APPENDIX C: STUDY REACH MAPS, SUMMARIES, AND RECOMMENDATIONS

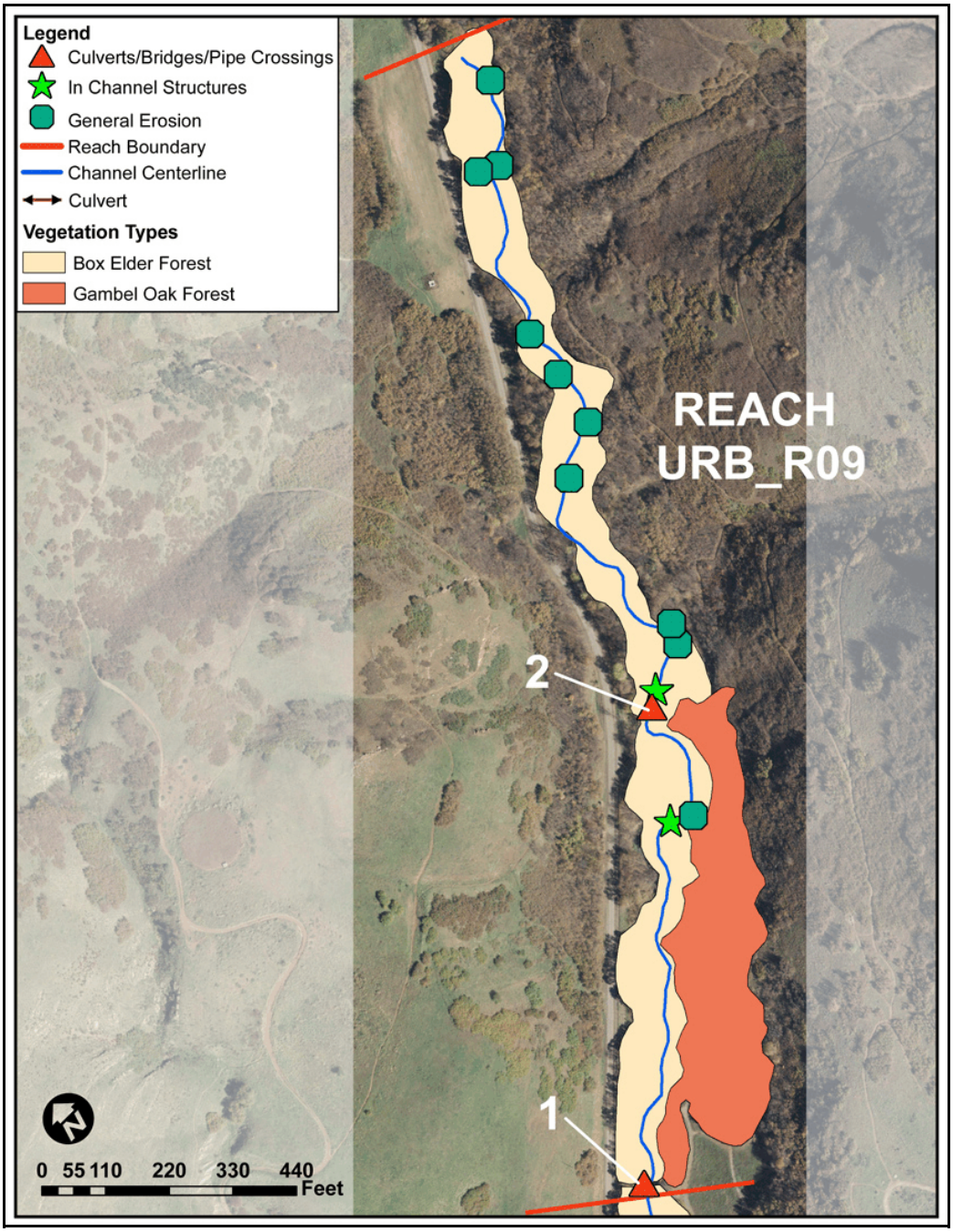
This appendix provides summary information and maps for each of the fully-assessed study reaches. These summaries are not intended to comprehensively provide all the information collected for each reach; rather, they are meant as a reference that provides a brief characterization and overview of existing conditions, issues, and recommendations for each assessed reach. The maps in this appendix include vegetation community types and locations of features such as litter areas, storm drain outfalls, culvert crossings, access trails, artificial bank treatments, and erosion areas. A brief description and selected photos are also provided, along with tables summarizing stream channel data and vegetation characteristics. For each reach, a table is also provided that lists appropriate types of improvement measures for the reach and describes where within the reach the measures should be applied. Measures identified for implementation at the reach-scale will typically require additional detailed site-level design work and engineering to determine specific locations and combinations of treatment techniques.

Approximate cost estimates for the items identified in the recommendations tables are provided in Appendix D. The recommendations included in this appendix are not exhaustive; as priorities evolve and funding becomes available for specific reaches or treatment techniques, it may be appropriate to implement measures not included in the tables at this time.

On Red Butte Creek, many study reaches are privately owned. Assessments in these reaches were only completed at properties for which specific access permission was obtained, and therefore were not comprehensive. Brief descriptions and photos of these partially-assessed reaches are provided at the end of this appendix.

REACH URB_R09: UPPER RED BUTTE GARDEN

This reach flows through the downstream portion of Red Butte Canyon, and the channel is confined by steep hillslopes. The reach is in relatively natural condition, and although some trail and picnic facilities are present, recreational use does not appear to be negatively affecting riparian condition. Channel and bank slopes are steep, and the reach shows evidence of low bank/root scour, terrace/high bank erosion, hillslope slumping, and apparent bed incision. Vegetative structure and cover are generally excellent in this reach.



Issues affecting riparian function:

- low bank/root zone erosion
- terrace erosion
- eroded access trails (minor)
- invasive species (whitetop, lesser burdock, Siberian elm)
- bed incision

Constraints/ opportunities:

- location offers educational/ interpretive opportunities
- connected to a large area of natural open space

REACH CHARACTERISTICS						
LENGTH (feet)	SLOPE (feet/feet)	BANK MATERIAL	BED MATERIAL	FLAT FLOODPLAIN SURFACES	WOODY DEBRIS IN CHANNEL	BAR DEPOSITS
2297	0.051	boulder, sand/silt	cobble, gravel, silt	occasionally present	abundant	occasionally present

VEGETATION CHARACTERISTICS					
COMMUNITY TYPE	PERCENT COVER			INVASIVE SPECIES CLASS	WOODY DEBRIS ON BANKS
	Canopy	Shrub	Understory		
Gambel Oak Forest	76–100+	6–25	51–75	low	moderate
Box Elder Forest	76–100+	76–100+	51–75	moderate	moderate

EXISTING INFRASTRUCTURE			
WITHIN 50 FEET OF AHWL		WITHIN 50–100 FEET OF AHWL	
Northwest Bank	Southeast Bank	Northwest Bank	Southeast Bank
low	none	moderate (road)	low

RECOMMENDATIONS	
IMPROVEMENT MEASURE [a]	LOCATION
Invasive plant removal	within vegetation type(s)
Removal of concrete/asphalt on bank	point 1 on map
Biotechnical slope stabilization	point 1 on map
Revegetation of low bank at picnic area	point 2 on map

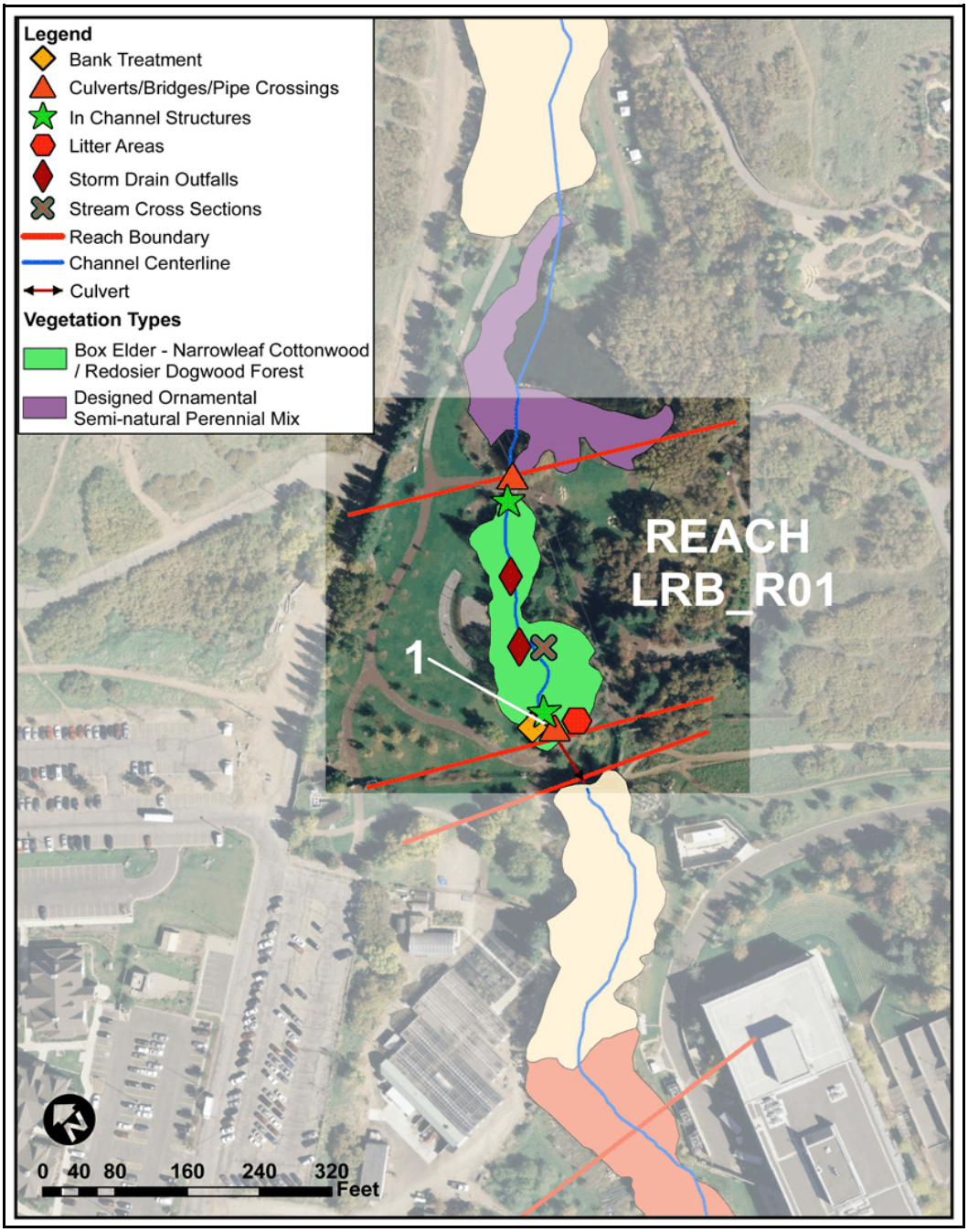
[a] See Appendix D for estimated costs.

