS service and coverage requirements to create a new single SBS Terminal Service Volume (SV).

The prospective Truckee-Tahoe SV is predicated upon the following:

- A. FAA SBS Program Office, Harris, and Truckee-Tahoe Airport District will agree on final requirements for SBS services and coverage.
- B. FAA SBS Program Office will authorize Harris to establish and sustain the new Truckee-Tahoe SV in accordance with FAA SBS contract DTFAWA-07-C-00067 subject to available private party funding.
- C. Harris will enter into a separate agreement with the Truckee-Tahoe Airport District to provide SBS services for the new SV.
- D. Truckee-Tahoe Airport District will provide all required funding for SV establishment and sustainment directly to Harris in lieu of any FAA funding.

The Truckee-Tahoe SV initiative is currently in the planning phase and final requirements for SBS service have not been completed. This Rough Order Magnitude (ROM) estimate for delivery of these SBS services is provided at the request of the Truckee Tahoe Airport District to support their planning for this initiative. ***The ROM considers the preliminary air traffic requirements for SBS Coverage provided to Harris and is not based on a SV design.***

**2.0 SCOPE OF REQUIREMENTS**

The Truckee-Tahoe SV initiative is currently in the planning phase and final requirements for SBS service have not been completed. The Truckee-Tahoe Airport has been approved by the FAA to develop departure and instrument approach procedures under the FAA Performance Based Navigation Implementation Process per JO 7100.41. Expanded surveillance capability to encompass the existing & proposed procedures is expected to increase safety and minimize environmental impacts. The Truckee-Tahoe ‘Air Traffic Requirements for SBS Coverage’ form dated April 19, 2018 provides preliminary SBS coverage requirements as the basis for the prospective Truckee-Tahoe SV. *It is expected that the prospective SV design will focus on coverage for the waypoints/fixes specified.*

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Select requirements excerpts from this form that help to define the objectives for the prospective SV are as follows:

**Primary Airport Name:** Truckee-Tahoe Airport

1. SBS coverage for this primary airport is Surface to 24,000 AGL  
(Minimum height) (Recommended maximum height)

2. Th	LID	Type Approach (SBS, ILS, VOR, TACAN, GPS, NDB, etc)	Runway	Latitude, Longitude, & MSL Altitude of Lowest Point on the Approach Path to be Covered	Lowest Point -Type (FAF, OM, MM, EOR, MAP, etc.) (MAP preferred)
1	TRK	RNAV (GPS)	11	Latitude: N39° 19' 54.13" Longitude: W120° 10' 04.98" Altitude: 6253	MAP
2	TRK	RNAV (GPS) Y	20	Latitude: N39° 20' 13.88" Longitude: W120° 07' 23.26" Altitude: 6222	MAP
3	TRK	RNAV (GPS) Z	20	Latitude: N39° 20' 13.88" Longitude: W120° 07' 23.26" Altitude: 6222	MAP
4	TVL	GPS	18	Latitude: N38° 56' 53.75" Longitude: W119° 59' 03.29" Altitude: 6664	MAP
5	TVL	LDA/DME	18	Latitude: N38° 58' 40.53" Longitude: W119° 58' 41.44" Altitude: 6454	MAP

3. The SBS should provide SBS coverage at the indicated altitudes for the following satellite airports:

Item	Airport Name & LID	ARP Elevation (MSL)	Latitude / Longitude	Min. Alt. / Max. Alt. (MSL)
1	Lake Tahoe Airport - TVL	6268	N38° 53' 38.00"/ W119° 59' 43.20"	6454/12000

4. The SBS should provide SBS coverage specified by location/altitude for the following navigational fixes, airway/approach intersections, and other navigation points.

