



State of Utah

JON M. HUNTSMAN, JR.
Governor

GARY R. HERBERT
Lieutenant Governor

Department of Administrative Services

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Executive Director

Division of Facilities Construction and Management

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Director

ADDENDUM NO. 5

Date: April 8, 2009

To:	Company	Contact	Fax
	Explus Inc.	Brett Beach	703-260-0790
	Kubik Maltbie Inc.	Charles M. Maltbie, Jr.	856-234-0760
	Pacific Studio	Marc Burns	206-783-5409
	Superior Exhibits & Design Inc.	Duncan R. Miller	847-364-9386

From: Rick James, Project Manager, DFCM

Reference: Exhibit Fabrication and Installation – Utah Museum of Natural History
University of Utah
DFCM Project No. 02243750

Subject: **Addendum No. 5**

Pages	Addendum Cover	2 Pages
	Cost Proposal Attachment (Excel Format)	12 Pages
	Specs - Addendum Nr. 5 Exhibit Audio Visual Elements	23 Pages
	<u>100% Interpretive Plan (Excel Format WinZip Format)</u>	<u>189 Pages</u>
	Total	226 Pages

Note: This Addendum shall be included as part of the Contract Documents. Items in this Addendum apply to all drawings and specification sections whether referenced or not involving the portion of the work added, deleted, modified, or otherwise addressed in the Addendum. Acknowledge receipt of this Addendum in the space provided on the Bid Form. Failure to do so may subject the Bidder to Disqualification.

While we contend that SB220 should only be potentially applicable to a contract issued after the effective date of said bill, this is to clarify that for purposes of this contract, regardless of the execution or effective dates of this contract, the status of Utah Law and remedies available to the State of Utah and DFCM, as it relates to any matter referred to or affected by said SB220, shall be the Utah law in effect at the time of the issuance of this Addendum.

5.1 SCHEDULE CHANGES: None

5.2 GENERAL ITEMS: Clarifications

5.2.1 It has been requested that the Excel file be released which includes the Cost Proposal Attachment. Cost Proposal Attachment in Excel Format is attached.

- 5.2.2 Clarifications for the listing of Subcontractors - refer to the Subcontractor List Requirement. See also Request for Proposals, "Instructions and Subcontractor List Form", pages 18-20.
- 5.2.2.1 All first-tier subs \$35,000 or over must be listed on the Subcontractor List.
- 5.2.2.2 Suppliers are not required to be listed.
- 5.2.2.3 If the subcontractor is not required to be licensed as a contractor (which may be the case for some categories in this project), it is still required that the subcontractor be listed on the form. Enter "Not Required" under the column for contractor license number.
- 5.2.2.4 After the bid no substitutions are allowed without the approval of the DFCM Director. Changes are only allowed for the reasons listed on page 19 of the RFP.
- 5.2.2.5 Some firms are listed in the project specification as approved firms for subcontractor list. In the bid, however, only one firm can be shown for the same work. See page 18 in the RFP. "Bidder may not list more than one subcontractor to perform the same work."
- 5.2.2.6 Selection of subcontractors is done by the bidder before the bid is submitted.
- 5.2.2.7 In order to gain approval for a subcontractor which not listed in specification as an approved subcontractor, submit the firm name and other credentials to the Exhibit Designers, Ralph Appelbaum Associates, 88 Pine Street, 29th Floor, New York, NY 10005 before the "Last Date to Submit Questions for Final Addendum" as shown in the Project Schedule, as currently revised.
- 5.2.3 Refer to the Specification Section AV 040609. Replace with the attached "Addendum Nr.5 Exhibit Audio Visual Elements".
- 5.2.4 It has been requested that the Excel files be released which include the Interpretive Plans. WinZip files are attached.

UTAH MUSEUM OF NATURAL HISTORY

100% FINAL DESIGN DOCUMENTS

ADDENDUM Nr. 5

EXHIBIT AUDIO VISUAL SYSTEMS

PREPARED BY RALPH APPELBAUM ASSOCIATES

ISSUED: APRIL 6, 2009

RAA Project No. 0275

University of Utah Project No. 0872-9630

Division of Facilities Construction Management Project No. 02243750

SECTION 11130 AUDIO-VISUAL SYSTEMS

PART 1- GENERAL

1.01 GENERAL CONDITIONS

- A. Work of this section, as shown or specified, shall be in accordance with the requirements of Division 1 Specifications of the Contract Documents and Owner provided General Conditions.

1.02 SUMMARY

- A. Scope of Work

1. The range of audio visual technologies used include experiences based on simple media playback such as immersive audio environments, audio cues within mechanically interactive exhibits, a number of LCD screens and video projections in varying formats. Other exhibits involve larger video projections with touch activated interfaces to content. Additionally there are a number of interactive audio visual based 'trails' through the exhibits. These experiences are based on site specific interactive content that is accessed by handheld devices including the visitor's own smart phones through the University's wireless broadband Ethernet.
2. Furnish and install audio-visual systems as shown on the project drawings and described in this specification. The drawings and specifications do not describe all work required to fulfill the contract. In addition, provide any additional equipment, materials and labor required to make complete and working systems consistent with the intent embodied in the project drawings and specifications
3. Prepare shop drawings and other submittals for review by the exhibit design team prior to construction.
4. Provide all necessary connectors, terminals, punch blocks, patch bays, connector panels, and cover
5. Provide all necessary conduit, surface raceway, boxes, wire and fiber except those items specifically listed as work by others.
6. Provide all equipment required to meet the performance requirements defined in the AV design documents.
7. Coordination
 - (a) The Av Systems Integrator will be required to work with University of Utah and existing service providers to insure that exhibits and wireless technologies work within the operating parameters and standards of the University's campus IT department (NetCom).
 - (b) All AV hardware that is built into millwork and graphics must be provided to the Exhibit Contractor for measurement and integration into exhibit housings and other surrounds. Cost of shipment and insurance is the responsibility of the AV Systems Integrator. Delivery times should be coordinated with the Exhibit Contractor.

