J.B.C.

yes

REPORT

TELECOMMUNICATIONS/BROADCASTING IN CENTRAL JAMAICA

PREPARED FOR

AGENCY FOR INTERNATIONAL DEVELOPMENT

BY

TELECONSULT INC.
WASHINGTON, DC

JANUARY 1980

Teleconsult Inc.
Washington, D.C.

Teleconsult
THE TELEMUNDI GROUP
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January 16, 1980

Dr. Anthony Meyer, DS/ED
U.S. Agency for International Development
Washington, D.C.

RE: AID/otr-C-1619 Task 4,
Telecommunications Broadcasting
in Central Jamaica

Dear Dr. Meyer:

Enclosed are ten copies of the Final Report on the referenced task as required by the Work Order. This completes all work required on the Work Order.

The report shows the methodology used in the study and presents all findings of the consultant, including recommended actions and budgets for the project.

We have appreciated the opportunity to assist AID in this important project and look forward to being of further assistance on future projects.

Very truly yours,

Frederic C. Leiner

Frederic C. Leiner
Vice President

FCL/tlb

Enclosures

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SECTION 1
INTRODUCTION

This report is prepared in accordance with USAID Contract AID/otr-C-1619, Work Order No. 4, dated 12 December 1979, entitled, "Jamaica: Telecommunications/Broadcasting in Central Jamaica." The Statement of Work and report requirements are provided as Exhibit I, for reference.

The following sections of this report: Section (2) describes the methodology used to perform the work; Section (3) discusses the broadcasting requirements as indicated by the Project Paper; Section (4) discusses the field survey results; Section (5) describes the alternate configurations and facilities considered during the study; Section (6) provides the consultant's recommendations; and Section (7) provides a detailed list of equipment required for the project and presents a cost estimate for the project.

EXHIBIT I

STATEMENT OF WORK

Work Order No. 4

Contract No. AID/OTR-C-1619

The contractor will gather data and conduct analyses in order to describe the most cost-effective means of broadcasting in Central Jamaica to cover the Pindars River and Two Meetings watershed areas and Mandeville within the context of the existing JBC system. The contractor will describe the least cost means as well as the equipment and the extent (that is, the percent of population covered as well as geographical boundaries) and the quality of coverage that could be purchased for $230,000. To accomplish these goals, the contractor shall:

1. Collect, review and analyze available data regarding radio broadcast facilities in Jamaica to the target areas of Pindar River and Two Meeting watershed.

2. Inspect existing radio facilities at Spur Tree Mountain with particular attention to M.W. Transmitter, space available for additional or replacement equipment; grounding system antenna system, diplexer, etc.

3. Inspect possible new transmitter sites of James Hill and Bull Head to determine suitability, existing facilities, power and structures.

4. Review with Jamaica Broadcasting Company, soil conductivity and field strength measurements both for daytime and for nighttime transmission to the target area. Have field strength measuring test equipment to make measurements in selected areas.

5. Inspect proposed broadcast studio building and facilities in Mandeville as to appropriateness. Review proposed equipment list for initial minimum requirements.

6. Develop several alternatives as possible solutions to include, but not be limited to, the following:

   a) Increased power for transmitter at Spur Tree with link to the Mandeville Studio for program control.

b) Link for Spur Tree transmitter site to Mandeville and link from Mandeville Studio to new transmitter site on James Hill, Bull Head or other location to serve target area. Transmitter power requirements.

c) Equipment and cost for each alternative including all ancillary items.

REPORTS: Prior to the contractor's departure from Jamaica, recommendations will be reviewed with the AID Mission and Jamaica Broadcasting Company.

The contractor shall submit a final report to DS/ED, AID/Washington (10 copies) prior to the completion date of this order.

