International Civil Aviation Organization
NORTH AMERICAN, CENTRAL AMERICAN AND CARIBBEAN OFFICE
Twentieth Meeting of Directors of Civil Aviation of the Eastern Caribbean (20th E/CAR DCA)
Miami, Florida, United States 4 to 7 December 2006

Agenda Item 3: Air Navigation Matters
3.6 Other Air Navigation Issues

PROPOSAL TO RECTIFY REPORTED DEFICIENCIES RUNWAY STRIPS AND RUNWAY END SAFETY AREAS (RESA)

(Presented by the United States of America)

SUMMARY

In 2004 the *Runway Strips & Runway End Safety Area Task Force,* under AGA/AOP/SG/4 -WP/13, dated 03/11/04, presented the status of non-compliant runway strips and RESAs in the CAR/SAM Regions that ICAO documented over the last decade. WP/13 included Table 1, Appendix A that summarized, according to the CAR and SAM Regions, the positive actions taken by Member States/Territories to rectify reported deficiencies and those international airports that continued to wait for corrective action(s).

To assist E/CAR in the resolution of documented deficiencies, this WP highlights selected material from WP/13 that will enable those deficiencies to be *categorized*. The benefit of this approach is that DGCA should then be able to:

(1) Understand the complexity of the remedial actions necessary to rectify existing deficiencies,
(2) Prioritize deficiencies according to the level of effort needed for remedial action,
(3) Implement a ***Comprehensive Strategic Action Plan*** to eliminate deficiencies, and
(4) Submit corrective action plans for each deficiency to the ICAO NACC Regional Office.

WP/13 further identifies two alternative means for airports that are constrained by land and/or sea environments to achieve full or partial compliance with ANNEX 14, Volume I, standards and recommended practices (SARP).

REFERENCES

ANNEX 14, Volume I, Aerodrome Design and Operations, 4th edition
CAR/SAM REGIONAL PLANNING IMPLEMENTATION GROUP (GREPECAS)
AGA/AOP/SG/4 -WP/13, dated 03/11/04,
AGA/AOP/SG/3 - WP/3 dated 27/06/03.

1. **Introduction**

1.1 ICAO concentrates its efforts for reducing the risk of damage to an airplane that undershoots, veers off, or overruns the runway by requiring prepared protective areas that surround the runway. To achieve this safety goal, Annex 14, Volume I defines the protective areas as the runway strip, the "graded portion" of the runway strip, and the runway end safety area (RESA). Figure 1 illustrates the relationship among these ICAO protective areas which are categorized as *standards*.

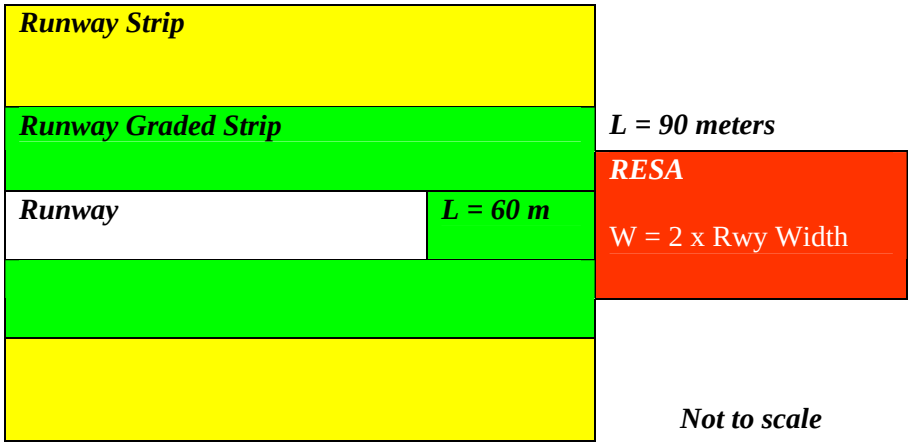


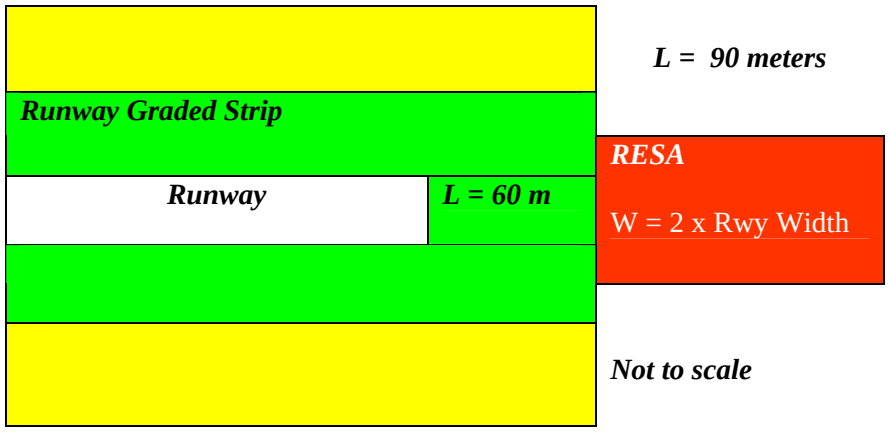
Figure 1 - Schematic of a runway and its runway strip, graded portion of the runway strip, and the runway end safety area (RESA).

Notes: #1 - Paragraphs 3.4 and 3.5, Annex 14, Volume I provide the dimensional and surface standards and recommended practices.
#2 - The length of the runway strip off the runway end for Code 1, non-instrumented runways is 30 meters.
#3 - Code 1 and 2 non-instrumented runways are not required to have RESAs.