- (c) The AV Systems Integrator is responsible for defining and coordinating equipment and media program requirements including native file formats for playback with the Media Producer(s). AV Systems Integrator shall cover the cost of online tests to optimize file and compression formats for the specified AV Systems prior to installation of media content on site.
 - (d) The AV Systems Integrator will be responsible for coordinating with the work of the Exhibit Contractor and the General Contractor's MEP and IT Subcontractors to insure that all systems are properly integrated into the base building's IT, electrical and mechanical infrastructure, terminations of all wiring at panels, terminal closets and equipment racks. Test all installed cabling and equipment.
- 8. Provide for shipping sample equipment to Exhibit Contractor s & Media Producer(s) as required.
 - 9. Prepare all As-built documentation
 - 10. Provide on-site training in the operation and maintenance of the systems for personnel designated by the Owner.
 - 11. Provide on-site support for opening week events.
 - 12. Provide a one-year warranty covering all systems installed under this specification

2) RELATED WORK

A. Related Work Specified Elsewhere

- 1. Division 16: Conduit, raceway and standard electrical boxes shall be provided by General Contractor. All 120 VAC circuits for A/V, teleconferencing, and network devices. Installation of AV Systems Integrator provided dimmer racks.
- 2. CAT5 and fiber optic cables, jacks and patch bays for connection of AV systems to building LAN. Exhibit specific CAT and fiber optic cables are included in AV integrators scope.

1.01 REFERENCES

A. Codes

- 1. Code compliance is mandatory. Inform the owner if work is shown that appears to conflict with federal, state, and local codes and requirements.

B. Standards:

- 1. CSA, UL or other nationally recognized testing laboratory standards.

1.02 SYSTEM DESCRIPTION

- A. General: Provide audio-visual systems for sound playback, video projection, computer graphics display, and AV interactive elements.
- B. The system consists of the exhibits listed in the following chart;

Exhibit Name	Ref	notes
CANYON		
Trail Head	CN4.E01.av01-06	(6x) 17" touchscreen, CPU , 1 CPU & laser printer in gift shop
Trail System	N/A	Server for Trail System
SKY		
Demo Area	SK.av01	Ceiling Spkrs, Controls, W/L mic, floating ALS
Weather Station	SK3.E01.av01	46" monitor,CPU (Instrument N.I.C.), split screen ctrl + weather cam
Snowflake Video	SK3.E01.av02	20" AV monitor, S-Def
NATIVE VOICES		
Demo Area	NV.av01	Ceiling Spkrs, Controls, W/L mic, floating ALS
Storytelling	NV6.E01.av01-04	MP3 w/ focused spkr (4) caption reader
Generational Memory	NV5.E06.av01	(5) frameless 42" Displays S-Def, speakers
Welcome	NV1.E01.av01	MP3 player, speaker, motion sensor
Language Station	NV3.E01.av01	CPU, 17" monitor, KBD / trackball, headphones
LIFE		
Demo Area	LF.av01	Ceiling Spkrs, Controls, W/L mic, floating ALS
Keritan Interactive	LF2.E02	(24) 2" 5x7 LED displays & electronics
What Cells Can Do	LF3.E02.av01	Video projector, S-Def, focused spkr
Populations Interactive	LF5.E02.av01	Touch interactive
Ecosystems	LF6.E01-E04.av01	(4x) 4 Sprk. Soundscape
Human Interactions	LF6.E05.av01	(4) handsets w/ buttons
Talkback Station	LF6.E05.av02	CPU, 17" monitor w/ kbd station

THE LAND

Demo Area	LD.av01	Ceiling Spkrs, Controls, W/L mic, floating ALS
Plate Tectonics	LD1.E03.av01	Globe on/off control only Allowance for 32" Omni Globe+software
B&R Biogeography	LD4.E08.av01	26" AV Monitor, S-Def,
Talkback Station	LD4.E04.av01	CPU, 17" monitor, still cam
Jump Seismometer	LD4.E03.av01	CPU, 15" monitor, local

FIRST PEOPLES

Demo Area	FP.av01	Ceiling Spkrs, Controls, W/L mic, floating ALS
Ceramics, Tools, Weaving	FP5.E02.av01 FP5.E05.av01 FP5.E06.av01	(3x) 20" AV monitors S-Def w/ sound
Tool Interactive	FP5.E06.in01	Triggered Audio

LAKE

Demo Area	LK.av01	Ceiling Spkrs, Controls, W/L mic, floating ALS
Sounds of the Lake	<i>LK2.E01.av01</i>	(8) speaker soundscape
Watershed	<i>LK2.E06.av01</i>	46" AV Monitor, S-Def, speakers, Cap Snsr
People and the Lake	<i>LK2.E05.av01</i>	46" AV Monitor, S-Def, speakers, Cap Snsr

PAST WORLDS

Demo Area	PW.av01	Ceiling Spkrs, Controls, W/L mic, floating ALS
Pleistocene Dinner Table	PW2.E04.av01	Triggered Audio (x5)
Paleo Prep Lab	PW7.E01.av01	20" AV monitor, S-Def, w/ sound
Cleveland Lloyd Quarry	PW5.E03.av01	(4) 32" AV monitor, S-Def, w/ sound
Late Cretaceous	PW4.E01.av01	(6) speaker soundscape

