

C. KRAFT

File

OPERATIONS CONTROL PLANS

FOR

MANNED SPACE FLIGHT

PRESENT MCC - COMP COMPLEX - COMP PROG CANNOT SUPPORT LATE GEN & APOLLO
REQUIRES NEW BLDG - DISPLAYS - COMPUTERS - COMMUNICATIONS

HAVING ESTABLISHED THAT POD SHOULD BE IN HOUSTON THAN THIS PRESENTATION HAS
BEEN PREPARED TO BRING OUT WHERE MCC - COMPUTERS SHOULD BE LOCATED AND THE
PLAN FOR HOW THESE MISSION CONTROL CENTER LOCATED AT HOUSTON
OPS. SHOULD BE CARRIED OUT USING THESE FACILITIES

ADVANTAGES

1. Proximity to entire FOD and project office personnel for timely control of:
Already made pt that ops inputs are vitally needed.
 - (a) Initial implementation and checkout
 - (b) Modifications due to changes in mission or spacecraft systems requirements *This impt from Merc Exper.*
2. Availability of key personnel at MSC otherwise absent during flight control training and mission periods
This cannot be over emphasized - flight plan - prog - computer prog checkout actually accomplished here - Can't afford not to do simul. but only so many people - long term missions etc.
3. Direct availability of MSC specialists for consultation during mission periods

Primarily a people prob.
Days spent away
Supervisory PEOPLE.
Only so many of this
type avail - Got to
use economic ally

DISADVANTAGES

1. Lack of proximity of control center to the launch site - *Intangible but important*
2. Long lines for communication systems requiring high data rates and large bandwidth for information flow

↓
However USES OR TV

DAY TO DAY CONTACT - MERCURY Experience. - LAUNCH PROG^{OUR} - PEOPLE AT GSFC
GEN RENDEZVOUS & APOLLO CONTROL SEVERAL ORDERS OF MAGNITUDE GREATER
REQUIRES CONTINUOUS REAL TIME COMPUT - COMPLETE MISSION ANY CIRCUM
I.E. CONTIN CONT OVER TRAJEC EVEN THOUGH IN ORBIT - SAME THINGS & LOGIC MUST
BE CONSIDERED IN ORBITAL FLT AS IN LAUNCH.

COMPUTING COMPLEX LOCATED AT HOUSTON

MERC. MOSTLY WITH. ONCE IN ORBIT -

CONSIDER. THESE PROB. MUST HAVE PEOPLE PERFORMING FLT. CONT.