SECTION 2
METHODOLOGY

The methodology used by Teleconsult in performance of this Work Order is in accordance with the Statement of Work. Following is a daily schedule of the consultant's work on the project:

DATE(S)	ACTIONS
11-22-79	Teleconsult recieved USAID letter dated 11-19 requesting proposal.
11-27-79	Teleconsult hand-delivered proposal to AID.
11-27-79	Consultant talked to Dr. A. Meyer and Mr. A. Hotvedt regarding plans for the project.
11-28-79	Consultant visited Dr. A. Meyer to obtain documents and discuss project approach.
11-30-79	Dr. Pat Peterson of AID/Kingston called consultant to discuss project and arrange telephone discussion with Mr. N. James of JBC.
12-3-79	Mr. N. James called consultant from AID/Kingston for detailed technical discussion.
12-1/11-79	Consultant made telephone calls to Ms. V. Prakash, Mr. K. Bluteau, AID-Contracts; Dr. A. Meyer, AID-DS/ED; and Mr. A. Hotvedt, AID-NE/PD, to discuss project.
12-12-79	Mr. K. Bluteau provided signed Work Order to consultant, effective 12-11-79.
12-12-79	Consultant received and tested Potomac Instruments field intensity meter.

DATE(S)	ACTIONS
12-16-79	Consultant travelled to Kingston via Miami.
12-17-79	Consultant met with AID/Kingston and JBC personnel to review approach and plan field work.
12-18-79	Consultant and AID/Kingston representative drove to Mandeville, Spur Tree Hill, Christiana and to a number of locations in the Pindars River area, met with project personnel and made measurements of field strength of Jamaican AM broadcasting stations, including measurements during the evening hours. Team stayed overnight at Christiana.
12-19-79	Above team was joined by JBC personnel and joint team inspected facilities at Spur Tree Hill, proposed studio sites in Mandeville and proposed transmitter sites at James Hill, Bull Head and in the Grove Place vicinity. The team again made measurements at other points in the project area, including evening measurements in the Two Meetings area.
12-20-79	Consultant met with AID/Kingston and JBC to review results and discuss JBC needs and prepared preliminary recommendations.
12-21-79	Consultant held meeting with AID/Kingston and JBC to review preliminary recommendations and obtain concurrence.
12-21-79	Travel to Miami.
12-22-79	Travel to Washington, D.C.
12-26,27-79 1-2,3-80	Worked on preliminary report, discussed requirements with potential suppliers and requested pricing information.
1-4-80	Presented preliminary report to AID/DS-ED and AID/LA Bureaus and discussed recommendations.
1-7/15-80	Prepared final report.
1-16-80	Presented final report.

In order to provide a background for the project, the consultant reviewed the following reports and documents:

1. Project Paper, Project No. 931-1109, "Communications Technology: Studies and Applications," dated 23 May 1979.

2. "Project Grant Agreement Between the Government of Jamaica and the U.S.A., for the Jamaica Broadcasting Company," dated August 31, 1979.

3. Project correspondence from the Academy for Educational Development, dated December 27, 1978; January 19, 1979; September 18, 1979 and October 3, 1979. (Note: the latter item contained a report from an earlier consulting study performed during September 1979.)

4. AID cables dated October 1, 1979 and October 25, 1979.

5. "Estimated Ground Conductivity in Jamaica" (map), dated January 1973.

6. "Jamaica Broadcasting Corporation Radio Nighttime Service Limits" (map), dated February 1973.

7. "Population Distribution in Jamaica" (map), prepared from 1960 Census.

8. 1:50,000 topographic maps of Jamaica, prepared for the Jamaica Survey Department, dated 1949, 1963, 1969, 1973.

9. JBC planning schedules and manning tables (internal memoranda) prepared 1979.

10. "Minutes of Two-Day Planning Meeting, JBC Radio Central Workshop Reports, Group I and Group II," prepared late 1979.