UTAH FUTURE

Sustainability (basic)	UF3.E01.av01	single 10K LCD, CPU, 15 gobo & sensor
UF Talkback Station2	UF3.E01.av02	CPU, 12" monitor spkrs, microphone, repeat monitor

OUR BACKYARD

Our Backyard Animal Sounds	OB2.E01.av01	(5x) MP3 players & speakers + 5 spkrs, 2 tracks in trees
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LEARNING LABS	Earth, Naturalist & Dry Cave	(3x) Ceiling Spkrs, Laptop Iface, Controls, Proj,W/L mic, floating ALS
NATURAL HISTORY NOW	HV.AV01-AV03	(3x) 20" monitor, CPU, KBD, Trkball
CENTRAL EXHIBIT DIMMER RACK & CONTROLS	N/A	Dimmer rack, modules, controls, no installation

- C. Systems includes KVM switch to monitor all computers in rack room
- D. System includes video multiplexor for monitoring video playback in rack room
- E. Many exhibits have motion sensors covering area in front of exhibit to trigger the start of the show. Selecting, providing, installing and wiring a motion sensor is in this scope.
- F. Many exhibits have hidden docent pushbutton switches to start and stop specific exhibits. Providing, installing and wiring this momentary switch is in this scope as required
- G. Projection exhibits may have dual projectors for back-up. There is no intention to run both projectors at the same time so pixel resolution alignment is not required.

1.03 SUBMITTALS

- A. Required Submittals:
 1. Provide the Exhibit Designer with 3 copies of all required submittals and allow a minimum of 14 days for review for each submittal. Provide enough time in the schedule to allow for at least (3) rounds of submittals.
 2. Submittals must be approved prior to equipment procurement and systems fabrication.
 3. Substitutions: Submit product literature and manufacturers data on all proposed equipment substitutions for review and approval by Exhibit Designer.
 4. Submit shop drawings to include the following:
 - (a) Functional block diagrams for the audio, video, room control, and network/telecom systems. Label all inputs and outputs.
 - (b) Rack, frame and backboard elevations for all systems.
 - (c) Structural details of ceiling attachments and mounts.
 - (d) Audio, video and network patch panels.
 - (e) Detailed riser diagram.

- (f) Panel details showing all engraving for all systems.
- (g) Schematics of all custom circuits.
- (h) Detail any modifications to equipment supplied by manufacturers.
- (i) Screen images of the audio processor programs showing blocks and all control pages, and a listing of statistics from the compiler showing board, processor and net utilization if applicable.
- (j) Chart or other documentation of exhibit programming functionality. This should document:
 - 1. How the exhibit operates on the floor.
 - 2. How the exhibit is turned on & off.
 - 3. Any staff controls for test/debug.

B) Prototyping:

1. Prototypes: Some larger exhibits will require full-scale prototyping in coordination with Exhibit Contractor and media producers. It is assumed that the AV Systems Integrator will provide all necessary staging, equipment and facilities for these working prototypes and will host a meeting for coordination and review. These exhibits include:

a.	Populations Interactive	LF5.E02.av01
b.	What Cells Can Do	LF3.E02.av01
c.	Sustainability Interactive	UF3.E01.av01
2. Prior to final fabrication and installation of all interactives shall be prototyped and tested by the Exhibit Contractor and reviewed by Exhibit Designer and Owner.
3. Fabrication schedule should be planned so that a minimum four weeks are allowed for prototyping testing and review prior to installation.
4. Notify Exhibit Designer one month in advance of dates and times when prototype will be fabricated and ready for review.
5. Prototypes shall demonstrate the aesthetic effects and functional qualities of materials and systems as well as the defined visitor experience, ergonomics and functionality of interactive programs as provided by the media producer.
6. Mock-ups and prototypes will take place in the AV Integrators shop.
7. Build mockups and prototypes to comply with the following requirements, using materials and products indicated for the completed Work to demonstrate the following:
 - image quality, contrast, color, brightness, edge blending (if any), etc
 - geometry, screen dimensions, lenses, etc.
 - user interface components, accessibility, ergonomics and ease of use
 - integration of all hardware, products and systems with surrounding exhibits

- durability and maintenance

C. Documentation: On completion of the Installation:

1. Submit written notification to the Owner of completion of initial tests, and coordinate checkout schedule.
2. Submit as-built drawings, to include:
 - a. Functional block diagrams for the audio, video, room control, and network/telecom systems. Label all inputs and outputs
 - b. Rack, frame and backboard elevations for all systems.
 - c. Audio, video and network patch panels
 - d. Wire lists for all systems, assigning wire numbers for every wire
 - e. Schematic of all custom circuits.
 - f. Detail any modifications to equipment
 - g. Submit System Operation and Maintenance Manuals as specified in Section 01730, to include:
 - h. All manufacturers' manuals. In a narrative section illustrated as necessary, describe the typical procedures to be followed in configuring and operating the systems. This manual should be written for a technically literate reader who is not an expert.
 - i. A programmer's manual, intended to guide an experienced programmer through the custom software, with appropriate references to manufacturer's manuals.
 - j. A maintenance manual, describing programmed maintenance procedures with appropriate references to manufacturer's manuals.
 - k. A troubleshooting guide.
 - l. A summary in tabular form of the operating settings of all adjustable components

1.04 QUALITY ASSURANCES

- A. The AV Systems Integrator and the installer shall be one of the same firm who can substantiate that the firm has been continuously engaged in the fabrication and installation of museum audio-visual work similar in scope and scale to that described herein for not less than seven (7) years.
- B. AV Systems Integrator must identify the name, relevant experience and qualifications of the project manager and lead programmer who will remain on this project from initiation to completion. Lead programmer must be on AV Systems Integrator's permanent staff and not a subcontractor.