Priorities identified by stakeholders:

- restoration of "renegade" trails with native vegetation
- interest in publicly accessible trail system with proper erosion controls and stream crossings
- general study area priorities (habitat, water quality, bank stability) also apply

REACH LRB_R01: LOWER RED BUTTE GARDEN

This is a short reach downstream of the ponds in Red Butte Garden. At the time of field assessment, the riparian corridor was affected by construction activities associated with renovation of the Red Butte Garden concert venue. The banks through this reach are much lower and less confining than in Reach URB_R09, and several grade control structures are present. A narrow but thick buffer of riparian vegetation with excellent shrub density limits direct access to the stream. No invasive plant species were noted in this reach.



Issues affecting riparian function:

- affected by active construction at time of assessment

Constraints/ opportunities:

- location offers educational/ interpretive opportunities
- total width of natural riparian vegetation limited by developed concert venue

REACH CHARACTERISTICS						
LENGTH (feet)	SLOPE (feet/feet)	BANK MATERIAL	BED MATERIAL	FLAT FLOODPLAIN SURFACES	WOODY DEBRIS IN CHANNEL	BAR DEPOSITS
281	0.043	fill on right bank	cobble, silt	abundant	absent	absent

VEGETATION CHARACTERISTICS					
COMMUNITY TYPE	PERCENT COVER			INVASIVE SPECIES CLASS	WOODY DEBRIS ON BANKS
	Canopy	Shrub	Understory		
Box Elder - Narrowleaf Cottonwood / Redosier Dogwood Forest	76–100+	76–100+	0	none	moderate

EXISTING INFRASTRUCTURE			
WITHIN 50 FEET OF AHWL		WITHIN 50–100 FEET OF AHWL	
Northwest Bank	Southeast Bank	Northwest Bank	Southeast Bank
low	low	moderate	low

RECOMMENDATIONS	
IMPROVEMENT MEASURE [a]	LOCATION
Stream cleanup	point 1 on map
Monitor/protect riparian corridor	reach-scale

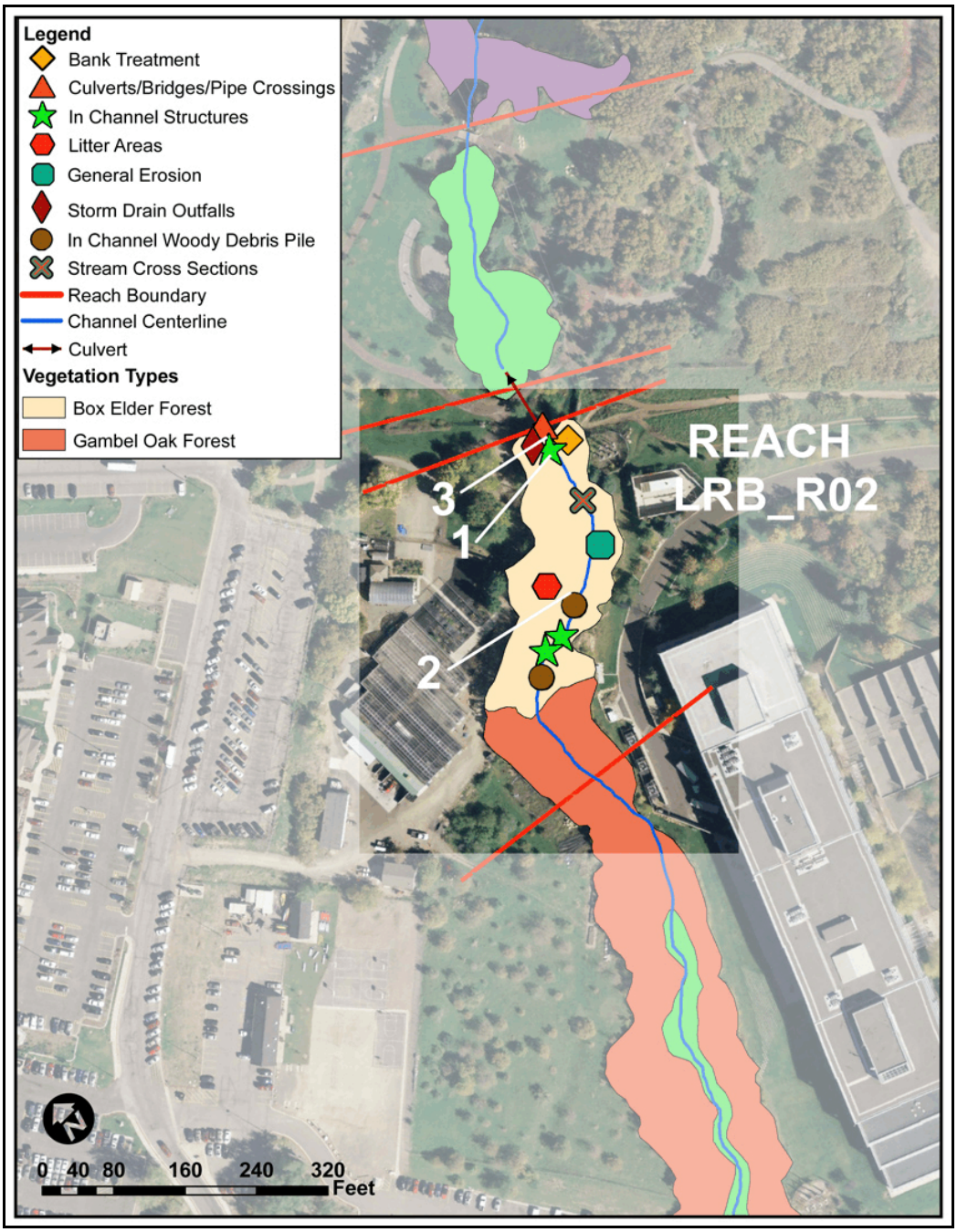
[a] See Appendix D for estimated costs.

Priorities identified by stakeholders:

- no reach-specific items identified
- general study area priorities (habitat, water quality, bank stability) apply

REACH LRB_R02: UNIVERSITY - BELOW RED BUTTE GARDEN

On the southeast side in this reach, the channel is confined by a tall bank that in some areas appears to have been affected by fill placement. The riparian area is impacted by heavy foot traffic that has compacted the soil and reduced understory vegetation cover. Rock and concrete pieces have been placed in several bank and in-channel areas; otherwise, bed material is dominantly sand and small gravel. Vegetation diversity is generally poor in this reach.