SECTION 3
REQUIREMENTS

During the course of the work, an effort was made to meet with available personnel of AID, JBC and the Jamaican Ministry of Agriculture in order to obtain a thorough understanding of project requirements and to obtain information for the evaluation of alternatives. Following is a list of persons with whom the consultant had discussions during the field survey:

1. Dr. Pat Peterson, USAID/JAM Project Director
2. Wycliffe Bennett, General Manager, JBC
3. Newton James, Chief Engineer, JBC
4. Fitz Bartley, AID Agronomist
5. Harry Nixon, Chief Engineer, JBC
6. Lincoln Robinson, Project Manager
7. Dudley Reid, Jamaica Project Manager
8. Leslie Campbell, JBC Studios
9. Rudy Pederson, AID Civil Engineer
10. A.C. McDonald, Regional Director, Central Region, Ministry of Agriculture
11. Antonio Campbell, JBC Engineer-FM, TV
12. Claude Robinson, Deputy General Manager, JBC.
13. Earl Toyloy, Radio Jamaica Engineer

The basic requirements for the AM radio broadcasting system are cited at a number of points in the project paper and may be summarized as follows (references are to pages of Annex A):

1. Radio coverage includes primarily the Pindars River and Two Meetings Watersheds, with secondary coverage to other farming arreas adjacent to these areas but not in the project area (page 8).

2. Radio reception quality should be suitable for simple, low-cost transistor radios (page 24).

3. Hours of reception should facilitate 500-1,000 hours of operation per year (page 31) with particular emphasis on the evening hours (pages 22, 35).

4. Studio facilities must be suitable for the generation of up to three hours per day of locally produced public service programs, with the flexibility to switch from national to local programs (page 35).

5. Programs will include live and pre-recorded programs, news and spot announcements. Tape recorders will be used to provide interviews, etc. A tape library will be maintained and copies will be provided to extension agents (page 37).

In addition to the above requirements, it was apparent from an inspection of the region that both the studio and transmitter site should have back-up electrical power supply to insure reasonable continuity of operation.

SECTION 4
SITE SURVEYS AND FIELD STRENGTH MEASUREMENTS

Since the location and power rating of the transmitting station are major factors in determining the project cost, the consultant inspected the existing facilities at Spur Tree Hill and made extensive measurements of radio field strength of the Spur Tree Hill signal and other Jamaican AM radio broadcast signals throughout the project area. Following are the results.

4.1 SPUR TREE HILL FACILITIES

Two radio facilities are located at Spur Tree Hill:

1. An AM broadcast facility, shared by JBC and RJR (Radio Jamaica).
2. An FM/TV broadcast facility operated by JBC.

The AM facility is operated and maintained by RJR and consists of the following components:

1. JBC transmitter, Gates BC-5P, operating at 5 KW output.
2. RJR transmitter, identical to JBC.
3. Single guyed tower, 292 feet high, base insulated, with FM circular array mounted at approximately 200 feet.
4. Diplexer used to feed both transmitters to the antenna.
5. Onan 75 KVA diesel generator, 120/240 VAC, 60 Hz, 3 phase.
6. Standby transmitter for RJR, Gates Vanguard, 1 KW.

All radio facilities are housed in a single block building, including an area for maintenance and parts storage. The generator is housed in a separate building. Neither building has space available for additional equipment other than very small units.

The transmitters, diplexer, antenna, grounding system and generator were in good operating condition. It is the consultant's judgement that any significant increase in the JBC transmitter power would necessitate a major redesign of this facility.

4.2 FIELD STRENGTH MEASUREMENTS

There are at least seven Jamaican AM radio transmitting stations which could be heard at some locations in the project area for at least some of the time:

CALL LETTERS - LOCATION	FREQUENCY (KHz)
JBC-Kingston (JBC-K)	560
RJR-Galena	580
JBC-Spur Tree Hill (JBC-S)	620
JBC-Montego Bay (JBC-M)	700
RJR-Kingston	720
JBC-Galena (JBC-G)	750
RJR-Spur Tree Hill	770

In general, the characteristics of the JBC and RJR signals from a given location were quite similar, so particular attention was paid to the JBC signals. Table 4-1 provides the data for the JBC signal strength measurements made at a number of locations: (a) on the route from Kingston to the project area (Loc. Nos. 1-4); (b) in the vicinity of Spur Tree Hill (Loc. No. 5); (c) throughout the two project watersheds (Loc. Nos. 6-15); and (d) at James Hill (Loc. Nos. 16A,B).