1.05 OTHER GENERAL REQUIREMENTS

- A. Field Cooperation: Cooperate at all times with all trades doing work on site to minimize lost time, work stoppages and interference.
- B. Store all material until it can safely be installed on site. Coordinate delivery times, storage and protection of the equipment at the site, and acceptance with the Owner

1.06 WARRANTY

- A. Provide a 1 year warranty on the installed systems. Warranty period shall begin on acceptance of the system by the Owner. See 'Warranties' Section for additional requirements.
- B. Warranty shall cover labor and materials required to keep systems functioning as they were at the time of acceptance. Consumables such as projector lamps are not covered by the warranty. Damage or loss due to improper operation of the equipment, fire, flood, earthquake or theft shall not be covered by the warranty.
- C. During the warranty period, inspect the system annually and restore all equipment to original performance.
- D.

PART 2 PRODUCTS

2.01 MATERIALS AND EQUIPMENT

- A. Materials and equipment shall be new and shall meet or exceed the latest published specifications of the manufacturer in all respects.
- B. Supply the latest model of each piece of specified equipment available at the time of bidding. In the event that models are superseded between bidding and ordering of equipment, notify the Owner and provide the latest model with equal or superior specifications if the cost does not exceed that of the equipment as bid. If the cost of the newer piece exceeds the bid amount the Owner may elect to purchase the newer piece as a change order at additional cost.

2.02 SOFTWARE

- A. Show control software will be the responsibility of the contractor. Show control software will operate exhibits as described in media briefs. In addition software will provide for:
 - Scheduled system on/off following museum operation hours
 - Manual override of schedule for events
 - Global volume controls
 - System status reporting via graphical "map" of exhibit
 - Any code-mandated fire shutdown.

- B. Media software will be the responsibility of Media Producer(s). AV Systems Integrator to coordinate the installation of media, coordinate formats and system requirements including optimized compression formats.
- C. AV Systems Integrator will be responsible for setting up any computers so they will auto boot with no login to the operating system.

2.03 CUSTOM FABRICATION

- A. Unless otherwise specified, custom plates shall be 1/8" brushed aluminum with beveled edges. Labels shall be engraved and paint filled. Anodized finish and infill colors to be approved by Owner.
- B. Adopt either EIA 568-A or –B wiring standard for Cat-5 cable to coordinate with data/telecom contractor.
- C. Avoid use of mini-din connectors for S-video on custom plates. Use dual 75 ohm BNC on plate and adapters at equipment.
- D. Equipment mounted in racks shall be labeled
- E. Seismic safety: Attach all permanently installed equipment to the building to minimize risks to personnel and the equipment in the event of earthquake. Brace all hanging equipment appropriately. Obtain the services of an Utah licensed engineer for design of seismic attachments and mounts where required by codes or prudent practice.
- F. All custom fabricated circuits employing integrated circuits and/or discrete components will be built using custom printed circuit boards. Wire wrap or soldered construction on prototyping boards is not acceptable. Exception: Pads and other simple networks that can be built into connector bodies or barrels.

PART 3 EQUIPMENT SCHEDULE

3.01 OVERALL SYSTEMS

1. Show Control

- a. Acceptable systems; Crestron / AMX / MSC, Alcorn-Mcbride
- b. All exhibits will be under control of a master show control system. AV Systems Integrator will provide system meeting the following design criteria.
- c. System will be modular. No more than (3) exhibits will be connected to a single controller element to prevent single point failure from affecting other exhibits. Units will be networked to allow for overall monitor system however removal of monitor system will not affect exhibit operation.
- d. System will provide an overall status monitor to show the status of:
 - The whole museum (on graphical floor plan)

- Individual exhibits
 - Individual pieces of equipment.
- e. System shall be programmable to achieve all functionality in specification including
- Master on/off via schedule and buttons with override.
 - Global Volume Control
 - Specific exhibit functionality & monitoring
2. Master Audio Control: AV Systems Integrator will provide system meeting the following design criteria.
- a. Acceptable systems: Media Matrix, BSS, MSC
 - b. All audio signals will run through the master audio system.
 - c. System will be DSP based.
 - d. System will be modular. No more than (3) exhibits will be connected to a single controller. Single point failure will not affect other exhibits
 - e. All inputs and outputs will be balanced.
 - f. Each output channel will have volume control, 5 band parametric EQ, delay and limiting functions. Each inputs will have 5 band parametric EQ, limiting and matrix mixing capabilities.
3. Computers: Commercial grade major manufacturer PC's with the following minimum features.
- a. Intel Core 2 duo processor > 3Ghz
 - b. 2Gb Ram, 80GB hard drive, DVD-ROM drive
 - c. NVidia Quadro video card.
 - d. Vista Operating system
4. Media Players
1. At bid time this project is based on Standard Definition playback. The project is aware of the transition to HD and this may be revisited however for the purpose of this bid each video playback will include:
 - a. Standard Definition Media player with solid state memory with demonstrated record of at least 3 years operation in a museum environment
 - b. Simultaneous Y/U/V and composite outputs (or DA to achieve this functionality)
 - c. Cable for future HD upgrade including one Cat5/6 low skew cable and one HD-SDI (SMPTE-292) coax.