Item	Fix, Intersection, Navigation Point	Lat/Long in Deg/Min/Sec (DD° MM' SS.s")	Min. Alt./ Max. Alt. (MSL) (500' below MEA or Mandatory Alt)
1	AWEGA	N39° 36' 49.83"/ W120° 01' 31.06"	10700
2	BULOK	N39° 32' 35.06"/ W120° 18' 26.88"	11000
3	BWMEN	N39° 17' 54.36"/ W120° 05' 23.36"	6800
4	CONYO	N39° 13' 47.18"/ W120° 45' 33.58"	11000
5	DLANI	N39° 07' 33.95"/ W120° 03' 39.56"	11500
6	FAMPU	N39° 26' 29.90"/ W120° 17' 14.06"	9700
7	FILUV	N39° 24' 57.53"/ W120° 05' 41.93"	8040
8	HARDY	N39° 19' 54.95"/ W120° 15' 10.29"	10300
9	HETRY	N39° 12' 31.35"/ W120° 05' 49.65"	10800
10	HUYJO	N39° 14' 56.64"/ W119° 50' 56.26"	11000
11	JEZYY	N39° 01' 52.03"/ W119° 58' 29.00"	8700
12	KINGS	N39° 14' 51.47"/ W119° 55' 58.68"	12000
13	KNETH	N39° 16' 03.01"/ W120° 07' 16.03"	7800
14	LEKYI	N39° 31' 39.27"/ W120° 21' 18.29"	10800
15	LINNN	N39° 13' 48.00"/ W120° 05' 24.00"	8800
16	LODOG	N39° 11' 00.00"/ W120° 05' 06.00"	10000
17	MARDR	N39° 19' 54.13"/ W120° 10' 04.98"	6253
18	MX18	N38° 58' 40.53"/ W119° 58' 41.44"	6454
19	OBAVE	N39° 10' 16.41"/ W119° 58' 40.31"	10800
20	OPOJI	N39° 28' 44.76"/ W120° 04' 20.58"	9500
21	PWWDR	N39° 27' 55.37"/ W120° 05' 38.09"	12000
22	RICHY	N38° 59' 52.14"/ W120° 01' 09.00"	8300
23	Approach End RW02 (TRK)	N39° 18' 52.27"/ W120° 08' 23.90"	5900
24	Approach End RW11 (TRK)	N39° 19' 29.44"/ W120° 09' 09.86"	5900
25	Approach End RW18 (TRK)	N38° 54' 11.46"/ W119° 59' 33.41"	6255
26	Approach End RW20 (TRK)	N39° 19' 32.07"/ W120° 07' 54.33"	5900
27	Approach End RW29 (TRK)	N39° 19' 29.44"/ W120° 09' 09.86"	5900