Issues affecting riparian function:

- heavy foot traffic/soil compaction
- lack of shrub cover
- lack of understory cover
- low bank/root zone erosion
- trash (minor)

Constraints/ opportunities:

- university location offers educational/ research opportunities
- confined by buildings/access roads

REACH CHARACTERISTICS						
LENGTH (feet)	SLOPE (feet/feet)	BANK MATERIAL	BED MATERIAL	FLAT FLOODPLAIN SURFACES	WOODY DEBRIS IN CHANNEL	BAR DEPOSITS
451	0.053	cobble, soil	gravel, sand/silt	occasionally present	occasionally present	occasionally present

VEGETATION CHARACTERISTICS					
COMMUNITY TYPE	PERCENT COVER			INVASIVE SPECIES CLASS	WOODY DEBRIS ON BANKS
	Canopy	Shrub	Understory		
Gambel Oak Forest	76–100+	51–75	1–5	low	moderate
Box Elder Forest	76–100+	0	0	none	sparse

EXISTING INFRASTRUCTURE			
WITHIN 50 FEET OF AHWL		WITHIN 50–100 FEET OF AHWL	
Northwest Bank	Southeast Bank	Northwest Bank	Southeast Bank
low	low	high	high

RECOMMENDATIONS	
IMPROVEMENT MEASURE [a]	LOCATION
Access control	reach-scale
Revegetation - understory layer	within vegetation type(s)
Biotechnical slope stabilization	reach-scale
Revegetation - shrub layer	within vegetation type(s)
Bank stabilization	reach-scale
Mechanized trash removal (concrete pieces)	point 1 on map
Stream cleanup	point 2 on map
Invasive plant removal/control	within vegetation type(s)
Culvert replacement with bridge	point 3 on map

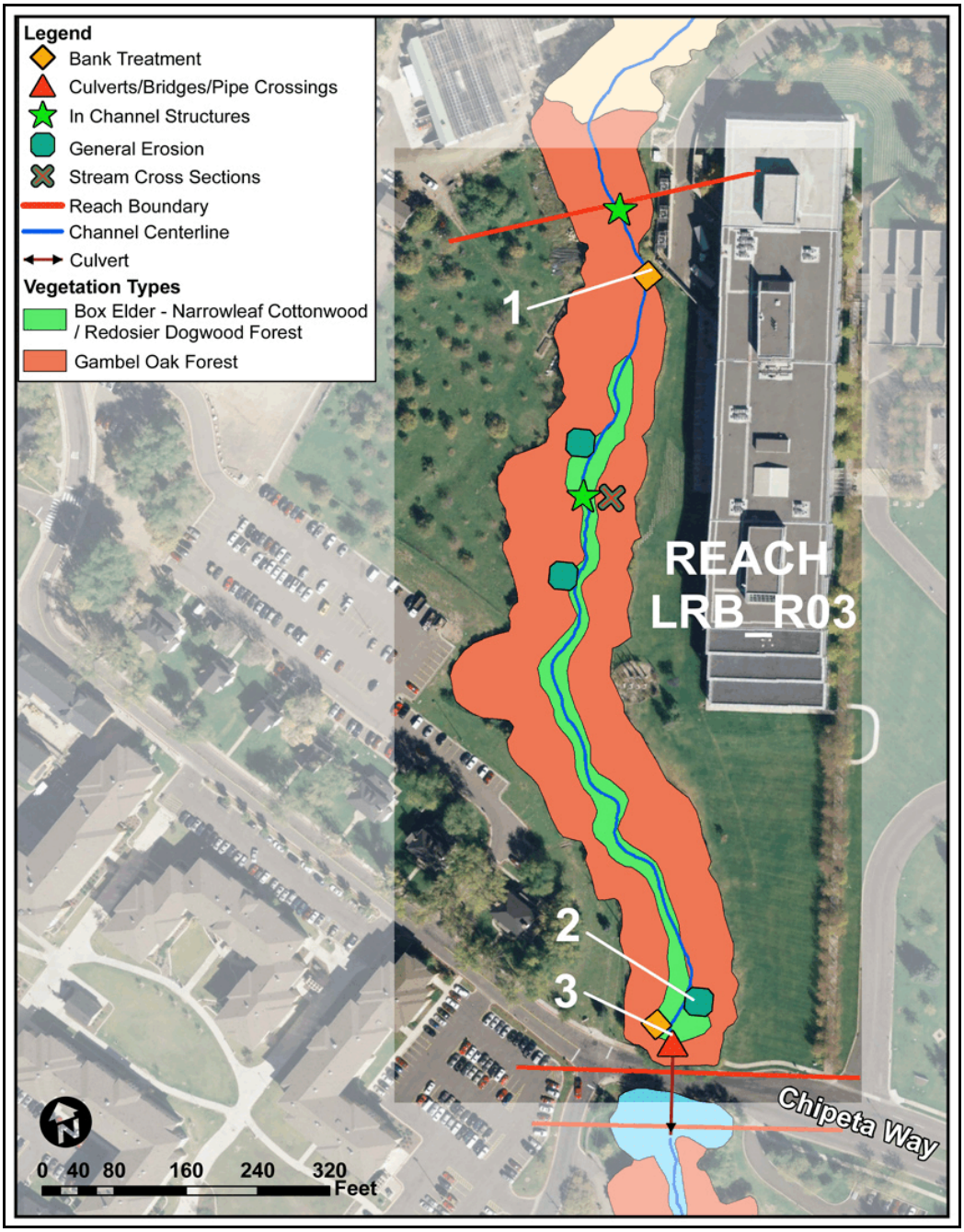
[a] See Appendix D for estimated costs.

Priorities identified by stakeholders:

- interest in public access/potential for trail
- general study area priorities (habitat, water quality, bank stability) also apply

REACH LRB_R03: UNIVERSITY - ABOVE CHIPETA WAY

Although this reach is generally steep, rock grade control structures have created small sections with flat, slow-moving water and wetland vegetation. Tree cover is poor on the east bank at the upstream end of the reach where a building/access road extends to within 16 feet of the channel centerline. The channel is confined by tall, steep banks through much of the reach. Poorly designed gravel and concrete brick wall bank protection features are contributing to erosion on adjacent/opposite banks.



Issues affecting riparian function:

- invasive species (Russian olive, lesser burdock)
- terrace erosion
- low bank/root zone erosion
- deposition/clogging at culvert inlet
- failing bank revetment
- limited tree cover

Constraints/ opportunities:

- university location offers educational/ research opportunities

REACH CHARACTERISTICS						
LENGTH (feet)	SLOPE (feet/feet)	BANK MATERIAL	BED MATERIAL	FLAT FLOODPLAIN SURFACES	WOODY DEBRIS IN CHANNEL	BAR DEPOSITS
1041	0.062	boulder, soil	boulder, cobble	occasionally present	abundant	occasionally present

VEGETATION CHARACTERISTICS					
COMMUNITY TYPE	PERCENT COVER			INVASIVE SPECIES CLASS	WOODY DEBRIS ON BANKS
	Canopy	Shrub	Understory		
Gambel Oak Forest	76–100+	51–75	1–5	low	moderate
Box Elder - Narrowleaf Cottonwood / Redosier Dogwood Forest	51–75	51–75	26–50	low	moderate

EXISTING INFRASTRUCTURE			
WITHIN 50 FEET OF AHWL		WITHIN 50–100 FEET OF AHWL	
Northwest Bank	Southeast Bank	Northwest Bank	Southeast Bank
none	low	low	moderate

RECOMMENDATIONS	
IMPROVEMENT MEASURE [a]	LOCATION
Invasive plant removal	within vegetation type(s)
Removal/improvements to gravel bank protection	point 1 on map
Revegetation - canopy layer	point 1 on map
Removal/improvements to concrete brick wall	point 2 on map
Avoid placing yard waste on banks/leave "no-mow" buffer at edge of turf	reach-scale
Bank stabilization	reach-scale
Grade control	reach-scale
Culvert replacement/improvement	point 3 on map

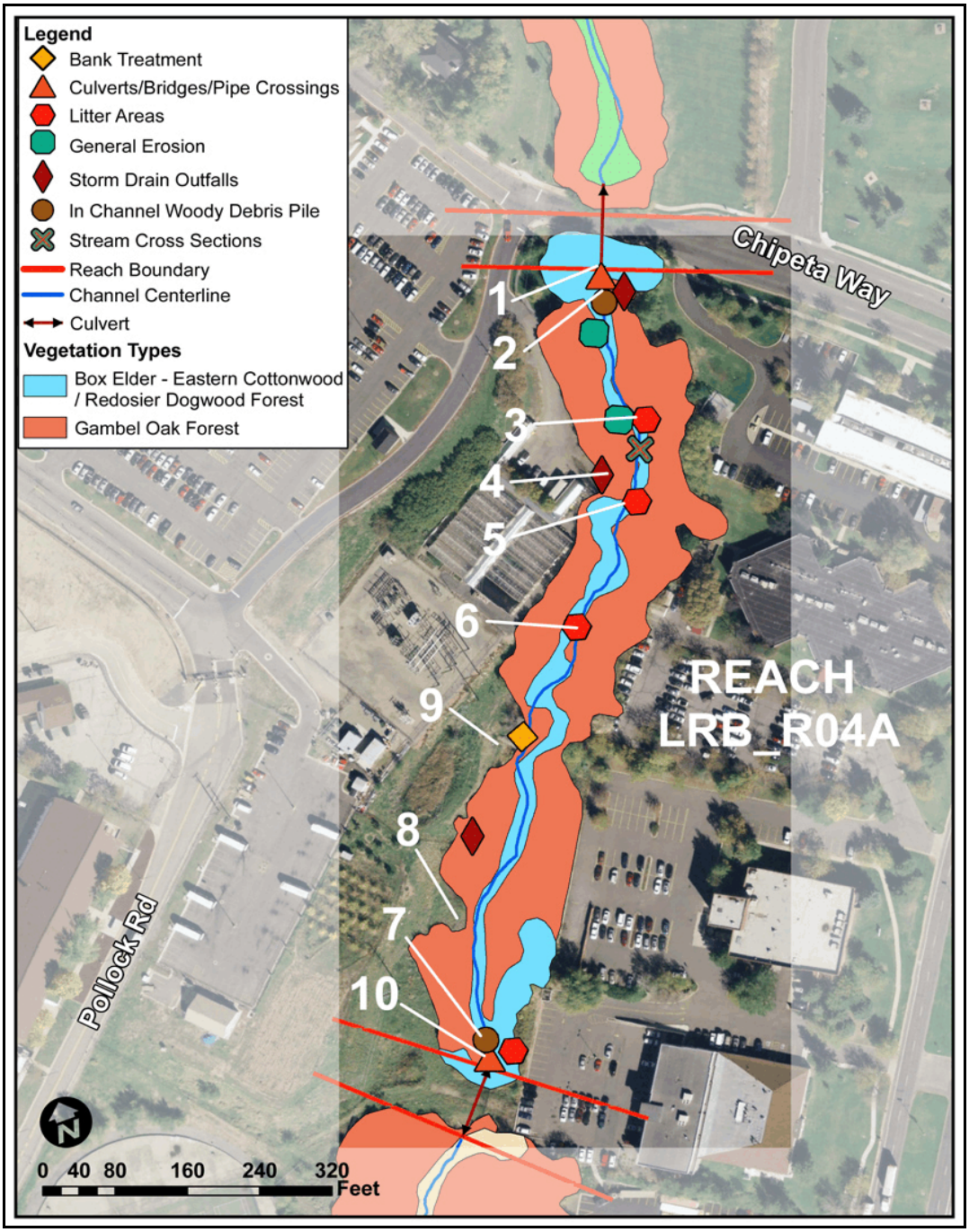
[a] See Appendix D for estimated costs.