3.02 SPECIFIC EXHIBITS

A. CANYON

Trail Head (6) computer interactives + gift shop printer)
CN4.E01.av01-06

- | | | |
|----|------------------------|---|
| 7) | 17" Touch Monitors | ELO 1739L |
| 7) | Computers | HP/Dell Pentium (see computer spec above) |
| 6) | Cat-5 Extender | TBD/ Magenta |
| 1) | Printer (in gift shop) | HP P4014N |

Trail System Server for Smart Phone System

- 1) Server 3GH Intel Quad core, Raid 5, (8) 146GB 15Krpm drives
Dual gigabit connection
- 1) 15" monitor
- 1) UPS 2200VA rack mount

B. UTAH SKY

Weather Station Weather display
SK3.E01.av01

- | | | |
|----|--------------------------------------|-----------------------|
| 1) | 46" Monitor | NEC 4620 |
| 1) | Computers | HP/Dell Pentium |
| 1) | Cat-5 Extender | TBD/ Magenta |
| 1) | Interface to owners weather inst. | TBD |
| 1) | Sky Cam 5mp @15mps camera | Custom or TimeScience |
| 1) | CPU and software for time-lapse rec. | |
- 1) Hardware and software to display split screen of
- Live weather instruments
 - Live time-lapse sky cam
 - Feed from UofU Meteorology dept remote sites

Snowflake Video Video playback w/sound, linear media
SK3.E01.av02

- | | | |
|----|---|---------------------------------|
| 1) | 20" LCD flat panels | ToteVision LCD-2007HDL |
| 1) | SD Media Players
(see general notes above) | Alcorn DVM \ P
DoReMi Nugget |
| | a/r Master Show Control | |
| | a/r Master Audio Control | |

C. NATIVE VOICES

Storytelling Audio playback w/4 Caption readers.
NV6.E01.av01-04

- | | | |
|----|--------------|------------------------|
| 1) | Speaker | Dakota FA-501 |
| 1) | MP3 playback | Alcorn 8-TraXX or 4MP3 |

4)	Caption Displays	Densitron LM4790
4)	electronic drivers for above	Custom
1)	Docent Switch / Sensor	Custom key switch
a/r	Master Show Control	
a/r	Master Audio Control	

Generational Memory *5 seamless plasma, 5 ch synch SD playback*
NV5.E06.av01 *Portrait orientation*

5)	42" seamless plasma	Akira/Orion MIS 4220
1)	SD Media Players (see general notes above)	Alcorn DVM \ P DoReMi Nugget
2)	Display Speakers	Innovox FD-H2
1)	Amplifier	QSC CX-302
1)	Sync gen a/r	
a/r	Master Show Control	
a/r	Master Audio Control	

Welcome *Triggered audio message*
NV1.E01.av01

1)	Speakers	JBL Control 25
1)	MP3 playback	Alcorn 8-TraXX or 4MP3
1)	Sensor	Passive Infrared / TBD
1)	Amplifier	QSC CX-302

Language Station *17" touch monitor, CPU, kbd & trackball, mic & headphones*
NV3.E01.av01

1)	17" Touch Monitors	ELO 1739L
1)	Computers	HP/Dell Pentium (see computer spec above) w/ rugged keyboard/trackball
1)	Cat-5 Extender	TBD/ Magenta
1)	Headphone Amp	Berringer HA-8000
2)	Headphones	TBD Allow \$100 ea
1)	Voice Processor	Symetrix 528E
1)	Microphone	Shure MX-395 cardioid

D. LIFE

Keratin Interactive *~24 2" 2 digit readouts, electronics package & programming to*
LF2.E02.in01 *run game*

30)	2" 5x7 Led Dot Array	LiteON LTP-2157AY Verify color with designer
30)	circuit cards for above including Drivers, controller and touch sensor (note this must be PCB)	Custom
1)	Central controller/computer to run game.	Custom
3)	Capacitive sensors to start game	Custom

All programming to provide complete functional interactive
Per media brief.

What Cells Can Do
LF3.E02.av01

*~4'x'6' projected image linear media w/ sound
+ switch to video microscope.*

- | | | |
|-----|---|---------------------------------|
| 1) | 5K lumen DLP Projector | Eiki EIP-5000 |
| 1) | Lens (contractor sized) | |
| 1) | Set spare lamps | |
| 1) | Projector mounting | Custom |
| 1) | SD Media Players
(see general notes above) | Alcorn DVM \ P
DoReMi Nugget |
| 1) | Directional Speaker | Dakota FA-501 |
| 1) | Pushbutton | Happ / TBD |
| 1) | 12" video monitor | |
| a/r | Master Show Control | |
| a/r | Master Audio Control | |

Populations Interactive
LF5.E02.av01

~4'x'6' projected image linear media w/ sound

- | | | |
|-----|-------------------------------|--|
| 1) | 3K lumen Projector SXGA+ | Projection Design F30sx |
| 1) | Lens (contractor sized) | |
| 1) | Set spare lamps | |
| 1) | Projector mounting | Custom |
| 1) | Computers | HP/Dell Pentium (see computer spec above) |
| 1) | Fiber Extender | Geffen DVI 1500HD |
| 1) | DVI-VGA converter | Extron DVI-RGB150 |
| 1) | Vip Touch Foil 30-40" max 4:3 | ViP (co-ordinate size with exhibit fabricator) |
| 1) | Set USB extenders | |
| a/r | Master Show Control | |

Ecosystems

(4) areas of natural sounds

LF6.E01-E04.av01

Equipment list is for all (4) dioramas

- | | | |
|-----|----------------------|----------------------------|
| 4) | 4track MP3 player | Alcorn 8Traxx / or 4MP3 |
| 8) | Small speakers | QSC AD-S52 (overhead) |
| 8) | Small speakers | JBL Control 25 (in bushes) |
| 4) | 4 channel amplifier | QSC CX-404 |
| 16) | Speaker brackets | Custom |
| a/r | Master Show Control | |
| a/r | Master Audio Control | |

Note DMX feeds to dimmers from show control.