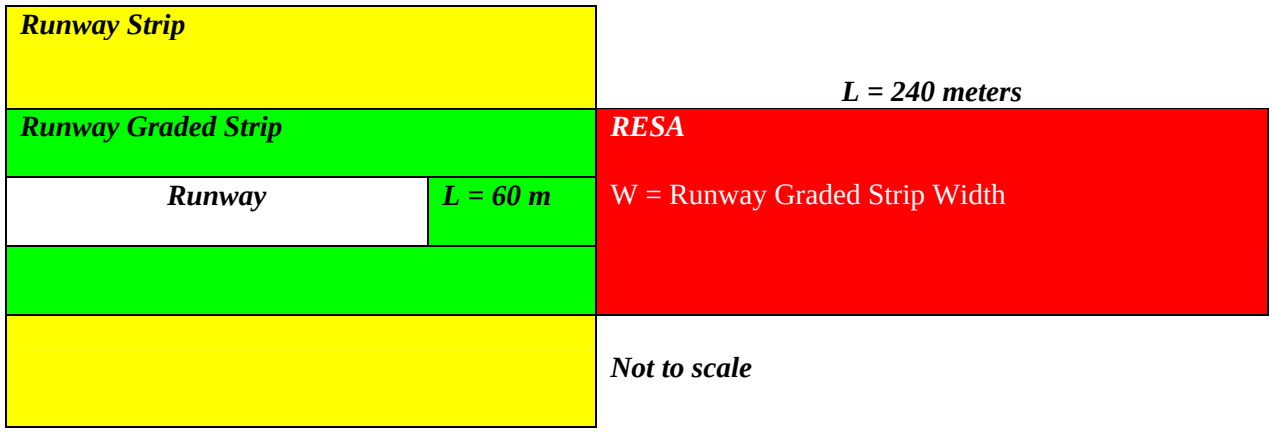
1.2 Table 1A, Appendix A of this WP documents the degree of compliance as reported in 2004 for the CAR/SAM Regions. The documentation was obtained from the ***GREPECAS Air Navigation Deficiencies Database (GANDD)*** that is maintained by the ICAO NACC Regional Office. Table 1A uses a four colour-coded system as follows that explains both the positive accomplishments and the remaining unresolved conditions:

- Deficient RESAs - Red
- Deficient runway strips - Orange
- Corrected RESAs and/or runway strips - Green, and
- Corrected RESAs and/or runway strips not reported in 2003 – Yellow

1.3 In 2005 the ICAO Secretariat delivered a WP to the Aerodromes Design Working Group (ADWG) under the Aerodromes Panel that would elevate *current recommended* RESA dimensional widths and lengths to the category of full *standard*. Consequently, RESAs that are compliant today only to the standards would become non-compliant unless the RESA met the *current recommended* dimensions. Figure 2, not to scale, illustrates in RED the results of that action.



(A) Existing RESA standards



(B) Proposed RESA standards

Figure 2 – Dimensional comparison between existing and proposed RESA dimensions

1.4 Recognizing the extent of non-compliance with RESA SARPs and the greater difficulties imposed by the proposed safety enhancement (see figures 3 and 4), ICAO Montreal accepted the position that Member State/Territories may use *alternative means* to achieve the safety benefits of RESA. ICAO further acknowledged a proven method to arrest overruns, known as the Engineered Materials Arresting Systems (EMAS). EMAS first appeared in the United States and is gaining acceptance worldwide (figures 5 and 6 and IP# E/CAT/DCA/20, *Status Of Engineered Materials Arresting System Installations in the United States*). However, ICAO and ADWG recognized the substantial costs associated with the installation of EMAS, and are therefore seeking other alternative means of compliance. Another alternative means used by various Member States is the application of declared distances to readjust the reported runway field lengths.

Figure 3 - Flight deck view of the RESA and a beach view of the landing aircraft on final approach to St. Marteen International Airport.

Figure 4 - Steep terrain off Runway 01 at Guatemala City La Aurora International Airport.

Figure 5 - Photos of EMAS off Runway 22L at JFK taken the day after the safe arrestment of a SAAB-340 overrun in June 1999 (note the surface area removed to extract the aircraft)

Figure 6 - Aerial photo showing (a) relationship of Hollywood Blvd. off Runway 26 at Burbank Airport, Burbank, California and (b) EMAS installation awaiting chevron-markings

1.5 In summary, this WP discusses how the reporting scheme used by ICAO to document deficiencies in GANND can be used to *categorize* the various deficiencies. Grouping similar deficiencies into separate categories allows for prioritization of the categories according to the complexity of the remedial actions needed to achieve compliance. Collectively, the end result of prioritization would be a written ***Comprehensive Strategic Action Plan*** for the Member State/Territories to follow.

2.0 **Discussion**

2.1. **RESA** - Table 1A, Appendix A (columns 3 and 7)

2.1.1 **CAR Region**, column No. 3, recorded 22 reported cases (or 22 runways) in 2003 that were deficient in some characteristic. Of these cases, 8 runways were corrected and are now fully compliant for this particular SARP. The positive trend, 8 of 22 runways, demonstrated a significant improvement of 36% from the 2003 WP/3 of AGA/AOP/SG/3 (27/06/03). In response to the remaining substandard runways, figure A1 of Appendix A was developed to *categorize the causes of non-compliance*. Figure A1 clearly showed the problem to be a *lack of RESAs* as compared to problems *within existing RESAs*. To illustrate this point, of the 14 non-compliant RESA deficiencies, 11 reported no RESA at both ends or at one end, a significantly high rate of 79% (11/14). The category with the predominant deficiency at 57% (8/14) was the category "lack of RESA at both ends."

2.1.2 **SAM Region,** column No. 7, recorded 7 reported cases (or 7 runways) in 2003 that were deficient in some characteristic. Of these cases, 1 runway was corrected and is now fully compliant for this particular SARP. The positive trend, 1 of 7 runways, demonstrated an improvement of 14% from the 2003 WP/3 of AGA/AOP/SG/3 (27/06/03.) For the SAM Region, figure A2 clearly showed the problem to be a *combination* of the lack or existence of RESAs and problems within existing RESAs. To illustrate the point, of the 6 non-compliant RESA deficiencies, 3 reported no RESA at both ends or at one end, or a rate of 50% (3/6) while 3 reported problems within existing RESAs, or a rate of 50% (3/6).