TABLE 4-1: FIELD STRENGTH MEASUREMENTS

LOG NO.	LOCATION	FIELD STRENGTH (Mv/METER) JBC-K	JBC-S	JBC-M	JBC-G
1	Intersection of Rte A-1 and Rte A-2, in Spanish Town	80.	0.7	0.1	0.8
2	On Rte A-2, 2 mi. west of Freetown	19.	4.0	1.5	0.1
3	On Rte A-2, at Four Paths	9.0	5.0	0.1	0.1
4	On Rte B-6, 1 mi. east of Mark Post	0.8	21.	0.3	0.05
5	Side road, approx. 1 mi. south of Spur Tree transmitting site	0.9	430.	0.9	---
6	Spauldings	1.0	2.0	---	---
7	Frankfield (High School)	0.4	0.24	0.4	---
8	Morgan's Pass	1.0	3.5	---	---
9	Colonel's Ridge	1.2	0.7	---	---
10	Brandon Hill Bridge (6:15 P.M.)	2.2	0.7	0.4	---
11	Kellits (6:30 P.M.)	3.0	0.9	---	---
12	Pedro River (6:45 P.M.)	1.3	1.5	---	---
13	Spring Ground (10:00 A.M.)	0.8	3.9	0.6	---
14	Christiana (11:00 P.M.)	0.3	3.5	Interf.	---
15	Two Meetings Bridge (7:00 P.M.)	1.3	2.0	Interf.	---
16A	James Hill (5:15 P.M.)	1.6	1.5	0.5	0.5
16B	James Hill (7:30 P.M.)	1.0	1.2	1.3	---

The field strength data in Table 4-1 illustrate the reception quality of the various radio signals which were monitored. Although U.S. standards provide for the use of radio signals with strengths as low as 1.0 millivolts per meter (Mv/m) in rural areas, JBC has determined that 4.0 Mv/m is required in Jamaica to insure good listenership. The consultant agrees with JBC, based on actual listening tests and also based upon discussions with residents of the project area.

4.3 FEASIBILITY OF USING SPUR TREE HILL

It can be seen from Table 4-1 that the measured signal strength (field strength) of JBC-Spur Tree Hill and JBC-Kingston are well below the Jamaican standard (4.0 Mv/m) at all points within the project area (Location Nos. 6-15). (We are principally concerned with the Spur Tree Hill station, of course, since it is planned that the special programs for the project area will be broadcast from that site.)

It is the consultant's judgement that listenership to the Spur Tree Hill station would continue to be very limited unless the power transmitted from that site could be substantially increased from the present level of 5 kilowatts (KW). The following table shows the power rating required if good service were to be provided at several of the communities where the signal was the weakest:

Location	Power Required at Spur Tree Hill
Two Meetings Bridge	20 KW
Colonel's Ridge and Brandon Hill Bridge	100 KW
Frankfield	150 KW

As stated in Section 4.1, any increase in power at Spur Tree Hill would require a major redesign of the station. The design to accommodate an increase to 20 KW at the Spur Tree Hill site would involve design and fabrication of new diplexer, and is estimated to be approximately twice the cost of a new station, whereas the higher power levels would cost several times as much as a new station. Consequently, it was determined that a new site closer to the project area would be required.

SECTION 5
ALTERNATIVES CONSIDERED

This section describes the system concept for the recommended overall system configuration and discusses the alternative approaches which were evaluated for meeting the transmitting station and studio requirements of the project.

5.1 SYSTEM CONFIGURATION

Exhibit 5-1 illustrates the basic system configuration required to fulfill the project requirements. A summary of the concept is as follows:

1. The existing AM transmitter site at Spur Tree Hill is retained to provide service in the Mandeville area.

2. A new AM transmitting site is to be established at James Hill to provide service in the Pindars River and Two Meetings areas.

3. A new studio is to be established in Mandeville to meet JBC and project requirements in the Mandeville and Central Jamaica areas.

4. The new studio will control and provide programming to both the Spur Tree Hill and James Hill transmitters through a system of studio-to-transmitter links (STLs) connecting the three sites, including a repeater site near Balcarres (approximately 2 miles southeast of Spauldings). (Note: the exact location of this site is subject to determination by survey.)