Human Interactions
LF6.E05.av01

(4) audio players with mushroom handsets

- | | | |
|----|--------------------|-------------------------|
| 1) | 4 track MP3 player | Alcorn 8Traxx / or 4MP3 |
|----|--------------------|-------------------------|

- 4) Small handsets (mushroom shaped)



Part # RU-9931
Receiver, Western Elec.
5 1/2" long
Weighted hard rubber,
original finish, NOT glossy

Note this is only the shell. Working parts and armored cable are custom by AV Systems Integrator.

- | | | |
|-----|-----------------------------------|-------------------|
| 1) | multi channel headphone amplifier | Behringer HA-8000 |
| 4) | Capacitive sensors/ buttons | Custom / Happ |
| a/r | Master Audio Control | |

Talkback Station *computer blogging station (text only)*
LF6.E05.av02

- | | | |
|----|---|---|
| 1) | 17" Monitors (touch optional) | ELO 1739 |
| 1) | Computers
w/ rugged Keyboard/trackball | HP/Dell Pentium (see computer spec above) |
| 1) | Cat-5 Extender | TBD/ Magenta |

E. THE LAND

Plate Tectonics
LD1.E03.av01

Video Globe

- | | | |
|-----|--|-----------------|
| 1) | 32" Video Globe
w/ 600Myr Paleo Animation | Omni Globe |
| 1) | 15" Monitors | NEC ALSCD52V-BK |
| a/r | Master Show Control | |
| a/r | Master Audio Control | |

B&R Biogeography
LD4.E08.av01

46" SD video playback

- | | | |
|-----|---|---------------------------------|
| 1) | 26" LCD flat panels | Sharp LC26SB24U |
| 1) | SD Media Players
(see general notes above) | Alcorn DVM \ P
DoReMi Nugget |
| a/r | Master Show Control | |
| a/r | Master Audio Control | |

Talkback Station
LD4.E04.av01

computer blogging station text and still cam

- | | | |
|----|---|---|
| 1) | 17" Monitors (touch optional) | ELO 1739 |
| 1) | Computers
w/ rugged Keyboard/trackball | HP/Dell Pentium (see computer spec above) |

- | | | |
|----|----------------|----------------------|
| 1) | Cat-5 Extender | TBD/ Magenta |
| 1) | Still Camera | Quick Cam Vision Pro |
| 1) | USB interface | TBD |

**Jump Seismometer
LD4.E03.av01**

CPU, 15" Monitor. Seismometer by owner

- | | | |
|----|-------------|---|
| 1) | 15" Monitor | NEC ALSCD52V-BK |
| 1) | Computer | HP/Dell Pentium (see computer spec above) |

F. FIRST PEOPLES

**Ceramics, Tools & Weaving (3) 20" video playback w/ sound, linear media
FP5.E02.av01**

- | | | |
|-----|---|---------------------------------|
| 3) | 20" LCD flat panels | ToteVision LCD-2007HDL |
| 3) | SD Media Players
(see general notes above) | Alcorn DVM \ P
DoReMi Nugget |
| a/r | Master Show Control | |
| a/r | Master Audio Control | |

**Tools Interactive
FP5.E06.in01**

triggered MP3 playback

- | | | |
|-----|----------------------|---------------------------------|
| 1) | MP3 player | Alcorn 8Traxx / or 4MP3 |
| 1) | Small speaker | TBD coord w/ Exhibit Contractor |
| 1) | amplifier | QSC CX-302 |
| a/r | Master Show Control | |
| a/r | Master Audio Control | |
- Note trigger switches by Exhibit Contractor

G. GREAT SALT LAKE

**Sounds of the Lake
LK2.E01.av01**

(8) speaker natural sound soundscape

- | | | |
|-----|----------------------|-------------------------|
| 1) | 4track MP3 player | Alcorn 8Traxx / or 4MP3 |
| 8) | Small speakers | QSC AD-S52 |
| 1) | 8 channel amplifier | QSC CX-168 |
| 8) | Speaker brackets | Custom |
| a/r | Master Show Control | |
| a/r | Master Audio Control | |

**Watershed
LK2.E06.av01**

46" video playback w/ sound, SD linear media

- | | | |
|----|---|---------------------------------|
| 1) | 46" LCD flat panels | NEC LCD 4620-2-AV |
| 2) | Display Speakers | Innovox FD-H2 (cut to length) |
| 1) | Amplifier | QSC |
| 1) | SD Media Players
(see general notes above) | Alcorn DVM \ P
DoReMi Nugget |

a/r Master Show Control
a/r Master Audio Control

People and the Lake
LK2.E05.av01

46" video playback w/ sound, SD linear media

1)	46" LCD flat panels	NEC LCD 4620-2-AV
2)	Display Speakers	Innovox FD-H2 (cut to length)
1)	Amplifier	QSC
1)	SD Media Players (see general notes above)	Alcorn DVM \ P DoReMi Nugget
a/r	Master Show Control	
a/r	Master Audio Control	

H. PAST WORLDS

Paleo Prep
PW7.E01.av01

video playback w/ sound, SD linear media

1)	20" LCD flat panels	ToteVision LCD-2007HDL
1)	SD Media Players (see general notes above)	Alcorn DVM \ P DoReMi Nugget
a/r	Master Show Control	
a/r	Master Audio Control	

Pleistocene Dinner Table
PW2.E04.av01

5 track triggered MP3 playback

1)	5track MP3 player	Alcorn 8Traxx / or 4MP3
1)	Small speaker	TBD coord w/ Exhibit Contractor
1)	amplifier	QSC CX-302
a/r	Master Show Control	
a/r	Master Audio Control	