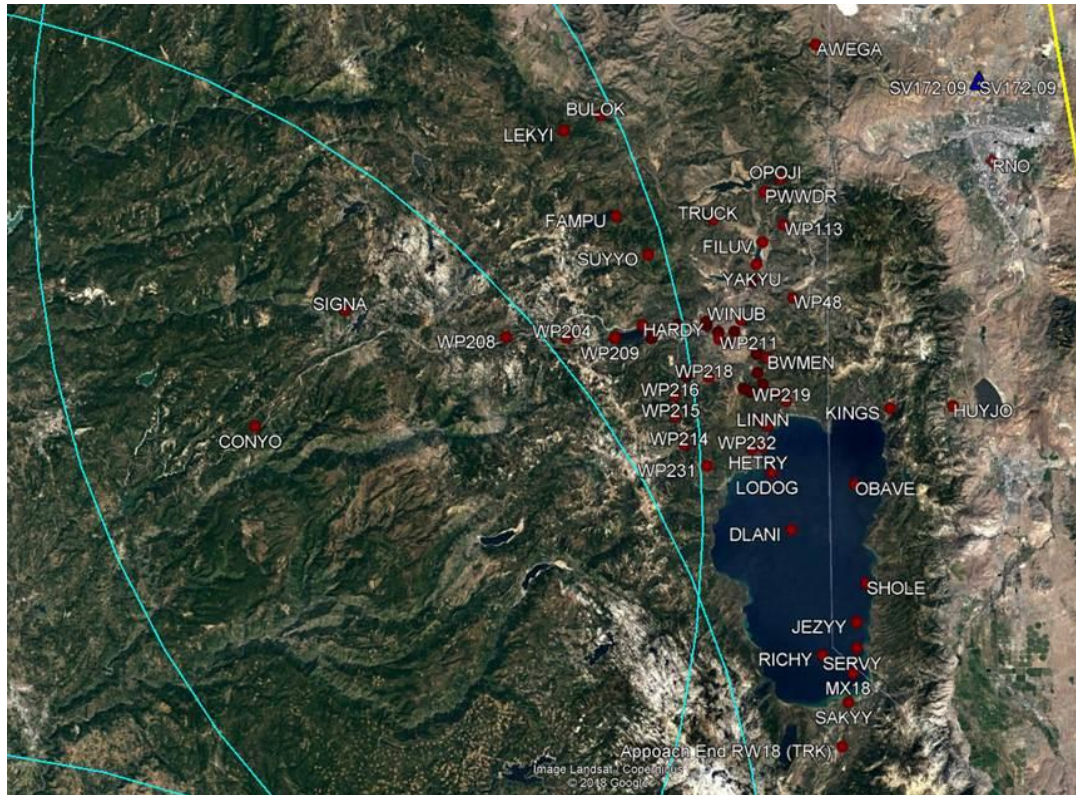
<b>Surveillance and Broadcast Services</b>	<b>ROM:  Truckee-Tahoe Terminal Service Volume</b>	<b>TPSV-2018-0001</b>
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<b>Item</b>	<b>Fix, Intersection, Navigation Point</b>	<b>Lat/Long in Deg/Min/Sec (DD°MM' SS.s")</b>	<b>Min. Alt/ Max. Alt. (MSL) (500' below MEA or Mandatory Alt)</b>
28	SAKY	N38° 56' 53.75" W119° 59' 03.29"	6664
29	SERY	N39° 00' 15.95" W119° 58' 26.85"	8300
30	SHOLE	N39° 04' 14.03" W119° 57' 45.62"	9500
31	SIGNA	N39° 20' 49.57" W120° 38' 28.84"	11000
32	SUYYO	N39° 24' 11.52" W120° 14' 43.82"	8480
33	TRUCK	N39° 26' 15.67" W120° 09' 42.48"	12400
34	WINUB	N39° 20' 13.88" W120° 07' 23.26"	6222
35	WP113	N39° 25' 59.46" W120° 04' 03.02"	8000
36	WP204	N39° 19' 10.58" W120° 21' 05.84"	11000
37	WP208	N39° 19' 12.75" W120° 25' 52.73"	9400
38	WP209	N39° 19' 09.30" W120° 17' 21.45"	9400
39	WP210	N39° 19' 08.20" W120° 14' 27.79"	9000
40	WP211	N39° 19' 05.64" W120° 09' 09.65"	7840
41	WP214	N39° 12' 39.97" W120° 11' 56.87"	9400
42	WP215	N39° 14' 22.53" W120° 12' 36.43"	8650
43	WP216	N39° 15' 37.90" W120° 12' 39.09"	8150
44	WP217	N39° 16' 45.90" W120° 11' 40.85"	7550
45	WP218	N39° 16' 45.02" W120° 09' 57.76"	7000
46	WP219	N39° 15' 18.10" W120° 03' 56.22"	8100
47	WP220	N39° 18' 09.46" W120° 06' 09.91"	6050
48	WP220	N39° 18' 09.46" W120° 06' 09.91"	6600
49	WP221	N39° 16' 19.11" W120° 05' 43.43"	7400
50	WP222	N39° 15' 51.26" W120° 06' 39.81"	6906
51	WP223	N39° 14' 11.67" W120° 06' 11.08"	7065
52	WP224	N39° 15' 45.31" W120° 04' 44.33"	7800
53	WP228	N39° 17' 00.88" W120° 06' 06.82"	6270
54	WP231	N39° 11' 25.13" W120° 10' 12.31"	9700
55	WP232	N39° 12' 24.17" W120° 06' 38.51"	8100
56	WP242	N39° 20' 08.16" W120° 10' 09.28"	6270
57	WP243	N39° 19' 11.93" W120° 17' 18.75"	8072
58	WP244	N39° 19' 28.47" W120° 14' 19.35"	7328
59	WP245	N39° 19' 57.73" W120° 12' 24.72"	6831
60	WP48	N39° 21' 34.97" W120° 03' 17.91"	7000
61	WUDVU	N39° 22' 38.56" W120° 06' 31.60"	7120
62	YAKYU	N39° 23' 36.59" W120° 06' 10.87"	7520

As noted in note on Requirement 2; The Truckee-Tahoe Airport has been approved by the FAA to develop departure and instrument approach procedures under the FAA Performance Based Navigation Implementation Process per JO 7100.41. Expanded surveillance capability to encompass the existing & proposed procedures is expected to increase safety and minimize environmental impacts. The Waypoints/Fixes listed above include fixes making up current procedures as well as fixes for proposed notional procedures. Due to the extreme terrain around the TRK airport we included these fixes in hopes of ensuring the maximum SBS coverage for the area.