2.2. **Runway Strips -** Table 1A, Appendix A (columns 4 and 8)

2.2.1 **CAR Region**, column No. 4, recorded 43 reported cases or 43 runways. Of these, 12 runways were corrected and are now fully compliant for this particular SARP. The positive trend, 12 of 43 runways, demonstrated a significant improvement of 28% from the 2003 WP/3 of AGA/AOP/SG/3 (27/06/03.) For the CAR Region, figure A3 clearly showed the problem of *physical size* as compared to problems within existing runway strips. To illustrate the point, of the 30 non-compliant runway strip deficiencies, 22 reported substandard dimensions for a significantly high rate of 73% (22/30). The predominant deficiency was width rather than length.

2.2.2 **SAM Region**, column No. 8, recorded 12 reported cases (or 12 runways). Of these, 3 runways were corrected and are now fully compliant for this particular SARP. The positive trend, 3 of 12 runways, demonstrated a significant improvement of 25% from the 2003 WP/3 of AGA/AOP/SG/3 (27/06/03.) For the SAM Region, figure A4 clearly showed the problem to be *within existing runway strips*. To illustrate the point, of the 9 non-compliant runway strip deficiencies, 8 reported no-dimensional problems at a rate of 89% (8/9). Objects, vegetation and/or solid structures, account for 50% (4/8) of the reported deficiencies.

2.3. **Summary Comparison for CAR/SAM Regions** (figures A5 and A6)

Figures A5 and A6 illustrated the differences between the CAR Region and the SAM Region for each SARP. For RESAs, figure A5 showed that *both regions share similar types of deficiencies*, with the exception of the much higher rate within the CAR Region for runways lacking RESAs at both ends, ***a rate of 8 to 1***. For runway strips, figure A6 showed a *dichotomy of the problem*. That is, the CAR Region faces a dimensional challenge as compared to the SAM Region, which faces a clearing of objects and improved grading conditions.

3. Recommendations and Discussions.

3.1 Recommend that the meeting discuss the information provided by the WP and how the proposal can be implemented by Member States/Territories to develop individual written ***Comprehensive Strategic Action Plans*** that:

1. Cover all recorded RESA and runway strip deficiencies from the ICAO NACC GANDD data base,
2. Categorize the types of deficiencies as recorded by ICAO in figures 1 – 4 of Appendix A,
3. Prioritize the categories determined in item 2 according to correct ability,
4. Develop Specific Action Plans for each deficient runway, and
5. Report the Specific Runway Action Plans to ICAO NACC Regional Office for entry into the GANDD data base.

3.2. Recommend that the DGACs of E/CAR provide information to AGA/AOP/SG under GREPECAS of alternative means to achieve compliance with RESA SARPs.

Appendix A

Table A1 - Runway Strips and Runway End Safety Area (RESA) 2004 Task Force Report

Reporte de 2004 de Grupo de Tarea de Franjas de Pista y Areas de Seguridad de Extremo de Pista (RESA)

OCTOBER 2004 REPORTED DEFICIENCIES AND CORRECTIONS

INFORMATION:
INFORMACION: Working Paper (WP) #03 Appendices A - D, 4th MEETING OF THE GREPECAS AGA/AOP/SG, Mexico City, Mexico; 15 – 19 Nov., 2004

CAR REGION				**SAM REGION**			
COUNTRY PAIS	AIRPORT / CITY AEROPUERTO / CIUDAD	DEFICIENCY & CORRECTIONS DEFICIENCIAS Y CORRECCIONES		COUNTRY PAIS	AIRPORT / CITY AEROPUERTO / CIUDAD	DEFICIENCY & CORRECTIONS DEFICIENCIAS Y CORRECCIONES	
		RESA 22 CASES/ CASOS	RWY STRIP 43 CASES/ CASOS			RESA 7 CASES/ CASOS	RWY STRIP 12 CASES/ CASOS
Column Columna #1	Column Columna #2	Column Columna #3	Column Columna #4	Column Columna #5	Column Columna #6	Column Columna #7	Column Columna #8
ANTIGUA & BARBUDA				BOLIVIA			
	ST. JOHNS V.C.	1	1		LA PAZ	1	1
BAHAMAS				COLOMBIA			

	FREEPORT	1	3		LETICIA		1
BARBADOS					RIO NEGRO	2	3
	BRIDGETOWN		1		SAN ANDRES		1
BELIZE					SANTE FE DE BOGOTA	3	3
	BELIZE CITY	1	2				
CAYMAN ISLANDS							
	GRAND CAYMAN	1	1	ECUADOR			
COSTA RICA					GUAYAQUIL		1
	ALAJUELA/SAN JOSE	2	1	PARAGUAY			
CUBA					ASUNCION		1
	HAVANA		1 ??? SG/3 WP#3	PERU			
	SANTIAGO DE CUBA	1 ??? SG/3 WP#3			LIMA-CALLAO	1	1
	VARADERO		1 1				
DOMINICAN REPUBLIC							
	SANTO DOMINGO		1				
GUATEMALA							
	GUATEMALA	1	2				
GRENADA							
	ST. GEORGES		1 ??? SG/3 ***WP#3***				
HONDURAS							

	TEGUCIGALPA	1	3				
	SAN PEDRO SULA	1	2				
JAMAICA							
	KINGSTON	1	2				
	MONTEGO BAY	1	3				
MEXICO							
	CANCUN	1	1				
	GUADALAJARA	1					
	MONTERREY	1					
NETHER-LANDS ANTILLES							
	BONAIRE/KRALEN DIJK		1				
	CURACAO/WILLE MSTAD		1				
	ST. MAARTEN/ PHILIPSBURG	1-??? SG/3 WP#3					
NICARAGUA							
	MANAGUA		1				
SAINT KITTS & NEVIS							
	BASSETERRE	1	2				
SAINT LUCIA							
	CASTRIES	1	2				
	VIEUX FORT	1	2				
ST. VINCENT & THE GRENADINES							
	KINGSTOWN	2-??? SG/3 WP#3	2-??? SG/3 WP#3				
	MUSTIQUE		2				
TRINIDAD &							