Note trigger switches by Exhibit Contractor

Cleveland Lloyd Quarry
PW5.E03.av01

4 ch sync video playback w/sound, linear media

4)	32" LCD flat panels	NEC LCD-3220
4)	Display Speakers	Innovox FD-H2 (cut to length)
1)	Amplifier	QSC CX-404
4)	SD Media Players (see general notes above)	Alcorn DVM \ P DoReMi Nugget
1)	Sync gen a/r	
a/r	Master Show Control	
a/r	Master Audio Control	

Late Cretaceous Soundscape
PW4.E01.av01

(6) speaker natural sound soundscape

1)	4track MP3 player	Alcorn 8Traxx / or 4MP3
----	-------------------	-------------------------

6)	Small speakers	QSC AD-S52
1)	8 channel amplifier	QSC CX-168
6)	Speaker brackets	Custom
a/r	Master Show Control	
a/r	Master Audio Control	

I. UTAH FUTURES

Sustainability Interactive UF3.E01.av01

Diorama Projections & interactive

1)	10K Lumen DLP	Panasonic PT-DW-10000U
1)	lens	contractor sized
1)	set spare lamps	
2)	CPU	HP/Dell
1)	Graphics Card	TBD
1)	Fiber Extender	Geffen DVI 1500HD
1)	DVI-VGA converter	Extron DVI-RGB150
3)	Gesture Cameras	Sentec STV-160BC
3)	Lens	contractor select to cover.
3)	Screw on IR filter	Custom
a/r	Camera interfaces	
8)	IR Illuminators	Custom
1)	Custom gesture capture software per interactive write up. This is only the capture system. Media production by others.	

Talkback Station UF3.E01.av02

AudioVideo recording station + Playback station

1)	20" Monitor w/ camera	Dell SP2009W
1)	32" LCD monitor	NEC LCD 3220
2)	Computers w/ rugged keyboard/trackball	HP/Dell Pentium (see computer spec above)
2)	Cat-5 Extender	TBD/ Magenta
2)	Wall speakers	JBL Control 126W
1)	Amplifier	QSC CX-302
1)	Voice Processor	Symetrix 528E
1)	Microphone	Shure MX-395 cardioid

J. OUR BACKYARD

Our Backyard Animal Sounds OB2.E01.av01

(5) speaker soundscape

1)	8track MP3 player	Alcorn 8Traxx / or 4MP3
5)	Speakers in tree	3-4" Custom Coord w/ exhibit fab
1)	multi channel amplifier	QSC 168

K. OTHER SYSTEMS

Central Dimmer

- 1) 96 ch ETC Sensor Rack 48 dimmer modules
- a/r Pharos controls to implement "Life Intro" gobo effects
DMX input from "Ecosystems"

The installation and wiring of this unit is part of the base building electrical package. Factory turn-on services and control wiring by AV Systems Integrator.

Learning Labs *Projection w/ laptop interface, Central SD media, speakers*

Equipment list is for all (3) labs

- 3) DLP Projectors Panasonic PT-D5700UL
- 3) lenses sized by contractor
- 3) Sets spare lamps
- 3) Laptop interface Extron RGB 460xi
- 3) SD Media Players Alcorn DVM \ P
- (see general notes above) DoReMi Nugget
- 12) Ceiling Speakers JBL Control 126
- 1) 70V amp QSC CX-204V
- 3) Headworn w/l mics Sure ULXPro 14/30
- 1) Complete Assistive listening system Listen LS-02-072
- 3) Wall Control Stations AMX MET-6N
- a/r Control system
- a/r Audio System include individual volume control for each input
- 1) 8.4" rack mount touch panel AMX
- 1) Control software Custom

Natural History Now Stations HV.AV01-AV03

computer, monitor on rolling cart

Equipment list is for all (3) carts

- 3) 20" Monitors NEC LCD205WNXM
- 3) Computers HP/Dell Pentium (see computer spec above)
w/ rugged Keyboard/trackball

Demo Areas *Wireless mic, controls, speakers*

Equipment list is for all (7) Demo Areas

- 14) Ceiling Speakers JBL Control 126
- 2) 70V amp QSC CX-204V
- 7) Headworn w/l mics Sure ULXPro 14/30
- 1) Complete Assistive listening system Listen LS-02-072
- 7) Wall Control Stations AMX MET-6N
- a/r Control system
- a/r Audio System include individual volume control for each input
- 1) 8.4" rack mount touch panel AMX
- 1) Control software Custom

Common Equipment

a/r	racks & accessories	Middle Atlantic MRK series
a/r	AC power distribution & seq.	Middle Atlantic
2)	Rack drawer for remotes	
1)	Dual Rack mount video monitor	Custom / Marshall VR-82 series
a/r	Video multiplexor (connect all video players)	Extron/ Honeywell
a/r	Ethernet Switch 24port, 1Ghz (connect all computers & controllers)	Netgear/Cisco (coord w/ owner)
a/r	KVM w/ 2 outputs (connect all computers)	Unimux 32x4
1)	15" Monitors	NEC ALSCD52V-BK
1)	Rack mount keyboard shelf	Custom/ TBD
	2min) UPS	Triplite Smart2200RMXL2U
	Size ups to power racks	

PART 4- EXECUTION

4.01 EXAMINATION

- A. Prior to commencing installation, verify all critical dimensions and conditions under which work is to be installed. Notify Owner in writing of any dimensional discrepancies or other conditions detrimental to the proper installation or performance of work. Do not proceed with installation until unsatisfactory conditions have been corrected.
- B. Insure that no devices (including cameras, monitors, projectors, microphones and loudspeakers) are prevented from achieving their intended function by interfering fixtures, architectural elements, or other audiovisual equipment. Notify Owner in writing of any such problems, and do not proceed with installation until unsatisfactory conditions have been corrected.
- C. AV Systems Integrator is responsible for assuring that no CAT5 cable runs provided by the AV Systems Integrator exceed 90m. Notify Owner in writing of any runs that will exceed this distance.
- D. Carefully verify all required projection and camera lens focal lengths to achieve desired image sizes and projector locations. Notify Owner in writing if no lens will fit the requirements. Note this means no lens, not just the standard lens that comes with the projector.