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Figure 1 presents a depiction of the geographic Waypoints/Fixes listed above.



**Figure 1: Geographic Depiction of Truckee-Tahoe SV Waypoints/Fixes**

### 3.0 TECHNICAL SOLUTION

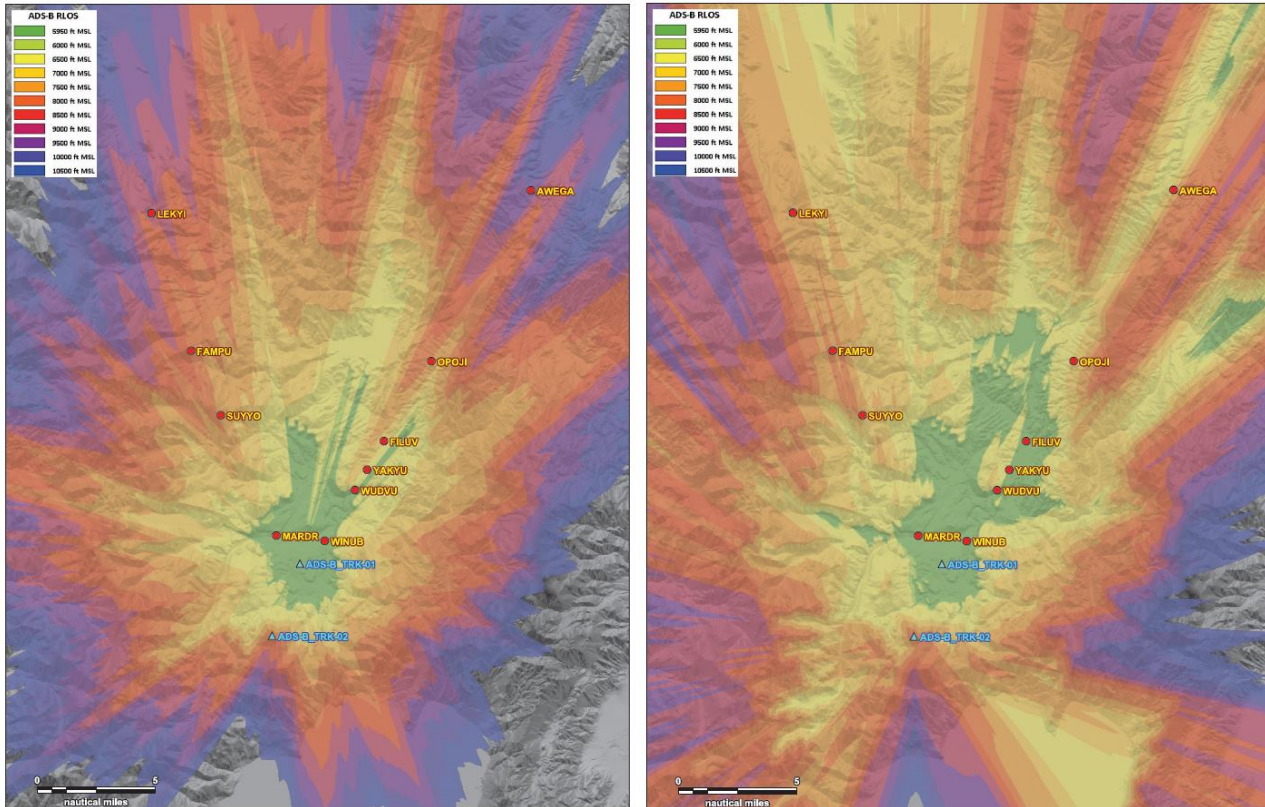
The Truckee-Tahoe Terminal SV has not been fully defined but will be based on the requirements objectives described above. The final SV requirements will be included in a revision to the FAA SBS Program Office’s Service Volume Description Document (SVDD). SBS services provided in support of the Truckee-Tahoe SV initiative include ADS-B, ADS-R, FIS-B and TIS-B. No WAM services are included as part of this coverage solution and ROM pricing estimate. SBS services are expected to be delivered to the FAA Service Delivery Point (SDP) to be specified in the SVDD. There are no terminal radars available to support TIS-B service for the Truckee-Tahoe SV. Therefore, a nearby en route radar will be utilized, which will require the approval of an appropriate deviation related to the TIS-B update rate for the KTRK SV. The deviation will require approval by the FAA prior to placing the new SV into service on the operational ADS-B network.