TOBAGO							
	PORT OF SPAIN		1-??? SG/3 WP#3				
UNITED STATES							
	SAN JUAN	1	2				

NOTE #1: The symbol ??? with a number (for example, 2 ???) indicates that the item was reported as a deficiency in 2003 WP#3 but not reported in 2004 as a correction or deficiency.
NOTA #1: El simbolo ??? con un numero (por ejemplo, 2 ???) indica que el articulo fue reportado como una deficia en 2003 WP#3 pero no esta reportado en 2004 como una correccion o deficiencia.

NOTE #2: The color *GREEN* indicates corrective action.
NOTA #2: El color *VERDE* indica accion correctiva.

NOTE #3: The color *YELLOW* indicates corrective action of an item not reported in 2003.
NOTA #3: El color *AMARILLO* indica accion correctiva de un articulo que no fue reportado en 2003.

SAM REGION Outstanding Deficiencies By Primary Factors			
RESA & FREQUENCY		RUNWAY STRIP & FREQUENCY	
1	NO RESA AT BOTH ENDS (U)	1	INSUFFICIENT WIDTH (B)
2	NO RESA AT ONE END (U)	2	NON-FRANGIBLE OBJECT (A)
2	NOT GRADED (U)	1	DEPRESSIONS (B)
1	V-SHAPED CHANNEL IN RESA (U)	1	OBJECT – TERRAIN (B)
		2	NOT GRADED (B)
		1	INSUFFICIENT WIDTH & OBJECT (B)
		1	OBJECTS - VEGETATION (B)
Priority for action: U = urgent, A=high, B=medium			

CAR REGION Outstanding Deficiencies By Primary Factors			
RESA & FREQUENCY		RUNWAY STRIP & FREQUENCY	
8	NO RESA AT BOTH ENDS **(U)**	1	NO STRIP AT ONE END **(U)**
3	NO RESA AT ONE END **(U)**	2	INSUFFICIENT LENGTH & WIDTH AT BOTH ENDS **(U)**
1	INSUFFICIENT LENGTH & WIDTH **(U)**	1	INSUFFICIENT LENGTH AT BOTH ENDS **(U)**
1	NOT GRADED **(U)**	5	INSUFFICIENT LENGTH **(U)**
1	NOT GRADED & VEGETATION AT ONE END **(U)**	2	INSUFFICIENT WIDTH AT BOTH ENDS **(U**)
		7	INSUFFICIENT WIDTH & OBJECTS **(A)**
		4	INSUFFICIENT WIDTH **(U) (A)**
		1	GRADED STRIP HAS WATER PONDS **(U)**
		4	NON-FRANGIBLE OBJECTS **(U) (A)**
		3	OBJECTS - VEGETATION **(A)**
Priority for action: U = urgent, A=high, B=medium			