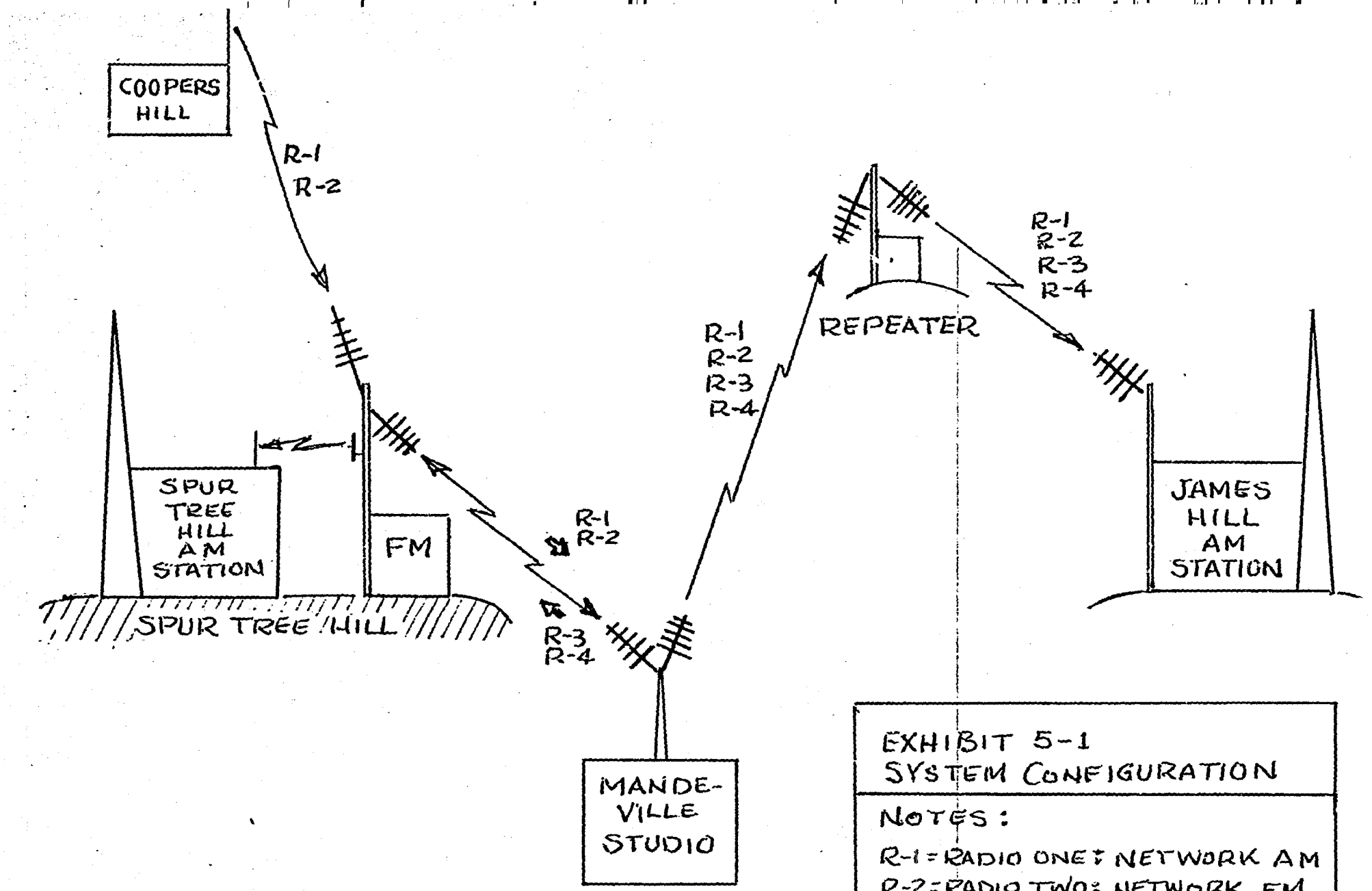

EXHIBIT 5-1
SYSTEM CONFIGURATION

NOTES:

R-1 = RADIO ONE: NETWORK AM
R-2 = RADIO TWO: NETWORK FM
R-3 = RADIO THREE: MANDEVILLE
R-4 = RADIO FOUR: PROJECT AREA

5.2 TRANSMITTING FACILITIES

Three transmitting sites were considered during the survey, as follows:

1. James Hill
2. Bull Head (mountain)
3. Grove Place

The first two were considered as new sites, in addition to Spur Tree, to be used principally to serve the project area. Grove place was suggested as a possible replacement site for Spur Tree Hill, to be used to serve both the project area and the Mandeville area.