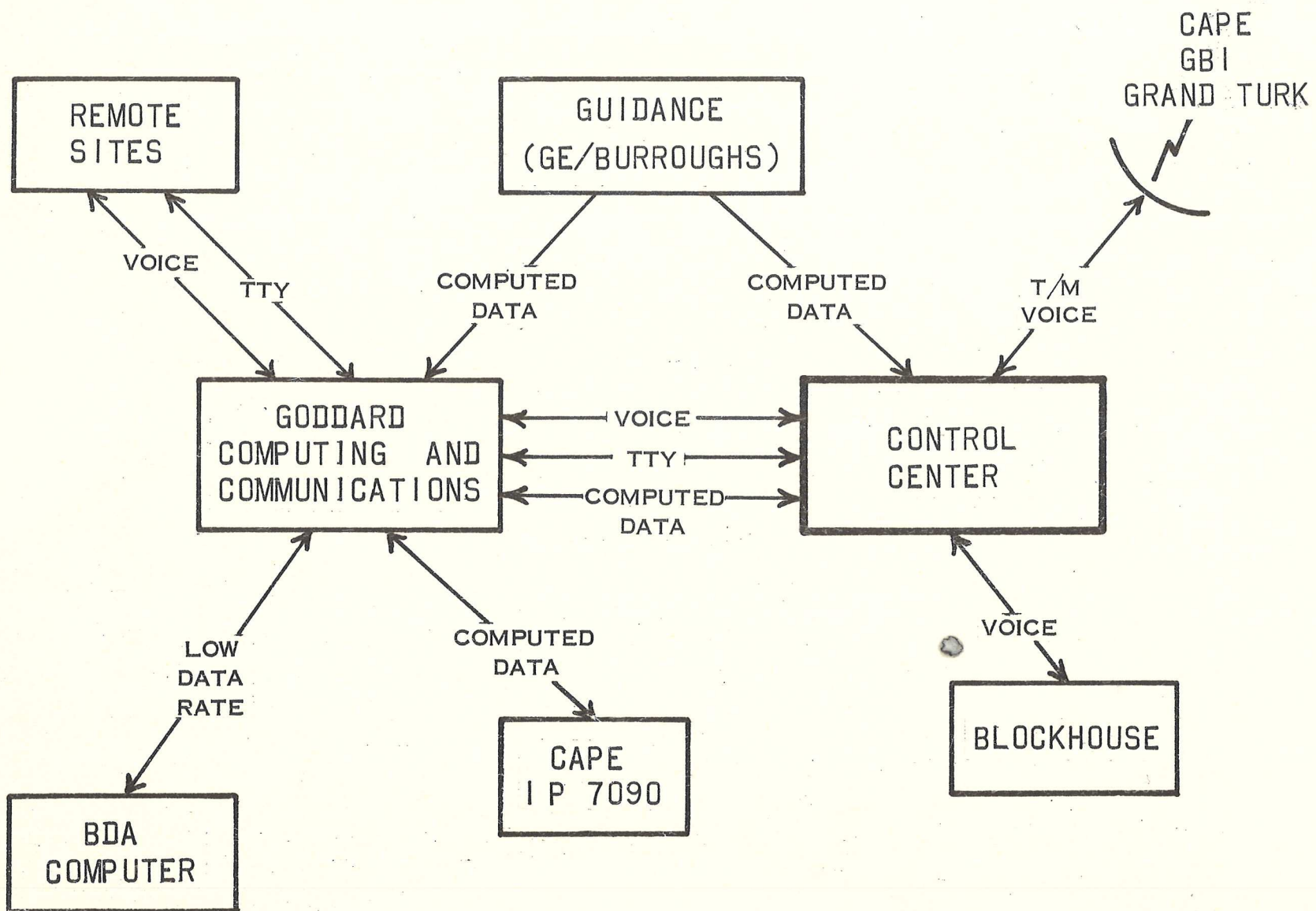
ADVANTAGES

1. Proximity of computer complex to FOD personnel responsible for design of mission logic and contracted computer programmer personnel.
2. Proximity to control center:
 - (a) to eliminate long-distance transmission of computer outputs
 - (b) to facilitate check-out of the computing and display systems
 - (c) to expedite preparation and execution of extensive trajectory control simulations

DISADVANTAGES

None

PRESENT MERCURY SYSTEM



18-ORBIT

GEMINI-ORBIT

APOLLO R & D

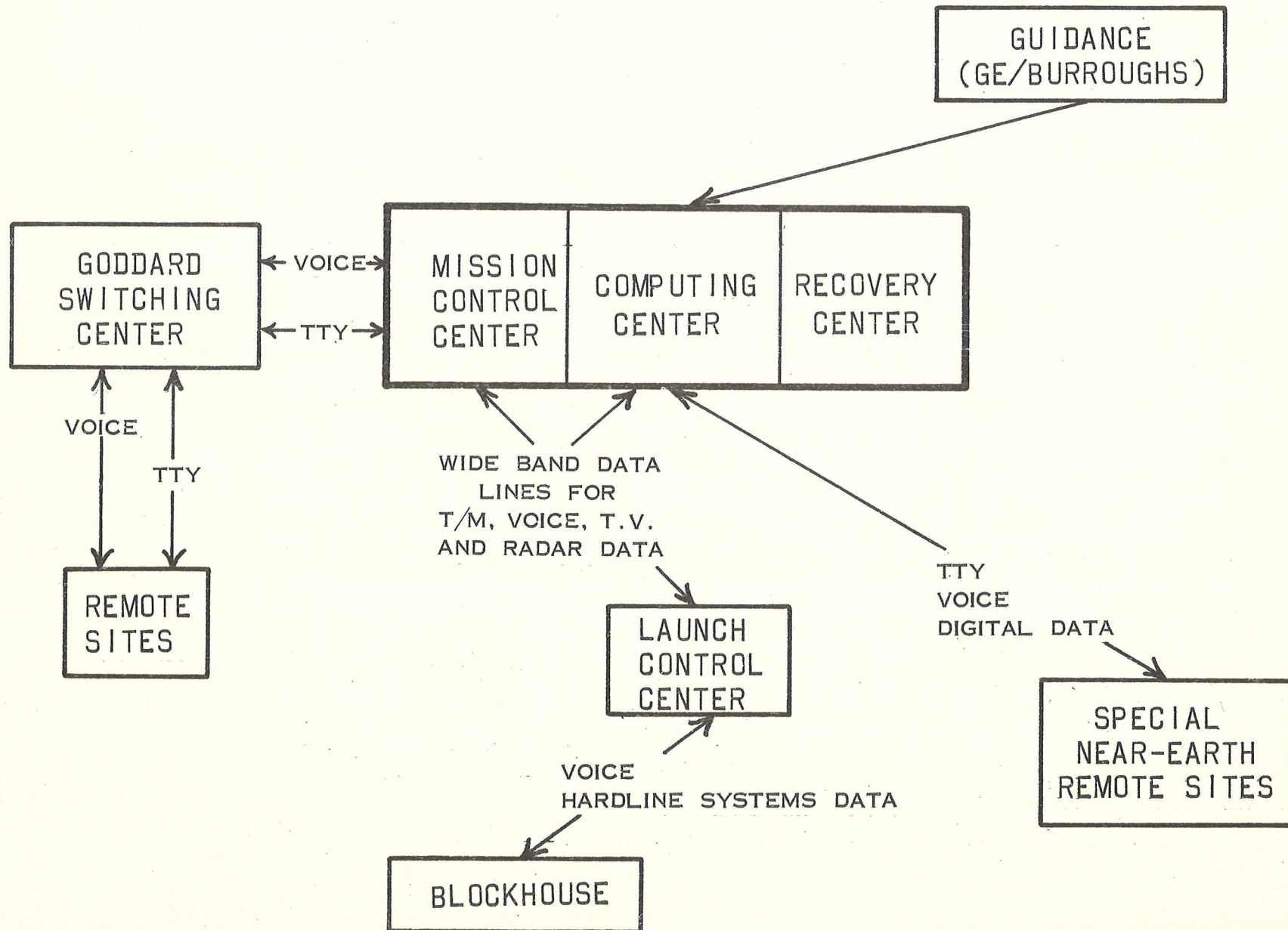
SIMILAR TO PRESENT SYSTEM WITH BDA HIGH
SPEED DATA REMOTED FOR DISPLAY AT M.C.C.