4.02 INSTALLATION

- A. General
 - 1. All cables, regardless of length, will be marked with permanent, non-handwritten number or letter cable markers within six inches of both ends. There shall be no unmarked cables at any place in the system. Marking codes used on cables shall correspond to codes shown on drawings and/or run sheets.

2. All cables shall be installed splice free from backboard, rack or frame to final destination.
 3. Each of the cable groups identified in the project drawings are to be run in separate conduit, bundled separately where run in trays, and grouped within racks except where specifically noted.
 4. Wherever possible, maintain 3" separation between cable groups. Maintain larger separations where necessary to avoid interference.
 5. All cable shall carry at least the NEC CM rating. Use plenum cable everywhere in project other than within racks or in runs completely within conduit.
 6. Provide sufficient ventilation within racks to insure that all equipment operates within manufacturer's recommendations.
 7. All boxes and equipment shall be mounted plumb and square.
- B. Audio
1. Maintain phasing throughout the audio system.
 2. Use crimp type lugs where stranded wire is connected to barrier strips and binding posts.
 3. Each rack shall contain a grounding bus bonded to the rack frame and connected to the audiovisual power distribution panel with a #6 or larger conductor. The rack shall show an impedance of at least 100 Kohm to ground when this conductor is lifted.
 4. AC outlets within racks shall have ground wires, which shall be connected to the rack ground bus.
 5. Connect audio cable shields at one end or both ends to produce best system noise performance. Mic lines and tie lines shall have shields connected at both ends.
- C. Video
1. All coaxial cable connections shall be made with crimp type BNC connectors. Provide adapters from BNC to UHF, S-Video or RCA connectors where required.
 2. All video receptacles shall be insulated from the panels in which they are installed.
 3. Terminate all unused outputs with the appropriate impedance.
 4. Video signals may not be looped through connections unless explicitly specified.
 5. The lengths of the cables used to carry S-video and component video signals shall be matched to within 1".
 6. Projectors and cameras shall be installed so that images do not move or vibrate perceptibly under normal operating conditions.

4.02 FIELD QUALITY CONTROL

- A. In all cases, provide written documentation of tests including date, test equipment used, test equipment configuration and results.
- B. Initial Tests and Measurements:
 - 1. Verify the operation of all system equipment.
 - 2. Verify pinout and pairing of all wiring.
 - 3. Verify DCE/DTE (pin 2/3) requirements of all serial cables. Test to verify voltage on both pins. Wire cable as x-over (null modem) if required.
- C. Audio-Visual Systems:
 - 1. Verify that audio systems are free from perceptible hum and buzz.
 - 2. Conduct measurements and adjust audio systems to meet performance standards.
 - 3. Measure impedance of all loudspeaker circuits at 1 kHz and verify that transformer tapping is appropriate.
 - 4. Test that all coaxial cables are free from shorts and isolated from ground.
 - 5. Verify that video systems do not exhibit interference effects from AC power circuits (video hum).
 - 6. Align all video projectors and adjust color balance on projectors and monitors.

4.03 MUSEUM TRAINING

- A. Provide 20 hours of training to persons designated by the Owner in the operation of the systems in 5 non-contiguous 4-hour sessions.
- B. See also "Section 01820 Demonstration and Training" for other requirements.

4.03 FINAL ADJUSTING AND ACCEPTANCE TESTS

- A. Inventory all equipment on site and compare to equipment lists in contract documents.
- B. Demonstrate operation of all systems and equipment.
- C. Review initial testing measurements. Repair system and repeat measurements as required by the Owner. Provide the following test equipment for use in making adjustments and acceptance testing by the Owner:
 - 1. Composite, S video color bar generator.
 - 2. 1/3 octave real time analyzer, calibrated SPL meter, and RMS voltmeter capable of reading in dBu.

3. Audio tone generator and pink noise generator.
 4. Audio impedance meter operating at 1 kHz.
 5. Audio analyzer capable of measuring frequency response: MLSSA 9.0, TEF 20 or SIA SMAART.
 6. Cat 5 tester
 7. Video Test Generator both SD & HD
- D. Provide personnel expert in the operation and programming of all installed equipment for up to 80 straight time hours and 10 overtime hours to assist Owner and Exhibit Designer for adjustment and acceptance testing.
- E. Tests may be suspended at the option of the Owner if the systems fail to operate or if defective equipment requires repair or replacement. Tests will be resumed when the problems have been corrected by the AV Systems Integrator.

4.04 CLEANUP AND REPAIR

- A. The job site should be left clean and any damage caused to premises by installers should be repaired at no cost to Owner.

4.05 PROTECTION OF WORK

- A. It is the responsibility of the contractor to protect finished and unfinished work against damage or loss until the date of final acceptance. AV Systems Integrator shall take measures to prevent damage by dust and other byproducts of construction. Repair damaged work at no cost to the Owner.
- B. Museums are full of artifacts and other irreplaceable objects. While most of your work will take place prior to the installation of artifacts there will be some overlap. It is imperative that you take extra care to avoid risks to these objects. If you are unsure ask the museum staff for assistance. Also many of these items have deep cultural value and no jokes or disrespectful comments will be tolerated.

END OF SECTION