James Hill was determined to be a completely adequate site: James Hill is almost midway between the two watersheds and would provide excellent radio coverage; the proposed location is adjacent to a secondary road and is flat farm land adjacent to a pine woods. The available land (based on JBC information) is approximately 600 feet square. Its elevation is approximately 2,000 feet above MSL. There are no structures on the land. Power is available within two miles from the site. The trip to the site from JBC maintenance forces in Kingston takes about 2 hours in good weather, which can be expected to increase to 3-4 hours in wet weather; however, this will most likely be the case for any site suitable for the project area.

Bull Head is 5 miles east of James Hill, at an elevation of 2,780 feet; it is an adequate site, but is much less desirable than James Hill. Use of this site would require construction of 2 miles of new access road, at an estimated cost of $70,000; therefore, it was eliminated from further consideration.

The Grove Place site was also rejected, as it would provide no better signal strength in the project area than the present Spur Tree station. (Neither would it be suitable for service in the Mandeville area due to the weak signal strength.)

5.3 STUDIO FACILITIES

Two studio locations were considered during the field survey as follows (both in Mandeville):

1. The Jamaica National Building Society (JNBS) building, now vacant.
2. The "Belair," a former hotel now being occupied by the Ministry of Agriculture.

The JNBS site is well-suited as the studio for the JBC and project applications. It is conveniently located on a main street in the business district, and has ample parking. The proposed studio space is on the second floor, accessed through a private entrance. The space is adequate (about 5,000 square feet) and is laid out in spaces and offices suitable for studio use with only minor improvements.

The Belair site is also located on a main street and has some parking space within the fenced compound, as well as outside. However, it is too small for a studio; only 750 square feet is available at present, in the form of three separate offices (formerly hotel rooms). It is understood that the Ministry has proposed to provide approximately 2,000 square feet of additional space by a building addition adjacent to the offices. The space is accessible only through the main lobby, which is also used for other space. It is judged that this space would require extensive modification to make a suitable studio.

5.4 STUDIO TO TRANSMITTER LINKS

Many and various approaches were considered for linking the studio and transmitters, but only two were sufficiently promising to mention here:

1. The recommended configuration, described in Section 5.1 and illustrated in Exhibit 5-1.
2. Use of the existing repeater at Cooper's Hill, north of Kingston.

The Coopers Hill site was rejected due to the lack of a line-of-sight path from there to James Hill. The configuration finally recommended appears to be the only system which can be constructed to supply James Hill; even so, a careful survey must be made to determine the exact location for the repeater and the minimum STL antenna heights.

SECTION 6
CONCLUSIONS AND RECOMMENDATIONS

The conclusions and recommendations of the study were reviewed with the AID Mission and Jamaica Broadcasting Corporation prior to the consultant's departure from Jamaica and were amended and approved for AID by Dr. Pat Peterson and for JBC by Mr. Wycliffe Bennett on 21 December 1979. Exhibit II is a direct copy of the signed agreement for future reference. To insure clarity, handwritten amendment to item 8.(1) is recorded as follows:

> "In the event that unforeseeable problems become evident in the detailed development of this site, JBC will choose another site subject to the criteria agreed upon between JBC and AID, based upon the criteria to be presented in an Annex of the final report."

The criteria for location of such an alternate site are as follows:

1. The site shall NOT be further than 15 miles from any portion of the project area.
2. The site shall be level farm land or other similar land with a soil depth of at least 2 feet.
3. The site shall be located no closer than one mile to any mountain or steep hill which rises abruptly above the elevation of the site.