Priorities identified by stakeholders:

- interest in public access/potential for trail
- general study area priorities (habitat, water, quality, bank stability) also apply

REACH LRB_R04A: UNIVERSITY - BELOW CHIPETA WAY

Banks are generally steep and tall in this reach, which flows between University parking lots and maintenance facilities. Significant amounts of trash were noted in the reach. Vegetative structure is relatively good; however, total forested width is limited in some areas. Poison ivy dominates the understory cover. Heavy root scour and significant bank erosion are prevalent within the reach.



Issues affecting riparian function:

- terrace erosion
- storm drain outfall erosion
- low bank/root zone erosion
- trash
- invasive species (Siberian elm)
- narrow forested corridor
- bed incision

Constraints/ opportunities:

- university location offers educational/ research opportunities
- potential may exist to remove culvert at rarely used crossing at downstream end of reach and daylight 90 feet of channel

REACH CHARACTERISTICS						
LENGTH (feet)	SLOPE (feet/feet)	BANK MATERIAL	BED MATERIAL	FLAT FLOODPLAIN SURFACES	WOODY DEBRIS IN CHANNEL	BAR DEPOSITS
961	0.053	boulder, cobble, soil	cobble, gravel	occasionally present	abundant	absent

VEGETATION CHARACTERISTICS					
COMMUNITY TYPE	PERCENT COVER			INVASIVE SPECIES CLASS	WOODY DEBRIS ON BANKS
	Canopy	Shrub	Understory		
Box Elder - Eastern Cottonwood / Redosier Dogwood Forest	76–100+	51–75	51–75	moderate	moderate
Gambel Oak Forest	76–100+	0	26–50	none	moderate
Gambel Oak Forest	76–100+	51-75	26–50	none	moderate

EXISTING INFRASTRUCTURE			
WITHIN 50 FEET OF AHWL		WITHIN 50–100 FEET OF AHWL	
Northwest Bank	Southeast Bank	Northwest Bank	Southeast Bank
low	low	moderate	high

RECOMMENDATIONS	
IMPROVEMENT MEASURE [a]	LOCATION
Stream cleanup	points 2, 3, 5, 6, and 7 on map
Mechanized trash removal	points 3 and 6 on map
Storm drain improvement	point 4 on map
Culvert replacement/improvement/removal	points 1 and 10 on map
Revegetation to increase total forested width	points 8 and 9 on map
Invasive plant removal	within vegetation type(s)
Bank stabilization	reach-scale
Grade control	reach-scale

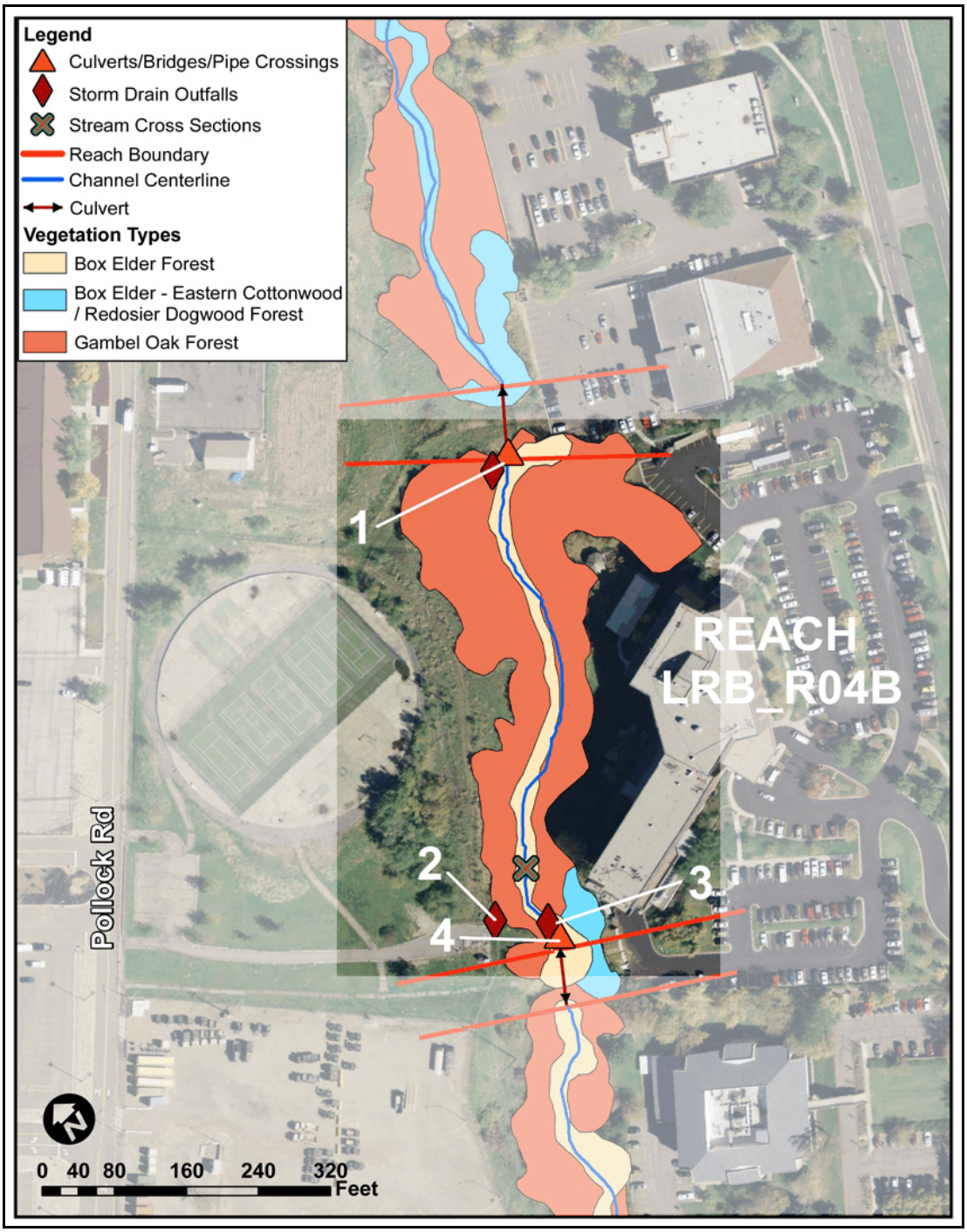
[a] See Appendix D for estimated costs.

Priorities identified by stakeholders:

- interest in public access/potential for trail
- general study area priorities (habitat, water quality, bank stability) also apply

REACH LRB_R04B: UNIVERSITY - NEAR TENNIS COURTS

This reach is located between tennis courts on the west and a hotel building on the east. As with the upstream reaches, banks are generally tall and steep and terrace erosion is prevalent. Several storm drain outfalls are causing erosion within the reach. Understory cover and species diversity are somewhat limited, with poison ivy dominant.