The Harris team performed preliminary radio line of sight (RLOS) analysis using two proposed location provided by the Truckee-Tahoe Airport District. The first location was sighted on KTRK and the second was on a mountain peak southwest of the airport as suggested by the airport during technical interchange meetings. **However, this early analysis only included near-by fixes and is not inclusive of all the**



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**fixes provided above.** The preliminary RLOS results indicate a solution that only places a SBS site on the airport will not be able to cover all fixes. Figure 2 compares predicted RLOS coverage from KTRK



**Figure 2: KTRK RLOS Coverage Comparison**

on the left versus RLOS coverage from the mountain site on the right. No analysis was performed for KTVL, designated as a satellite airport in the table above, however the terrain will likely cause a similar limitation for an on-airport site.

Harris will need to perform a detailed RF (radio frequency) coverage analysis to determine the optimized solution for service delivery coverage needs in the Truckee-Tahoe area. Although there are many terrain challenges in the prospective SV, Harris estimates that coverage needs can be supported by adding two to four (2-4) new SBS sites to the area. Final SBS site quantities and their locations will require detailed coverage analysis and site feasibility visits. The new sites will provide the same services as other SBS sites and will be service acceptance tested to support creation of the new service volume. Coverage from these sites may also be incorporated into any associated composite traffic volume (CTV). Truckee-Tahoe Airport District has indicated they have existing site locations that can be considered for hosting the new SBS sites. Specific designs for the SBS sites will be conducted for the formal proposal effort; however, for this ROM submittal, Harris assumed a typical site cost for a SBS site asset based on experience.



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The SBS data that is collected will be supplied as additional NextGen data feeding to the Harris Symphony OpsVue and MobileVue product applications. These products will be available for license for use at KTRK in the tower and for operations personnel and at KTVL, if desired, as selected. The OpsVue, part of the Symphony suite of applications, provides real-time shared situational awareness, performance monitoring and alerting of aircraft and vehicle movement. Symphony OpsVue is an integrated Collaborative Decision Making (CDM) solution developed to improve the business performance of airports, aircraft operators and aviation stakeholders by providing shared situational awareness, monitoring and alerting of operations. Symphony MobileVue is a situational awareness display system that integrates easily with existing mobile displays (smartphones and tablets) to show real-time aircraft and vehicle surveillance data on a portable device. MobileVue enhances safety and efficiency by providing operators with a depiction of their location in relation to aircraft and other assets operating on the airport surface, in the terminal area and en route.

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**4.0 HIGH LEVEL IMPLEMENTATION SCHEDULE**

This ROM estimate assumes Truckee-Tahoe Airport District Authorization to Proceed for Harris SV Design in **July 2018**, FAA SBS program office SV Design Approval in **January 2019**, Truckee-Tahoe Airport District Authorization to Proceed for Harris SV Deployment in **February 2019**, and SV implementation service acceptance test (ISAT) completion by **December 2019**. A notional schedule is provided in Table 4-1 and only shows the high-level milestones for this ROM effort.

**Table 4-1: Truckee-Tahoe SV Notional Schedule**

<b>Activity</b>	<b>Date</b>
FAA/Truckee-Tahoe MOA	Complete
ROM Submittal	May 2018
FAA SVDD Update	July 2018
FAA Cost Proposal to Harris for 3 <sup>rd</sup> Party SV Support Services	July 2018
Truckee-Tahoe Authorization to Proceed for Harris SV Design	July 2018
SV TIM – Kick-Off	August 2018
SV TIM – In-Process Review	October 2018
SV TIM – Design Review	December 2018
FAA SV Design Approval & Authorization to Proceed	January 2019
Final Fixed Price Cost & Technical Proposal Submittal	January 2019
Truckee-Tahoe Authorization to Proceed for Harris SV Deployment	February 2019
New RS Site Designs Complete and Submitted for Permits	March 2019
Site Leases Complete	March 2019
Permit Approvals Received	June 2019
Start New RS Site Construction	July 2019
New RS Site Construction Complete	October 2019
New RS Site Checkout Complete	November 2019
SV ISAT Complete	December 2019