In addition, Tables 1, 2 and 3, as mentioned in item 7., have been replaced by Tables 7-1, 7-2 and 7-3. Table 4 has been deleted, since it was not referenced in the Work Order.

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JBC RADIO CENTRAL PROJECT
SUMMARY OF FIELD SURVEY - DECEMBER 1979

1. Based on field strength measurements in the Pindars River and Two Meetings watersheds, it was determined that neither area is adequately served by the Spur Tree transmitting site; in addition, other station locations in Jamaica provide only very poor and spotty coverage of these areas. Reception is virtually impossible at almost all locations during the evening hours.

2. It is not practical to serve the project areas by increasing power at Spur Tree, since even a 14db increase in power, from 5kw to 125 kw, would serve only about one-half to three quarters of the project area.

3. The James Hill Site was the lowest-cost site identified during the survey. It is well suited as a transmitting site; it is on a secondary road; and it is near electric power service. Bull Head has none of these features, and would suffer a substantial cost disadvantage; it is also less suitable from a transmitting point of view.

4. The Teleconsult measurements correlate with test data and predictions made by JBC.

5. An inspection of two proposed studio sites at Mandeville was made with AID and JBC representatives. It was determined that the Jamaica National Building (second floor) was well suited as a broadcasting studio, and would require only minor modifications. The Belair site was not well suited for studio application, and would require major modifications including construction of a building addition.

6. Various other alternatives for achieving the desired results were considered, and will be discussed in the final report. None were considered to be suitable from either a technical or economic standpoint.

7. Equipment requirements for the recommended configuration are listed in Tables 1, 2, and 3, following. These equipments and quantities are estimated on the basis of providing reasonable and adequate service in the project area. These lists represent the minimum requirements for fully meeting the objectives of the Project Paper; equipment procurement costs will be estimated in the final report. In the event that the equipment costs are found to exceed the available budget for these items, certain quantities may be reduced to fit the budget; however, such reductions will reduce the effectiveness of Radio Central below the levels indicated in the Project Paper.

8. RECOMMENDATIONS: I recommend the following actions by AID and JBC:

(1) AID/JBC should select the James Hill site for the Radio Central transmitting location, and proceed to develop this site.

(2) AID/JBC should select the space on the second floor of the building owned by the Jamaica National Building Society, negotiate for lease of this site, and begin lease-hold improvements to include one internal sound-proofing wall, air-conditioning of the studio and control room, and expanded electric power service.

(3) JBC should continue use of the Spur Tree Hill site to serve the Mandeville area until whatever time the Company selects an alternate site.

(4) The equipment list in Table 4 should be considered for meeting the requirements of the JBC, IRDP and Ministry of Agriculture extension agents in the task of supervising and coordinating the activities related to the cooperative efforts of these three organizations.

(5) AID should make maximum use of the engineering and technical management resources of JBC for supervision and technical problem-solving requirements of this portion of the project, as JBC personnel involved in the surveys and conferences have demonstrated a high degree of competence and objectivity.

21-2-79 USAID/J

It is further recommended that the following steps be taken as soon as possible to help insure orderly design, procurement, installation, test and acceptance of the system, in order to achieve the scheduled operational date of September 1980:

1. Selection of a contractor to manage procurement of all items.

2. Appointment or selection of a consultant to work with JBC: (a) to prepare specifications for all major items; (b) to support JBC in the final selection of transmitter and repeater sites; (c) to evaluate bids and assist in procurement planning and scheduling; and (d) to supervise final test and acceptance.

3. Continued coordination between AID/Washington, the Mission, JBC and other parties to insure expedited processing of the procurement.

SECTION 7
EQUIPMENT REQUIREMENTS AND ESTIMATED COSTS

Tables 7-1, 7-2 and 7-3 are lists of equipment requirements and estimated costs for the transmitter site, studio and studio-to-transmitter links for the system, including spare parts, export packing and shipping. Additional allowances are made for consumable technical supplies, test equipment and technical assistance. A summary of costs is presented as follows:

TOTAL ESTIMATED PROJECT COSTS

Transmitting Station	$ 91,650
Studio	56,300
STL	32,900
Consumable Technical Supplies	5,000
Test Equipment	10,000
Technical Support	20,000
TOTAL ESTIMATED PROJECT COST	$210,850*

*Excludes taxes and export fees.