Figure 1A

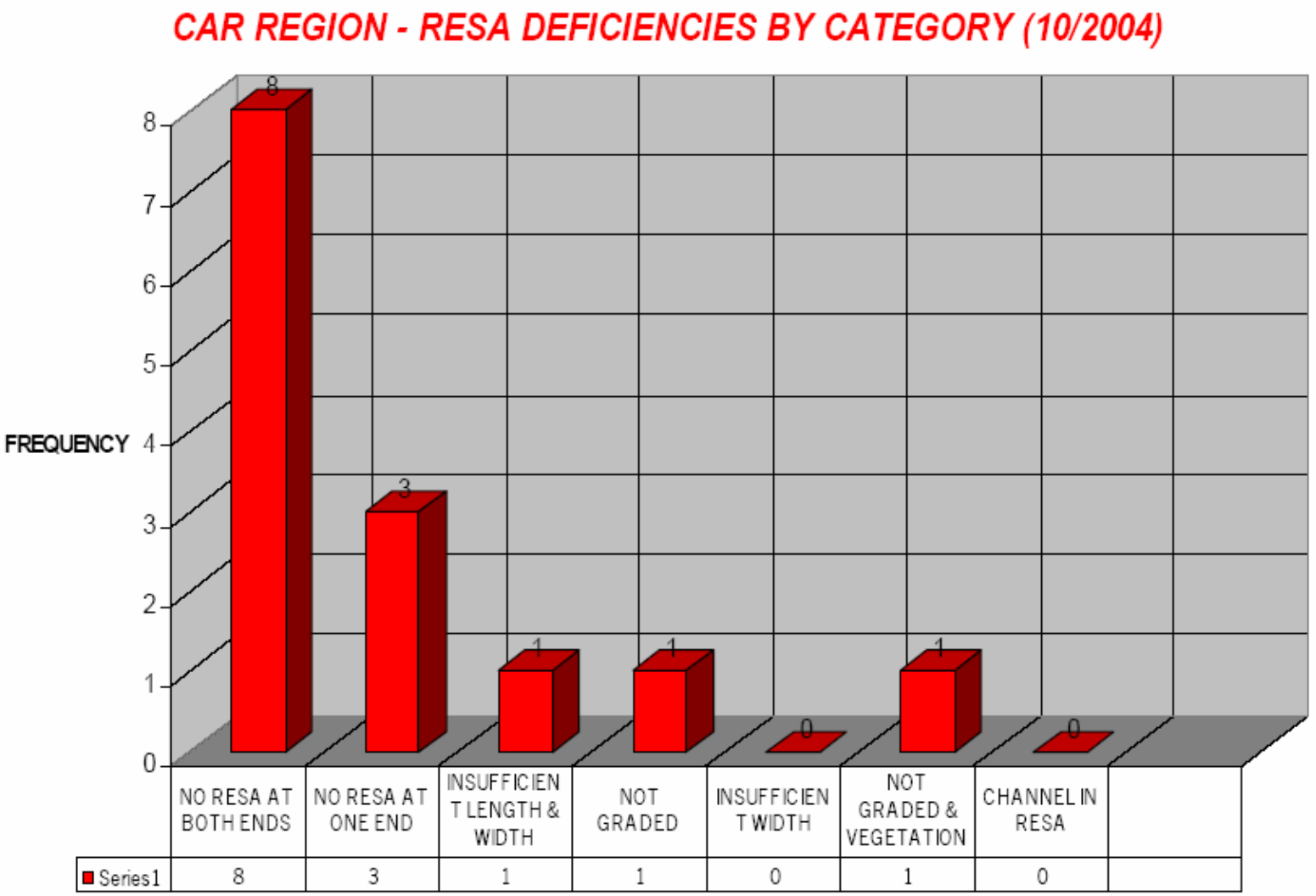
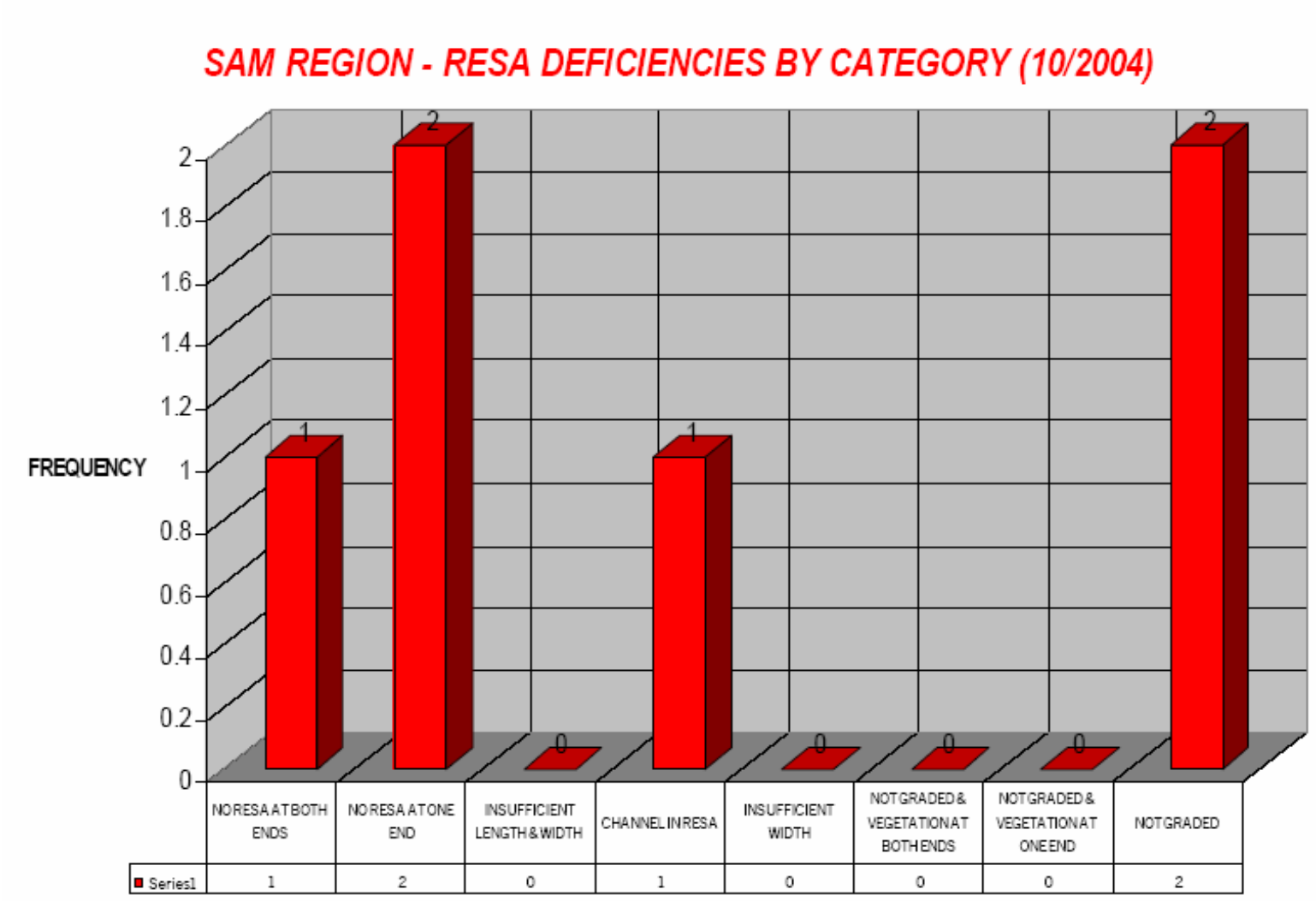

CAR REGION - RESA DEFICIENCIES BY CATEGORY (10/2004)
FREQUENCY
0
1
2
3
4
5
6
7
8
NO RESA AT BOTH ENDS
NO RESA AT ONE END
INSUFFICIENT LENGTH & WIDTH
NOT GRADED
INSUFFICIENT WIDTH
NOT GRADED & VEGETATION
CHANNEL IN RESA
Series1
8
3
1
1
0
1
0

Figure A2


SAM REGION - RESA DEFICIENCIES BY CATEGORY (10/2004)
FREQUENCY
2
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
NO RESA AT BOTH ENDS
NO RESA AT ONE END
INSUFFICIENT LENGTH & WIDTH
CHANNEL IN RESA
INSUFFICIENT WIDTH
NOT GRADED & VEGETATION AT BOTH ENDS
NOT GRADED & VEGETATION AT ONE END
NOT GRADED
Series1
1
2
0
1
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0
0
2