THIS PROVIDES COMPLETE COMMAND CONTROL AT M.C.C.

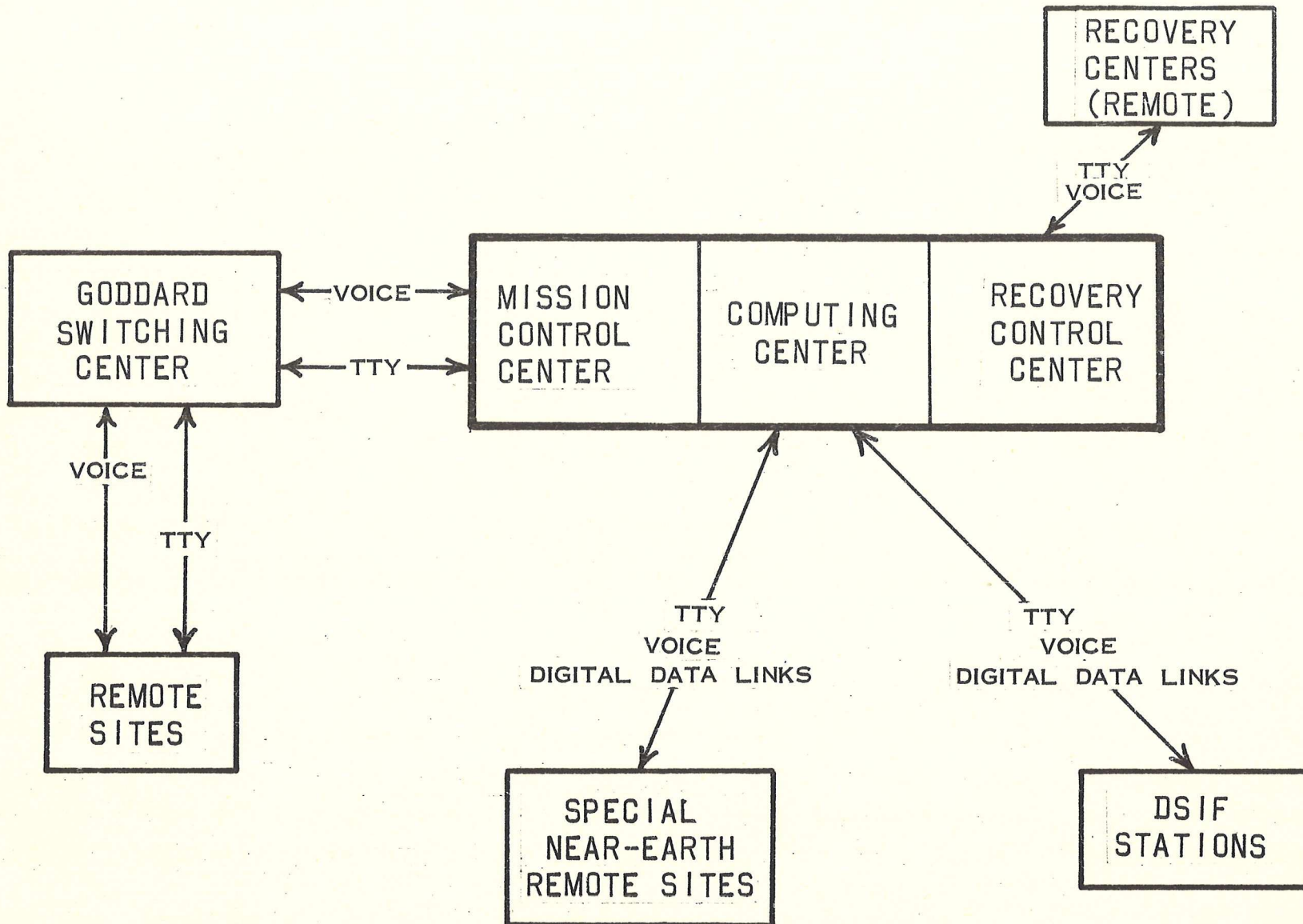
*MAKE POINT-DOING THIS IS NOT GOOD BECAUSE OF PEOPLE PROB
SUPERVISORS AT CANAVERAL WORK AT HOUSTON.*