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**5.0 ROM COST ESTIMATE**

This section provides the rough order of magnitude cost for the prospective Truckee-Tahoe Terminal SV. The ROM estimates contained herein are based on currently forecasted direct rates and overhead rates for the period of performance. FAA SV support services costs associated with this 3<sup>rd</sup> party SV initiative are expected to be paid directly to the FAA by Harris through an associated contractual process established within Harris’ contract with the FAA. The primary task elements of the non-recurring and recurring costs are shown in Table 5-1. The level of infrastructure assets required to provide data delivery service coverage for the prospective Truckee-Tahoe Terminal SV cannot be determined without completing a SV design; however, Harris believes it will range from two to four sites depending on final requirements for coverage and available site locations. Therefore, the Harris ROM accounts for a two, three, or four site solution set.

**Table 5-1: Elements of Non-Recurring and Recurring Cost**

<b>Task Elements of Non-Recurring Cost</b>	<b>Task Elements of Recurring Cost</b>
System Engineering	Tower Facility Maintenance
SV Engineering	Site Corrective Maintenance
SBS Site Engineering	Site Preventive Maintenance
Radio Cabinets	Site Generator Maintenance
Radios	Depot Repair
Antennas	Site Battery Back-Up Maintenance
Cables, Brackets, Other	Control Station Maintenance
Tower hardware	Site Utilities
Generators	Sustaining Spare Parts Support
Sales Tax on Equipment	State and Local Recurring Taxes
Control Station Equipment	FIS-B Supplier Subscription
Implementation Labor	Insurance
Implementation ODC, Travel, & Shipping	Network Telecom
Structural Analysis	Sustaining O&M and Engineering
Environmental Studies	Sustaining Program Management Office Support
A&E Drawings and Permits	FAA Support Services Fee
Site Construction & Equipment Installation	Symphony OpsVue Annual License (optional)
Utilities Setup	Symphony MobileVue Annual Licenses (optional)
Telecom Setup	
Telecom Sustainment through ISAT	
Integration and Test through ISAT	
Program Management Office Support	
FAA Support Services Fee	

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The Truckee-Tahoe Terminal SV ROM total based on the above notional schedule ranges from \$3,132,000 to \$5,969,000. These ROM estimates are dependent upon the level of infrastructure investment required to meet the service delivery requirements and the actual length of time the Truckee-Tahoe Terminal SV is in operation (December 2019 – September 30, 2025). The ROM service volume pricing estimate reflects the use of the existing National SBS network provided by the underlying ADS-B prime contract Harris performs for the FAA. The ROM pricing estimate provided herein and any resultant prospective contract for services to Truckee-Tahoe is contingent upon Harris’ continued performance under the FAA ADS-B prime contract and any follow-on National contract awarded for SBS services to Harris post September 2025.

This ROM includes a placeholder for optional Symphony products for an airport. The ROM was developed consistent with proposals provided for SBS sites on airports and Terminal SVs. Table 5-2 presents a ROM summary by solution type to include the Service Establishment Charge (SEC) and Subscription Fees. The subscription fees are prorated for the first year based on the notional ISAT date. The prorated amount will be adjusted based on the actual month ISAT occurs.

**Table 5-2: ROM Summary by Solution**

<i>ROM Estimate through GFY2025</i>	<b>2 Site Solution Total Cost</b>	<b>3 Site Solution Total Cost</b>	<b>4 Site Solution Total Cost</b>
<b>SEC</b>	\$1,496,000	\$2,214,000	\$2,932,000
<b>GFY2020 (Prorated)</b>	\$201,000	\$287,000	\$373,000
<b>GFY2021</b>	\$275,000	\$392,000	\$510,000
<b>GFY2022</b>	\$280,000	\$400,000	\$520,000
<b>GFY2023</b>	\$287,000	\$410,000	\$533,000
<b>GFY2024</b>	\$293,000	\$418,000	\$544,000
<b>GFY2025</b>	\$300,000	\$428,000	\$557,000
<b>TOTAL</b>	<b>\$3,132,000</b>	<b>\$4,549,000</b>	<b>\$5,969,000</b>

Table 5-3 on the next page presents the ROM estimate breakdown for the non-recurring cost and recurring cost broken out into four cost elements for each solution set. The recurring cost reflects subscription services costs from ISAT through GFY 2025. The optional Symphony product quantities are an estimate and not a recommendation or requirement to proceed with the SV. The Truckee-Tahoe Airport District would determine if these products are required and the order quantities.