Figure A3

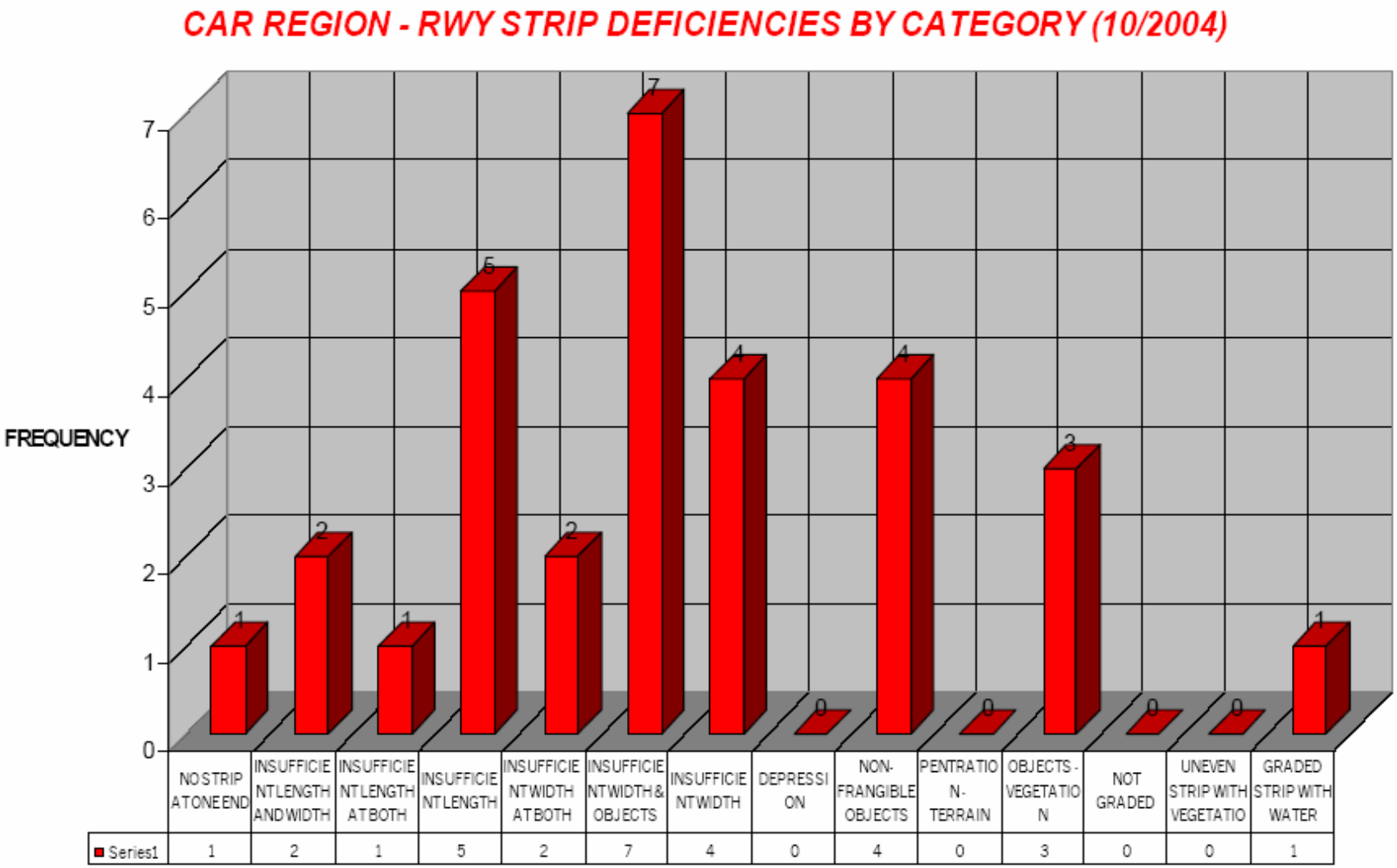

CAR REGION - RWY STRIP DEFICIENCIES BY CATEGORY (10/2004)
FREQUENCY
0
1
2
3
4
5
6
7
NO STRIP AT ONE END
INSUFFICIENT LENGTH AND WIDTH
INSUFFICIENT LENGTH AT BOTH
INSUFFICIENT LENGTH
INSUFFICIENT WIDTH AT BOTH
INSUFFICIENT WIDTH & OBJECTS
INSUFFICIENT WIDTH
DEPRESSION
NON-FRANGIBLE OBJECTS
PENTRATION-TERRAIN
OBJECTS - VEGETATION
NOT GRADED
UNEVEN STRIP WITH VEGETATIO
GRADED STRIP WITH WATER
Series1
1
2
1
5
2
7
4
0
4
0
3
0
0
1