NOTE: Present complex can continue to support these
missions without extensive changes.

GEMINI RENDEZVOUS
APOLLO - NEAR EARTH



APOLLO - DEEP SPACE



PHASES OF APOLLO MISSION CONTROL

| PHASE | RESPONSIBLE AGENCY | LOCATION |
|--|--|--|
| PRELAUNCH (a) Booster (b) Spacecraft (c) Network (d) Mission | LOC MSC GSFC (up to t-6hrs) MSC | CAPE CAPE WASHINGTON HOUSTON and CAPE |
| FLIGHT (TO ORBITAL SPEEDS) Abort Control | MSC and RANGE SAFETY | HOUSTON and CAPE |
| FLIGHT (IN ORBIT, DURING TRANSFER, and CISELUNAR) | MSC | HOUSTON |
| RE-ENTRY, RECOVERY | MSC | HOUSTON and REMOTE SITES |

SCHEDULE

| CALENDAR YEARS | 1962 | 1963 | 1964 | 1965 |
|--|----------------------|----------------------|----------------------|------------|
| PROGRAMS | | | | |
| 1. Mercury | ████████████████████ | | | |
| 2. Gemini Orbital | | ██████████████ | | |
| 3. Apollo - R&D | | ████████████████████ | | |
| 4. Gemini Rendezvous | | | ████████████████████ | |
| 5. Apollo - Manned | | | ████████████████████ | ██████████ |
| Award Houston Site Development Contract | ▼ | | | |
| MISSION CONTROL CENTER | | | | |
| 1. Award Study Contract | ▼ | | | |
| 2. Complete A&E Requirements | ▼ | | | |
| 3. Complete A&E Design and Award Implementation Contract | ▼ | | | |
| 4. Complete Equipment Requirements and Award Implementation Contract | ▼ | | | |
| 5. Building Construction | | ██████████████ | | |
| 6. Equipment Instrument and Checkout | | ████████████████████ | ----- | ~~~~~ |
| 7. Flight Controller Training | | | ██████████ | ~~~~~ |

CURRENT BUDGET AND REQUIREMENTS (IN THOUSANDS)

| | Fiscal Year 1962 | | | Fiscal Year 1963 | | |
|---|------------------|----------|------------|------------------|----------|------------|
| | Appropriated | Required | Difference | Authorized | Required | Difference |
| 1. Modifications to present Mercury Control Center for: | | | | | | |
| One Day Mercury Missions | 0 | 0 | 0 | 3,000 | 3,000 | 0 |
| Early Gemini Missions | 0 | 0 | 0 | 2,000 | 0 | -2,000 |
| 2. Mission Control Center | | | | | | |
| Study Contracts | 100 | 500 | 400 | 700 | 700 | 0 |
| A and E Requirements | 0 | 0 | 0 | 1,300 | 1,300 | 0 |
| Equipment Engineering | 0 | 0 | 0 | 1,700 | 1,700 | 0 |
| Building Construction | 0 | 0 | 0 | 0 | 7,000 | 7,000 |
| Equipment Costs | 0 | 0 | 0 | 0 | 15,000 | 15,000 |
| 3. Recovery Control Centers | | | | | | |
| Land acquisition and development | 0 | 0 | 0 | 3,000 | 3,000 | 0 |
| Construction | 0 | 0 | 0 | 5,000 | 5,000 | 0 |
| TOTALS: | 100 | 500 | 400 | 18,700 | 38,700 | 20,000 |