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TABLE 7-1: TRANSMITTING STATION EQUIPMENT

ITEM NO.	DESCRIPTION	QUANTITY REQUIRED	UNIT COST	TOTAL COST
1.1	Transmitter, 10KW, medium wave	1	33,000	33,000
1.2	Dummy load	1	900	900
1.3	Limiting amplifier	1	825	825
1.4	Modulation monitor	1	875	875
1.5	AM/FM receiver and speaker	1	500	500
1.6	Antenna mast, guyed, 290 ft., with base insulator, guys, guy insulators, anchors, paint, hardware	Lot	8,900	8,900
1.7	Ground radials, No. 10 copper	35K ft.	0.04	1,400
1.8	Antenna tuning equipment ?	Lot	4,000	4,000
1.9	Antenna lighting kit & isolatior transformer	1 ea.	3,550	3,550
1.10	Standby generator, diesel, 45 KVA, 50 Hz, with accessories & fuel tanks	1	10,600	10,600
1.11	Automatic transfer switch	1	2,400	2,400
1.12	Voltage regulator	1	2,500	2,500
1.13	Mobile transceiver, 25 W, 3-frequency, antenna, battery charger	1 ea.	1,100	1,100
1.14	Field strength meter	1	1,600	1,600
	Total Equipment			72,150
	Contingency & Spares			12,000
	Export Packing			2,500
	Shipping			5,000
	TOTAL ESTIMATED COST			91,650

TABLE 7-2: STUDIO EQUIPMENT

ITEM NO.	DESCRIPTION	QUANTITY REQUIRED	UNIT COST	TOTAL COST
2.1	Audio control console, mono, 8-channels, 16 inputs	1	4,000	4,000
2.2	Monitor speakers	3	300	900
2.3	Turntables with tonearm, cartridge, preamp	3	800	2,400
2.4	Cartridge machine, record/playback	2	1,700	3,400
2.5	Cartridge machine, playback only	3	1,100	3,300
2.6	Reel-to-reel tape recorder/reproducer 3-speed	2	2,150	4,300
2.7	Cassette record/playback, rack mount	2	700	1,400
2.8	Cassette record/playback, portable	10	400	4,000
2.9	Cassette high-speed duplicator	1	1,500	1,500
2.10	Microphone, studio	4	150	600
2.11	Microphone, outdoor	4	100	400
2.12	AM/FM receiver	2	250	500
2.13	Headphones	5	100	500
2.14	Studio clock, sign	2 ea.	100	200
2.15	Microphone stands, arms	4	100	400
2.16	Emergency generator, diesel, 18 KVA, 50 Hz, battery, accessories, fuel tank, transfer switch	1	10,500	10,500
2.17	Connectors, cable, hardware	Lot	1,500	1,500
2.18	Base station, 100 W, 3-freq., antenna	1	2,500	2,500
	Total Equipment			42,300
	Contingency, Spares			10,000
	Export Packing			1,500
	Shipping			2,500
	TOTAL ESTIMATED COST			56,300

FIGURE 7-3: STUDIO-TO-STUDIO TRANSMITTER LINKS

ITEM NO.	DESCRIPTION	QUANTITY REQUIRED	UNIT COST	TOTAL COST
3.1	STL system, 450 MHz, including antenna	5	3,000	15,000
3.2	Repeater, 450 MHz, including back-up power supply and antenna	1	5,000	5,000
3.3	Sub-carrier generator & receiver	1 ea.	1,000	1,000
3.4	Back-up FM receiver & antenna	1	500	500
3.5	Mast, 100 ft., guyed	2	1,600	3,200
3.6	Mast, 50 ft., S/S	1	2,200	2,200
	Total Equipment			26,900
	Contingency, Spares			5,000
	Export Packing			500
	Shipping			500
	TOTAL ESTIMATED COST			32,900