Issues affecting riparian function:

- terrace erosion
- storm drain outfall erosion
- limited understory cover
- deposition/clogging at culvert inlet

Constraints/ opportunities:

- university location offers educational/ research opportunities
- potential may exist to remove culverts at rarely used crossings at top and bottom of reach and daylight up to 160 feet of channel

REACH CHARACTERISTICS						
LENGTH (feet)	SLOPE (feet/feet)	BANK MATERIAL	BED MATERIAL	FLAT FLOODPLAIN SURFACES	WOODY DEBRIS IN CHANNEL	BAR DEPOSITS
595	0.040	boulder, cobble, gravel	cobble, gravel	occasionally present	occasionally present	absent

VEGETATION CHARACTERISTICS					
COMMUNITY TYPE	PERCENT COVER			INVASIVE SPECIES CLASS	WOODY DEBRIS ON BANKS
	Canopy	Shrub	Understory		
Box Elder Forest	76–100+	51–75	6–25	none	moderate
Box Elder - Eastern Cottonwood / Redosier Dogwood Forest	76–100+	6–25	0	none	sparse
Gambel Oak Forest	76–100+	26–50	6–25	none	moderate

EXISTING INFRASTRUCTURE			
WITHIN 50 FEET OF AHWL		WITHIN 50–100 FEET OF AHWL	
Northwest Bank	Southeast Bank	Northwest Bank	Southeast Bank
low	low	low	moderate

RECOMMENDATIONS	
IMPROVEMENT MEASURE [a]	LOCATION
Storm drain improvement	points 2 and 3 on map
Culvert removal	points 1 and 4 on map
Revegetation - understory layer	within vegetation type(s)
Biotechnical slope stabilization	reach-scale
Bank stabilization	reach-scale
Grade control	reach-scale

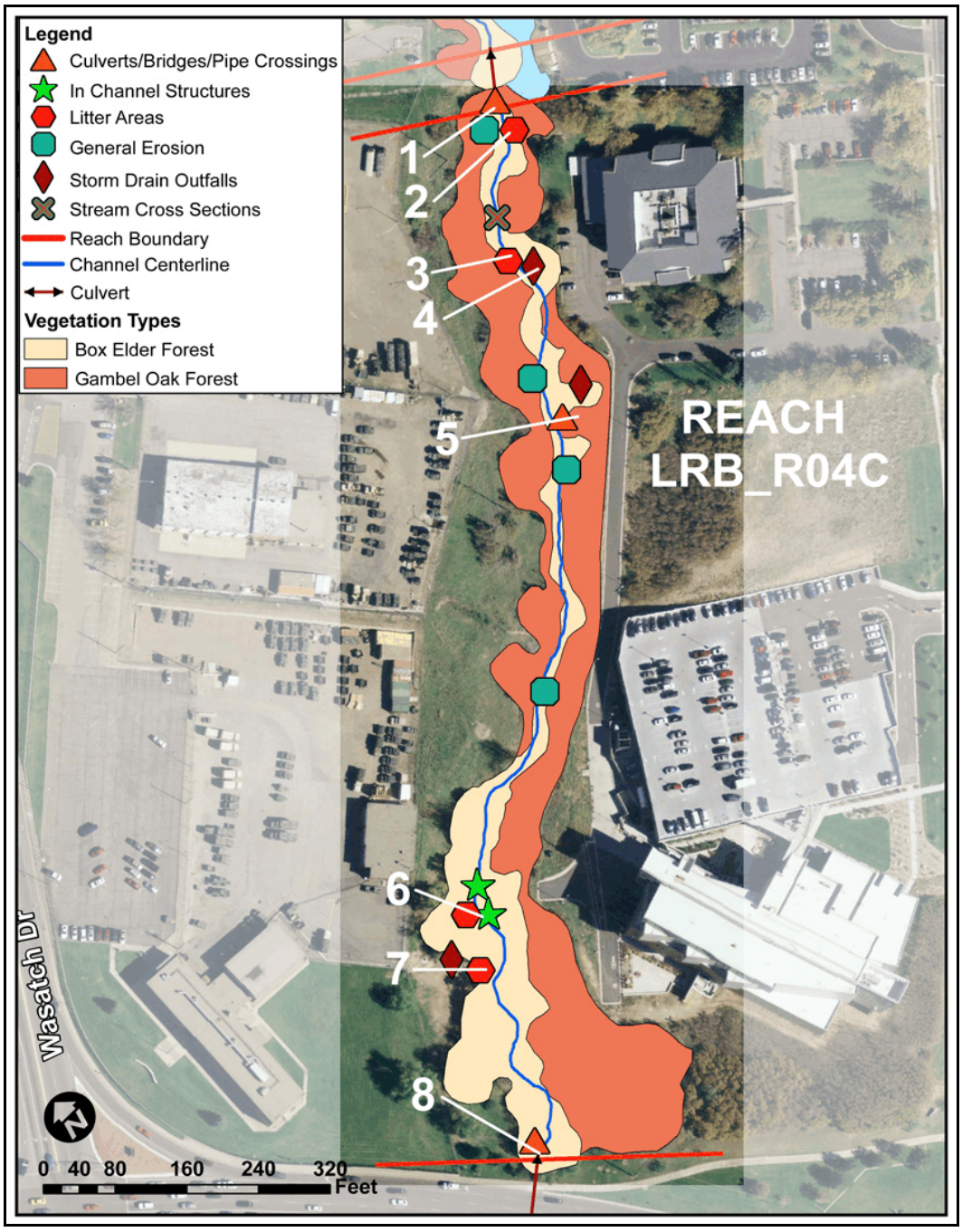
[a] See Appendix D for estimated costs.

Priorities identified by stakeholders:

- interest in public access/potential for trail
- general study area priorities (habitat, water quality, bank stability) also apply

REACH LRB_R04C: UNIVERSITY - ABOVE FOOTHILL DRIVE

This reach flows between U.S. Army facilities on the west and University of Utah research park buildings on the east. Several litter areas including broken pieces of concrete, pipe, chain link fence, and silt fence are present. Bank erosion is evident primarily in the upper and lower portions of the reach. This reach contains several storm drain outfalls and a wooden grade control structure. Forested width and canopy cover are limited in some areas.



Issues affecting riparian function:

- trash
- storm drain outfall erosion
- terrace erosion
- invasive species (whitetop, quackgrass)
- low bank/root zone erosion
- narrow forested corridor
- understory dominated by nonnative species
- bed incision
- limited shrub

Constraints/ opportunities:

- university location offers educational/ research opportunities
- potential may exist to remove culvert at rarely used crossing at top of reach and daylight up to 70 feet of channel

REACH CHARACTERISTICS						
LENGTH (feet)	SLOPE (feet/feet)	BANK MATERIAL	BED MATERIAL	FLAT FLOODPLAIN SURFACES	WOODY DEBRIS IN CHANNEL	BAR DEPOSITS
1294	0.032	cobble, gravel, soil	cobble, gravel	occasionally present	abundant	absent

VEGETATION CHARACTERISTICS					
COMMUNITY TYPE	PERCENT COVER			INVASIVE SPECIES CLASS	WOODY DEBRIS ON BANKS
	Canopy	Shrub	Understory		
Box Elder Forest	51–75	26–50	26–50	none	moderate
Gambel Oak Forest	76–100+	26–50	76–100+	high	moderate

EXISTING INFRASTRUCTURE			
WITHIN 50 FEET OF AHWL		WITHIN 50–100 FEET OF AHWL	
Northwest Bank	Southeast Bank	Northwest Bank	Southeast Bank
none	low	low	high

RECOMMENDATIONS	
IMPROVEMENT MEASURE [a]	LOCATION
Restoration of native understory plants	within vegetation type(s)
Invasive plant removal	within vegetation type(s)
Mechanized trash removal	points 3 and 6 on map
Stream cleanup	points 2, 3, and 7 on map
Revegetation - canopy layer	within vegetation type(s)
Storm drain improvement	points 4 and 5 on map
Culvert removal	point 1 on map
Biotechnical slope stabilization	point 8 on map
Bank stabilization	reach-scale
Grade control	reach-scale

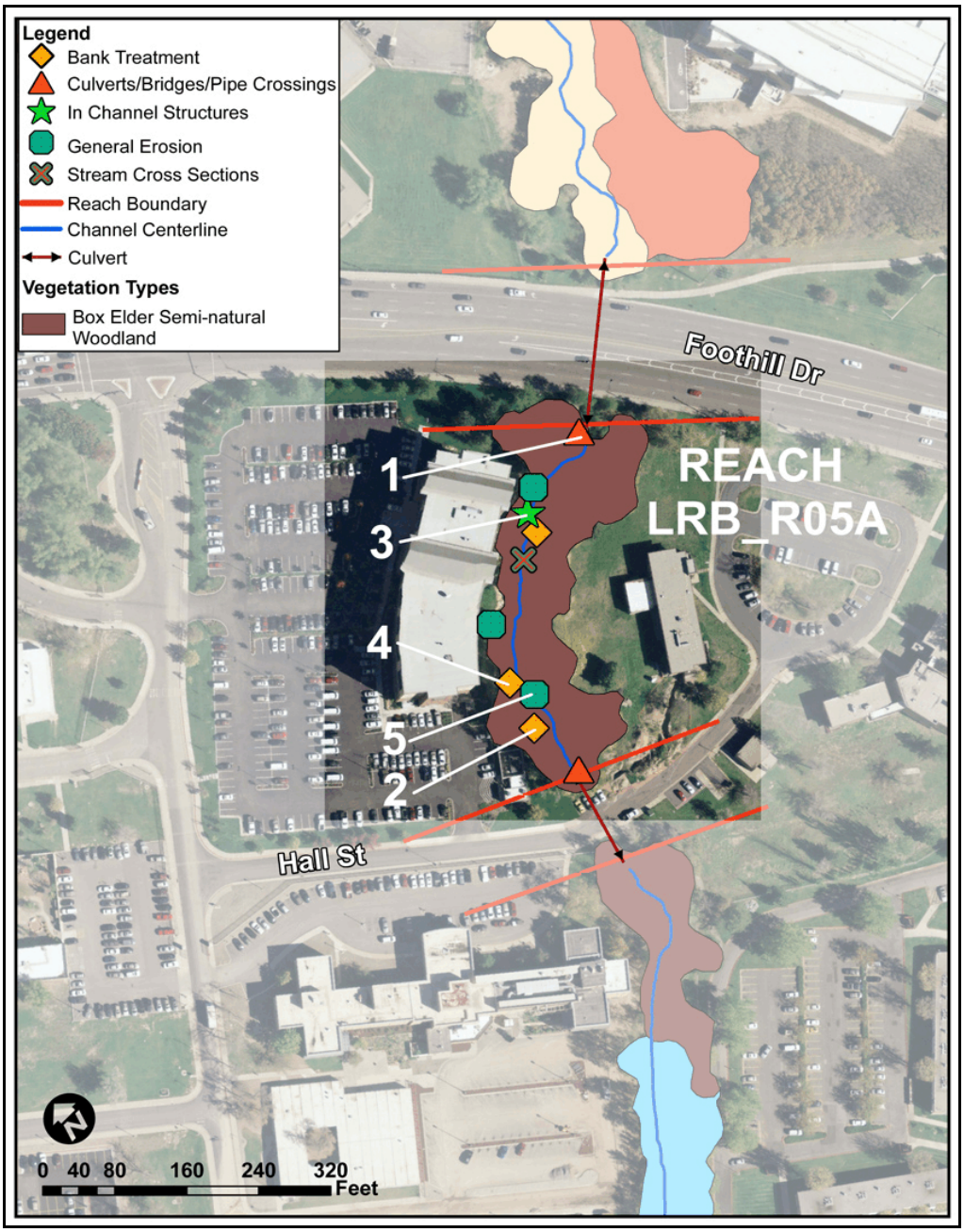
[a] See Appendix D for estimated costs.