Figure A4

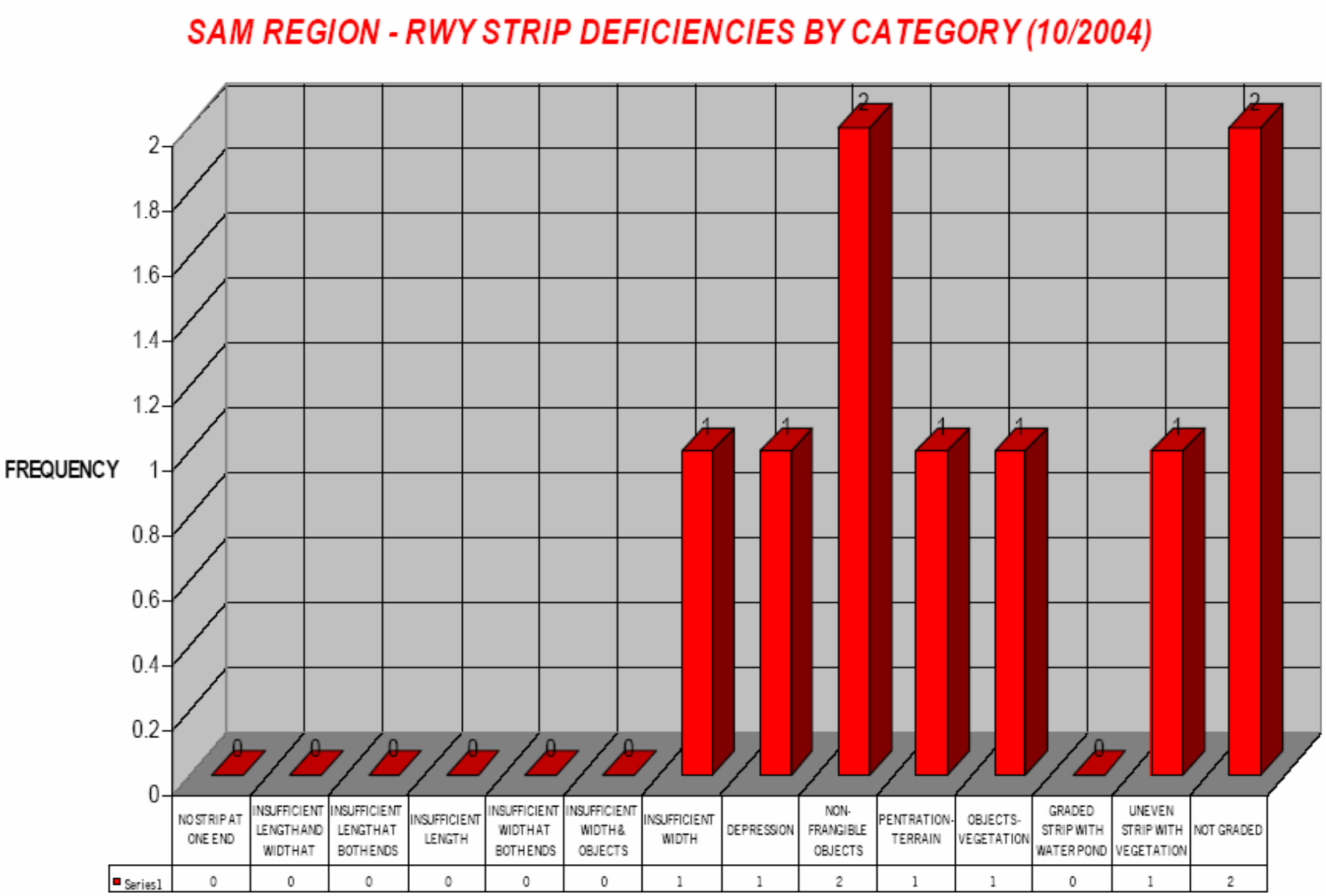

SAM REGION - RWY STRIP DEFICIENCIES BY CATEGORY (10/2004)
FREQUENCY
2
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
NO STRIP AT ONE END
INSUFFICIENT LENGTH AND WIDTH AT
INSUFFICIENT LENGTH AT BOTH ENDS
INSUFFICIENT LENGTH
INSUFFICIENT WIDTH AT BOTH ENDS
INSUFFICIENT WIDTH & OBJECTS
INSUFFICIENT WIDTH
DEPRESSION
NON-FRANGIBLE OBJECTS
PENTRATION-TERRAIN
OBJECTS-VEGETATION
GRADED STRIP WITH WATER POND
UNEVEN STRIP WITH VEGETATION
NOT GRADED
Series1
0 0 0 0 0 0 1 1 2 1 1 0 1 2