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**Table 5-3: Truckee-Tahoe SV ROM Estimate Break-down**

				2 Site Solution Total Cost						
<i>ROM Estimate through GFY2025</i>	Quantity	Non-Recurring Cost - EACH	Annual Recurring Cost - EACH	GFY2020 (Prorated)	GFY2021	GFY2022	GFY2023	GFY2024	GFY2025	TOTAL
New Service Volumes	1	\$60,000	\$3,000	\$62,000	\$3,000	\$3,000	\$3,000	\$3,000	\$3,000	\$77,000
New SBS Sites	2	\$718,000	\$116,000	\$1,608,000	\$236,000	\$241,000	\$246,000	\$252,000	\$257,000	\$2,840,000
Symphony OpsVue	1	\$0	\$17,000	\$13,000	\$17,000	\$17,000	\$18,000	\$18,000	\$19,000	\$102,000
Symphony MobileVue	3	\$0	\$6,000	\$14,000	\$19,000	\$19,000	\$20,000	\$20,000	\$21,000	\$113,000
				<b>\$1,697,000</b>	<b>\$275,000</b>	<b>\$280,000</b>	<b>\$287,000</b>	<b>\$293,000</b>	<b>\$300,000</b>	<b>\$3,132,000</b>

				3 Site Solution Total Cost						
<i>ROM Estimate through GFY2025</i>	Quantity	Non-Recurring Cost - EACH	Annual Recurring Cost - EACH	GFY2020 (Prorated)	GFY2021	GFY2022	GFY2023	GFY2024	GFY2025	TOTAL
New Service Volumes	1	\$60,000	\$3,000	\$62,000	\$3,000	\$3,000	\$3,000	\$3,000	\$3,000	\$77,000
New SBS Sites	3	\$718,000	\$116,000	\$2,412,000	\$353,000	\$361,000	\$369,000	\$377,000	\$385,000	\$4,257,000
Symphony OpsVue	1	\$0	\$17,000	\$13,000	\$17,000	\$17,000	\$18,000	\$18,000	\$19,000	\$102,000
Symphony MobileVue	3	\$0	\$6,000	\$14,000	\$19,000	\$19,000	\$20,000	\$20,000	\$21,000	\$113,000
				<b>\$2,501,000</b>	<b>\$392,000</b>	<b>\$400,000</b>	<b>\$410,000</b>	<b>\$418,000</b>	<b>\$428,000</b>	<b>\$4,549,000</b>

				4 Site Solution Total Cost						
<i>ROM Estimate through GFY2025</i>	Quantity	Non-Recurring Cost - EACH	Annual Recurring Cost - EACH	GFY2020 (Prorated)	GFY2021	GFY2022	GFY2023	GFY2024	GFY2025	TOTAL
New Service Volumes	1	\$60,000	\$3,000	\$62,000	\$3,000	\$3,000	\$3,000	\$3,000	\$3,000	\$77,000
New SBS Sites	4	\$718,000	\$116,000	\$3,216,000	\$471,000	\$481,000	\$492,000	\$503,000	\$514,000	\$5,677,000
Symphony OpsVue	1	\$0	\$17,000	\$13,000	\$17,000	\$17,000	\$18,000	\$18,000	\$19,000	\$102,000
Symphony MobileVue	3	\$0	\$6,000	\$14,000	\$19,000	\$19,000	\$20,000	\$20,000	\$21,000	\$113,000
				<b>\$3,305,000</b>	<b>\$510,000</b>	<b>\$520,000</b>	<b>\$533,000</b>	<b>\$544,000</b>	<b>\$557,000</b>	<b>\$5,969,000</b>