Priorities identified by stakeholders:

- interest in public access/potential for trail
- general study area priorities (habitat, water quality, bank stability) also apply

REACH LRB_R05A: VA MEDICAL CENTER - BELOW FOOTHILL DRIVE

This is a steep, short reach that is heavily impacted by development. Bank areas contain significant amounts of asphalt and concrete pieces that have failed to stabilize the banks and currently degrade aesthetics and limit vegetation establishment. The reach contains a concrete wall/weir/outfall structure that contributes to erosion and appears to be obsolete. Bed incision, root scour, and bank erosion are also ubiquitous through the reach. Shrub cover is lacking.



Issues affecting riparian function:

- scour/erosion at culvert outlet
- storm drain outfall erosion
- poor revegetation/ stabilization practices
- bed incision
- failing in-channel infrastructure
- failing bank revetment
- low bank/root zone erosion
- terrace erosion
- trash
- invasive species (Siberian elm)
- lack of shrub cover

Constraints/ opportunities:

- confined by infrastructure

REACH CHARACTERISTICS						
LENGTH (feet)	SLOPE (feet/feet)	BANK MATERIAL	BED MATERIAL	FLAT FLOODPLAIN SURFACES	WOODY DEBRIS IN CHANNEL	BAR DEPOSITS
433	0.055	cobble, soil	cobble, gravel	absent	occasionally present	absent

VEGETATION CHARACTERISTICS					
COMMUNITY TYPE	PERCENT COVER			INVASIVE SPECIES CLASS	WOODY DEBRIS ON BANKS
	Canopy	Shrub	Understory		
Box Elder Semi-natural Woodland	76–100+	0	26–50	high	moderate

EXISTING INFRASTRUCTURE			
WITHIN 50 FEET OF AHWL		WITHIN 50–100 FEET OF AHWL	
Northwest Bank	Southeast Bank	Northwest Bank	Southeast Bank
moderate	none	high	none

RECOMMENDATIONS	
IMPROVEMENT MEASURE [a]	LOCATION
Invasive plant removal	within vegetation type(s)
Revegetation - shrub layer	within vegetation type(s)
Culvert replacement/outlet protection	point 1 on map
Stream cleanup	point 5 on map; reach-scale
Mechanized trash removal	points 2 and 4 on map; reach-scale
Replace/improve obsolete concrete structure	point 3 on map
Bank stabilization	reach-scale
Grade control	reach-scale

[a] See Appendix D for estimated costs.

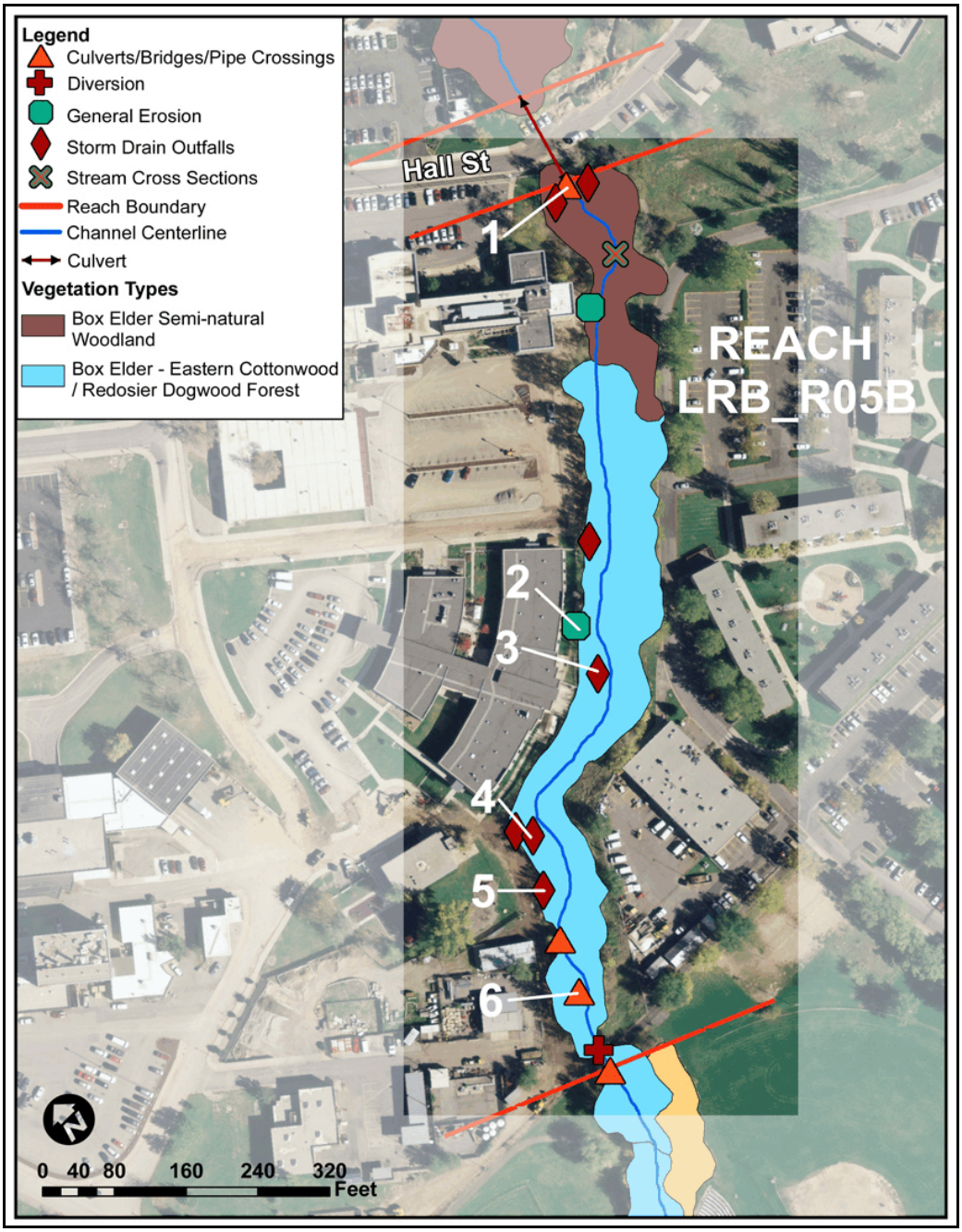
Priorities identified by stakeholders:

- interest in connecting small walking trail to Sunnyside Park trails
- interest in establishing bicycle commuting trail that would link to University of Utah
- general study area priorities (habitat, water quality, bank stability) also apply




REACH LRB_R05B: VA MEDICAL CENTER - ABOVE SUNNYSIDE PARK

This reach flows between Veteran's Administration and University of Utah facilities, ending at a diversion structure and bridge at the upstream end of Sunnyside Park. The reach contains seven storm drain outfalls, a utility pipe crossing, and a nearly clogged culvert at a trail crossing that does not appear to receive much use. Portions of the reach are in good condition.



Issues affecting riparian function:

- deposition/clogging at culvert
- bed incision
- terrace erosion
- storm drain outfall erosion
- limited shrub cover
- limited understory cover
- invasive species (Siberian elm, Russian olive)
- low bank/root zone erosion

Constraints/ opportunities:

- confined by infrastructure

REACH CHARACTERISTICS						
LENGTH (feet)	SLOPE (feet/feet)	BANK MATERIAL	BED MATERIAL	FLAT FLOODPLAIN SURFACES	WOODY DEBRIS IN CHANNEL	BAR DEPOSITS
1081	0.031	cobble, soil	cobble, gravel	occasionally present	occasionally present	occasionally present

VEGETATION CHARACTERISTICS					
COMMUNITY TYPE	PERCENT COVER			INVASIVE SPECIES CLASS	WOODY DEBRIS ON BANKS
	Canopy	Shrub	Understory		
Box Elder Semi-natural Woodland	76–100+	6–25	6–25	moderate	moderate
Box Elder - Eastern Cottonwood / Redosier Dogwood Forest	76–100+	6–25	6–25	low	moderate

EXISTING INFRASTRUCTURE			
WITHIN 50 FEET OF AHWL		WITHIN 50–100 FEET OF AHWL	
Northwest Bank	Southeast Bank	Northwest Bank	Southeast Bank
moderate	low	high	high

RECOMMENDATIONS	
IMPROVEMENT MEASURE [a]	LOCATION
Culvert replacement/outlet protection	point 1 on map
Culvert removal	point 6 on map
Storm drain improvement	points 3, 4, and 5 on map
Revegetation - shrub layer	within vegetation type(s)
Revegetation - understory layer	within vegetation type(s)
Invasive plant removal	within vegetation type(s)
Bank stabilization	reach-scale
Grade control	reach-scale
Biotechnical slope stabilization	point 2 on map

[a] See Appendix D for estimated costs.