Figure A5

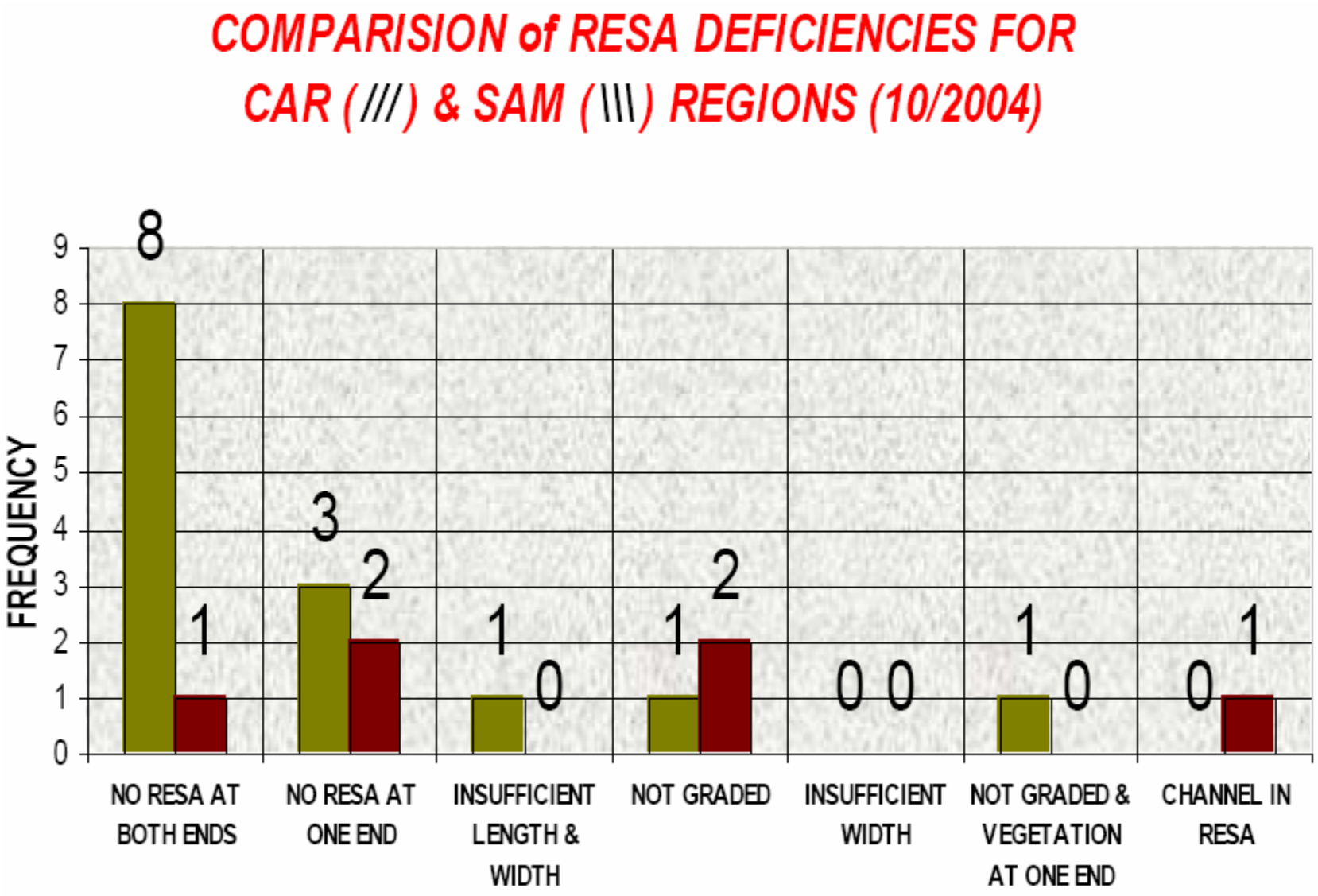
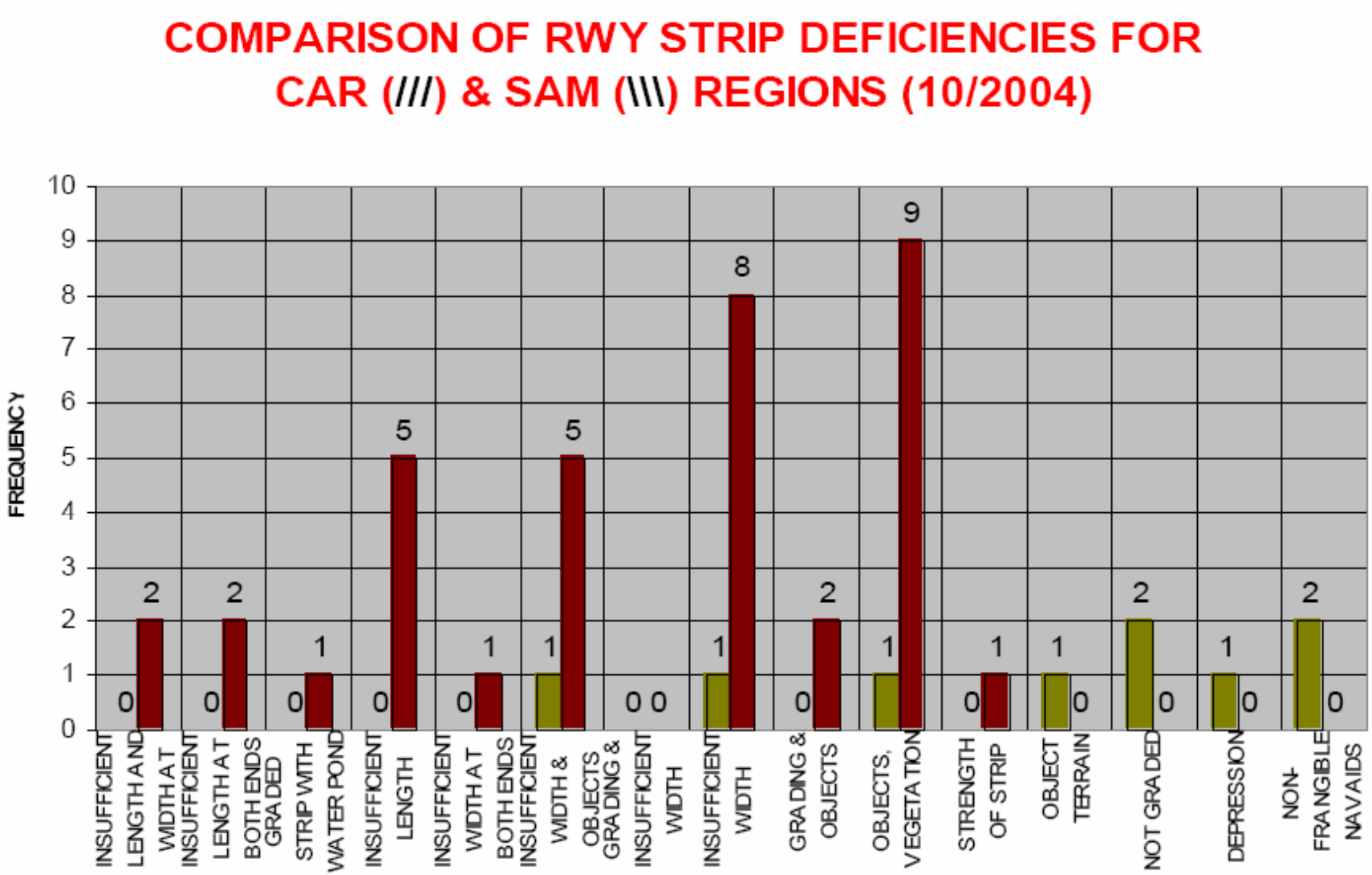

COMPARISION of RESA DEFICIENCIES FOR
CAR (///) & SAM (\\\) REGIONS (10/2004)
FREQUENCY
0
1
2
3
4
5
6
7
8
9
8
1
3
2
1
0
1
2
0 0
1
0
0
1
NO RESA AT BOTH ENDS
NO RESA AT ONE END
INSUFFICIENT LENGTH & WIDTH
NOT GRADED
INSUFFICIENT WIDTH
NOT GRADED & VEGETATION AT ONE END
CHANNEL IN RESA

Figure A6



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