ATTACHMENT C
Central Library Earthquake Retrofit & Building Repairs Project
RETROFIT APPROACHES COMPARISON MATRIX

	PROJECT GOALS	BASELINE APPROACH	SHEAR WALL APPROACH	BASE ISOLATION APPROACH
EARTHQUAKE REPAIR - Performance equivalent to a new building				
1	Basis of Design requires general conformance with performance requirements equivalent to a new structure	☐ does not meet requirements of new building standards	✓ meets requirements of new building standards	✓ meets requirements of new building standards
2	Requires secondary support system for gravity loads and a "strongback" for supporting remaining URM walls	☐ secondary gravity support system/strongback is needed	✓ shear walls perform dual purpose as the building's lateral system, gravity system, and strongback support for exterior URM walls	✓ secondary gravity support system/strongback is needed
3	Impact to interlocking URM ribs	☐ ribs require removal which increases risk of collateral damage to remaining URM walls	✓ ribs remain in place reducing risk of damage to remaining URM walls	☐ ribs require removal which increases risk of collateral damage to remaining URM walls
4	Recovery time after minor event	☐ seismic design is limited to address only very minor seismic events	✓ shear wall design will limit the impacts of minor seismic events	✓ base isolators will limit the impacts of minor seismic events
5	Recovery time after major event	☐ recovery will be the longest and most difficult after a major event	☐ potential for some structural damage after a major event	✓ if isolators move to design capacity, basement walls, stairs, and other vertical
6	Ability to accommodate a larger than design level earthquake	☐ no ability to accommodate extreme earthquakes	☐ potential for greater damage if design earthquake is exceeded	✓ reduced apparent magnitude of ground motion will help mitigate impacts of
7	Life/Safety of Occupants	☐ only meets minimum code	✓ meets basis of design	✓ may exceed basis of design
HISTORIC IMPACTS - ability to maintain character defining features and historic listing				
1	Preservation of historic interior finishes	✓ existing plaster and millwork will need to be removed to perform repairs - millwork will be salvaged and reinstalled	✓ existing plaster and millwork will need to be removed to perform repairs - millwork will be salvaged and reinstalled	✓ existing plaster and millwork will need to be removed to perform repairs - millwork will be salvaged and reinstalled
2	Preservation of historic exterior finishes	✓ some discreet exterior anchorage may be needed for decorative trim	✓ some discreet exterior anchorage may be needed for decorative trim	✓ some discreet exterior anchorage may be needed for decorative trim
3	Preservation of historic relationship of building to landscape	✓ no visual impact to exterior	✓ no visual impact to exterior	✓ needs moat around perimeter for building movement which affects base of building
ACCESSIBILITY - ability to make building meet universal design and ADA				
1	Floor levels on second floor and in basement need to meet ADA in order to use those spaces	✓ revisions to basement floor and portions of second floor will be needed but should not have additional impacts to seismic or historic design	✓ revisions to basement floor and portions of second floor will be needed but should not have additional impacts to seismic or historic design	✓ revisions to basement floor and portions of second floor will be needed but should not have additional impacts to seismic or historic design
2	Elevators to all floors including basement	✓ no special issues impacting elevators	✓ no special issues impacting elevators	✓ elevator pits and basement elevator stops will require an additional moat to accommodate base isolator movement
3	Accessible path from exterior into building	✓ ramps or an elevator will be needed to create an accessible path	✓ ramps or an elevator will be needed to create an accessible path	✓ exterior elevator would be difficult to implement due to moat, ramps and their handrails will need to bridge over the isolator's moat

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PUBLIC BENEFIT - Time needed to restore Library to public use				
1	Design/approval time	✓ engineering time is consistent with project schedule	✓ engineering time is consistent with project schedule	☐ engineering effort requires more time than currently allocated
2	Construction time	✓ quickest construction schedule	✓ quickest construction schedule	☐ requires time for both installation of base isolators and construction of secondary support system
3	Timeline for re-occupying building	✓ fastest approach to reusing building based on engineering, funding and construction durations	✓ fastest approach to reusing building based on engineering, funding and construction durations	☐ additional engineering time could affect ability to meet bond funding schedule which would delay construction start
BUILDING SYSTEMS UPGRADES - Ability to upgrade the building systems without significant impacts				
1	Replacement of major MEP equipment	✓ equipment location in basement will not be impacted by earthquake repair	✓ equipment location in basement will not be impacted by earthquake repair	✓ MEP systems will require flexible connections and special detailing when they pass through the ground floor due to location of isolators
2	Incorporate new IT infrastructure, Wi-Fi, additional power outlets and LED lighting	✓ no impacts of earthquake repair on ability to update building systems	✓ no impacts of earthquake repair on ability to update building systems	✓ no impacts of earthquake repair on ability to update building systems
3	Incorporate new ductwork into project	☐ In order to replace ductwork integrated in URM wall cavity, additional brick removal will be required	✓ new ductwork can be accommodated due to removal of URM and millwork already required by seismic approach	☐ In order to replace ductwork integrated in URM wall cavity, additional brick removal will be required
FUNCTION/FLXEXIBILITY- Ability to utilize spaces in the manner desired without impacts				
1	Ability to utilize spaces now and in the future in the manner desired without impacts	✓ no impediments to function or flexibility of spaces with this approach	✓ no impediments to function or flexibility of spaces with this approach	✓ no impediments to function or flexibility of spaces with this approach
COST EFFECTIVENESS - Lowest cost that meets earthquake performance				
1	Cost to construct	✓ lowest cost	✓ cost plan is based on this approach	☐ requires installation of both base isolators and construction of secondary support system
2	Cost to engineer	✓ engineering costs are covered under current contract	✓ engineering costs are covered under current contract	☐ additional engineering and peer review required
3	Overall value considering performance, cost and schedule	☐ does not meet basis of design although cost is lowest and schedule is consistent with project expectations	✓ fastest approach to reusing building based on engineering, funding and construction durations	☐ best performance but highest cost and longest schedule