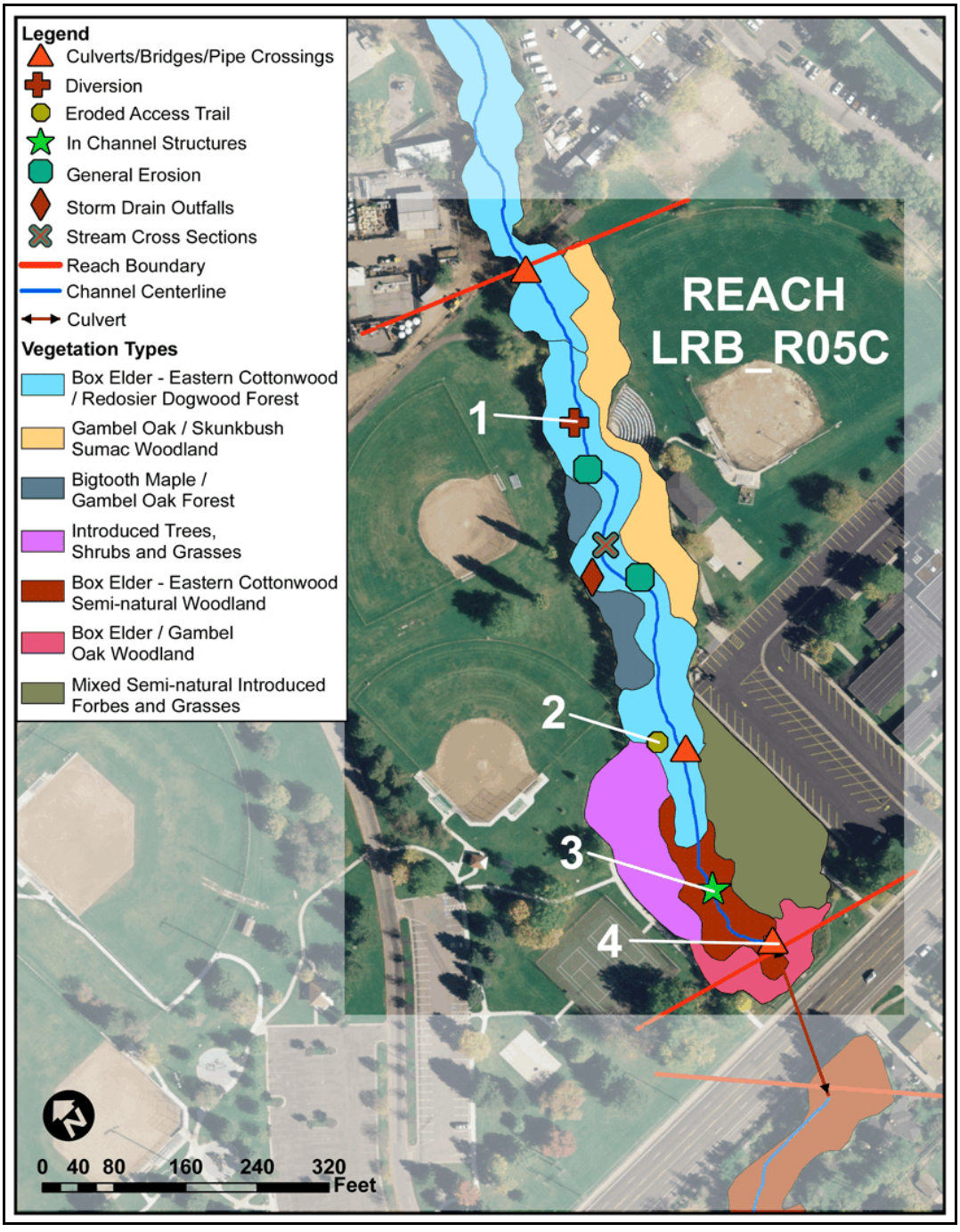
Priorities identified by stakeholders:

- interest in connecting small walking trail to Sunnyside Park trails
- interest in establishing bicycle commuting trail that would link to University of Utah
- interest in access deck that would allow nature appreciation/bird watching by State Nursing Home patients
- general study area priorities (habitat, water quality, bank stability) also apply




REACH LRB_R05C: SUNNYSIDE PARK

This reach contains a number of in-channel structures including a concrete diversion/weir structure and broken trash grate. The reach also contains several pedestrian access trails. Root zone scour and bank erosion are evident, particularly in the lower portions of the reach. Banks become less steep in the lower portion of the reach. Minimal understory vegetation cover is present.



Issues affecting riparian function:

- scour/erosion below concrete diversion weir
- low bank/root zone erosion
- eroded access trail
- bed incision
- invasive species (Russian olive, Siberian elm, houndstongue, whitetop)
- lack of understory cover
- failing in-channel infrastructure

Constraints/ opportunities:

- park location offers educational/ interpretive opportunities
- minimal infrastructure
- potential to reconnect broader floodplain near downstream end

REACH CHARACTERISTICS						
LENGTH (feet)	SLOPE (feet/feet)	BANK MATERIAL	BED MATERIAL	FLAT FLOODPLAIN SURFACES	WOODY DEBRIS IN CHANNEL	BAR DEPOSITS
887	0.037	cobble, gravel	cobble, gravel	occasionally present	occasionally present	absent

VEGETATION CHARACTERISTICS					
COMMUNITY TYPE	PERCENT COVER			INVASIVE SPECIES CLASS	WOODY DEBRIS ON BANKS
	Canopy	Shrub	Understory		
Box Elder - Eastern Cottonwood / Redosier Dogwood Forest	76–100+	26–50	0	moderate	dense
Box Elder - Eastern Cottonwood Semi-natural Woodland	76–100+	51–75	6–25	moderate	moderate
Introduced Trees, Shrubs, and Grasses	26–50	0	76–100+	high	absent
Box Elder / Gambel Oak Woodland	76–100+	0	76–100+	high	absent
Mixed Semi-natural Introduced Forbes and Grasses	26–50	0	76–100+	moderate	absent
Bigtooth Maple / Gambel Oak Forest	76–100+	26–50	6–25	moderate	absent
Gambel Oak / Skunkbush Sumac Woodland	76–100+	26–50	6–25	low	dense

EXISTING INFRASTRUCTURE			
WITHIN 50 FEET OF AHWL		WITHIN 50–100 FEET OF AHWL	
Northwest Bank	Southeast Bank	Northwest Bank	Southeast Bank
none	low	low	low

RECOMMENDATIONS	
IMPROVEMENT MEASURE [a]	LOCATION
Scour protection at diversion weir	point 1 on map
Revegetation - understory layer	within vegetation type(s)
Access trail stabilization	point 2 on map
Invasive plant removal	within vegetation type(s)
Remove/repair trash grate	point 3 on map
Bank stabilization	reach-scale
Grade control	reach-scale
Establish "no-mow" buffer at edge of turf	reach-scale
Culvert replacement	point 4 on map

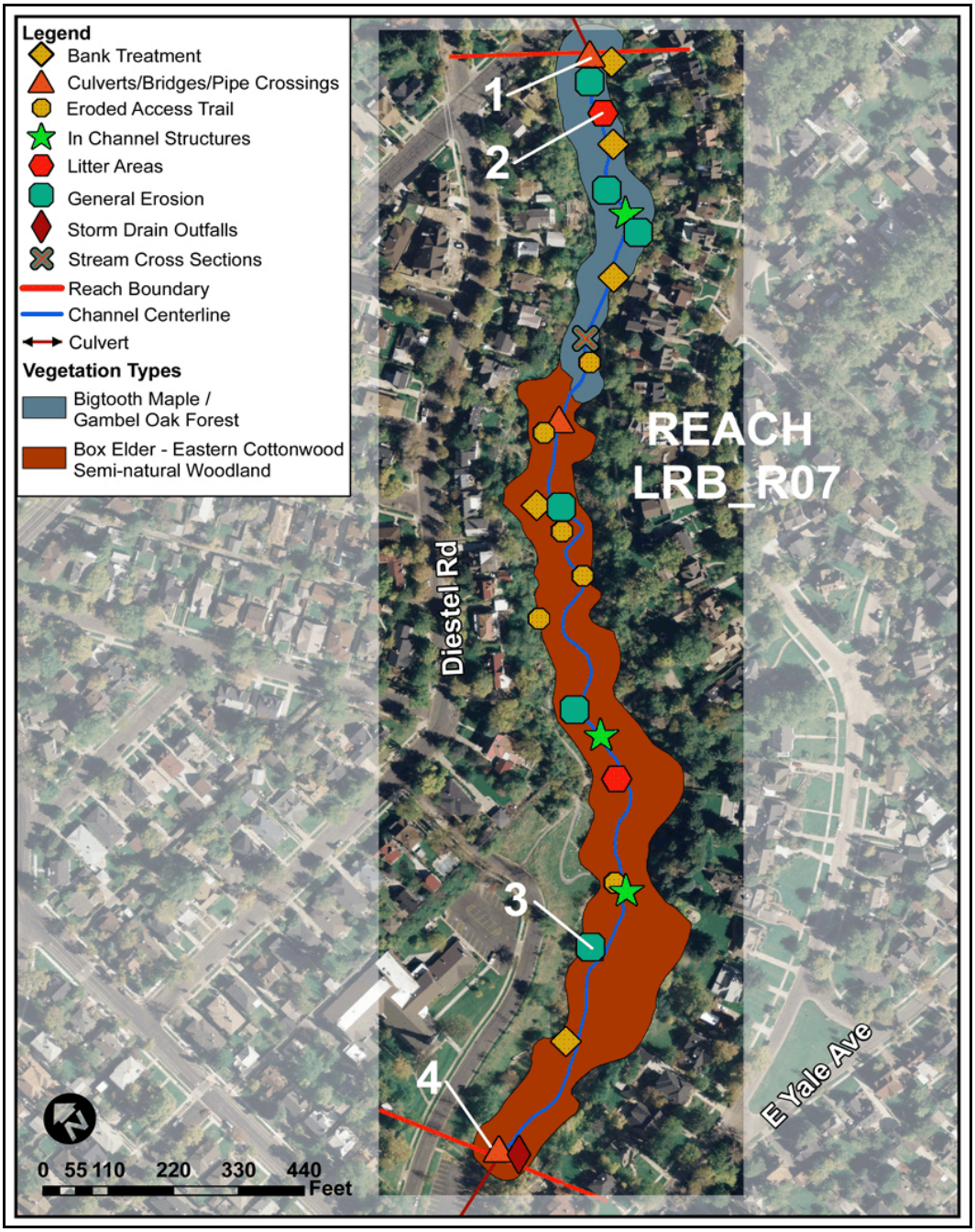
[a] See Appendix D for estimated costs.

Priorities identified by stakeholders:

- no reach-specific items identified
- general study area priorities (habitat, water quality, bank stability) apply

REACH LRB_R07: MILLER PARK/BONNEVILLE GLEN

This reach encompasses Miller Park and Bonneville Glen, a church-owned park area. Bank erosion and bed incision are issues within the reach. Various rock and concrete bank/ bed hardening structures are present in the reach, but in some areas the structures are failing or causing erosion on opposite/ adjacent banks. Established and user-created trails are prevalent throughout the reach, limiting shrub and understory cover and contributing to erosion. Invasive periwinkle and English ivy comprise much of the understory vegetation.



Issues affecting riparian function:

- bed incision
- failing in-channel infrastructure
- failing bank revetment
- invasive species (English ivy, periwinkle, Scotch thistle, cheatgrass, Siberian elm, tree of heaven)
- low bank/root zone erosion
- scour/erosion at culvert outlet
- eroded access trails
- heavy foot traffic/soil compaction from dogs and people
- understory dominated by nonnative species
- lack of shrub cover

REACH CHARACTERISTICS						
LENGTH (feet)	SLOPE (feet/feet)	BANK MATERIAL	BED MATERIAL	FLAT FLOODPLAIN SURFACES	WOODY DEBRIS IN CHANNEL	BAR DEPOSITS
2084	0.036	cobble, gravel, soil	cobble, gravel	occasionally present	occasionally present	occasionally present

VEGETATION CHARACTERISTICS					
COMMUNITY TYPE	PERCENT COVER			INVASIVE SPECIES CLASS	WOODY DEBRIS ON BANKS
	Canopy	Shrub	Understory		
Bigtooth Maple / Gambel Oak Forest	76–100+	0	26–50	high	sparse
Box Elder - Eastern Cottonwood Semi-natural Woodland	76–100+	26–50	76–100+	majority	sparse

EXISTING INFRASTRUCTURE			
WITHIN 50 FEET OF AHWL		WITHIN 50–100 FEET OF AHWL	
Northwest Bank	Southeast Bank	Northwest Bank	Southeast Bank
low	low	low	moderate

RECOMMENDATIONS	
IMPROVEMENT MEASURE [a]	LOCATION
Invasive plant removal	within vegetation type(s)
Restoration of native understory plants	within vegetation type(s)
Revegetation - shrub layer	within vegetation type(s)
Access control	reach-scale
Access trail stabilization	reach-scale
Bank stabilization	reach-scale
Grade control	reach-scale
Culvert replacement/outlet protection	points 1 and 4 on map
Mechanized trash removal	point 2 on map
Remove partial rock wall	point 3 on map

[a] See Appendix D for estimated costs.

Constraints/ opportunities:

- potential may exist to daylight part of culverted section downstream
- upstream portion is publically owned
- tall, steep banks may limit large equipment access

Priorities identified by stakeholders:

- bird habitat/bird watching
- concern about dog-use impacts on wildlife
- instream flows
- general study area priorities (habitat, water quality, bank stability) also apply

PARTIALLY ASSESSED STUDY REACHES

Reach URB_R10: Middle Red Butte Garden

In this reach Red Butte Creek flows through a series of constructed, landscaped ponds within the formal portion of Red Butte Garden. The stream channel is in stable condition, and wetland plant species such as bullrush and common reed are present along the shoreline of some of the ponds. A moderate amount of houndstongue, a noxious weed, was noted in the corridor within the upstream portion of this reach.

Reach LRB_R06: Sunnyside Avenue to 900 South

This reach flows through a privately owned residential area. Conditions were qualitatively evaluated from a property near the upstream end of the reach and also from the culvert inlet at the downstream end of the reach. Banks are steep in this reach, and the channel has been artificially stabilized in a number of areas with a variety of structures including boards, concrete walls, rock weirs, and gabion baskets. Understory vegetation is dominated by invasive English ivy and periwinkle vine. Whitetop, a noxious weed, was also noted as present in the reach. Opportunities are somewhat limited in this reach due to infrastructure constraints, but improvements to habitat and filtration functions could be attained through restoration of native understory plants and biotechnical stabilization of steep upper slope areas. Installation of stabilized, pervious access steps could also improve stability and reduce potential erosion in areas where access trails currently consist of bare dirt.

Reach LRB_R08: Below 1500 East

This reach was not assessed because access permission from property owners was not obtained. Riparian conditions are assumed to be similar to upstream and downstream reaches. Projects involving restoration of native understory plants and biotechnical stabilization of upper slope areas would likely be appropriate in this reach.

Reach LRB_R09: Above 1300 East

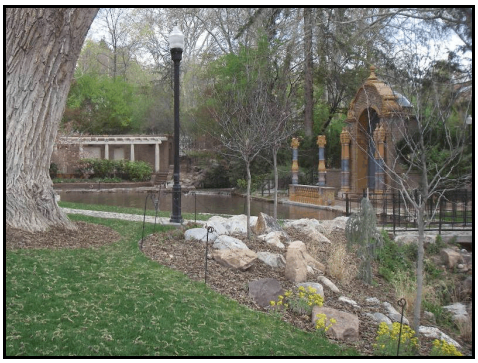
This reach was qualitatively evaluated from one property located near the middle of the reach. As in most of the study area, banks are steep and tall. The channel is well shaded by trees; understory vegetation is dominated by English ivy and periwinkle vine in some areas. Woody debris adds to in-channel habitat complexity. Streambanks have been hardened with grouted rock on some properties, and footbridges and fences occasionally cross the channel. Springs and seeps appear to be common in this reach and help to maintain baseflows while adding to habitat and vegetation diversity. Some of these springs have been developed with pipes and/or rocked spring heads. In several areas within the reach, small cottages are present immediately adjacent to or directly above the stream channel. These historic structures were built to provide cool places to sleep during the summer. Recommended projects for this reach include restoration of native understory plants, biotechnical stabilization of upper slope areas, and replacement of dirt access trails with stable, pervious access steps.

Reach LRB_R10: 1300 East to 1100 East

In this reach the Red Butte Creek channel drops below the lowest Bonneville bench level, bank height and steepness decrease, and the channel becomes less confined. This reach is completely within private property and was evaluated only in two locations where access was specifically permitted. In the areas assessed, the stream is channelized within artificially stabilized banks consisting of grouted rock walls, metal, or other hard structures. Fences commonly cross the stream at property lines, creating potential barriers to the transport of woody debris. As with reach LRB_R09, springs occur within the reach and footbridges have been constructed in several locations. Vegetation conditions vary among properties depending on landscaping, with natural vegetation in some areas and mowed grass in other areas. Within the historic Garden Park Ward property, the creek flows through a constructed pond. Opportunities within this reach are limited by the urbanized hydrology, infrastructure constraints, and

Reach LRB_R10: 1300 East to 1100 East (cont.)

"formal" landscaped use of streamside areas. Restoration of native shrubs, understory plants, and trees along the streambanks would improve the riparian functions of shading, filtration, and habitat in this reach.


Reach LRB_R11: Below 1100 East

This is a short reach that is tightly confined by residential buildings. The channel has been stabilized with concrete walls and, during high flow periods, velocities are very high due to the lateral confinement of the channel. Opportunities are limited in this reach due to the urbanized hydrology and tight infrastructure constraints.