

Design Concepts for the Greenway Experience

Greenway Corridor: Right-of-Way Descriptions and Designs

The width of the entire proposed route was examined using the RR ROW identified through the GIS software. The ROW of the RR varies throughout the city, which is how the final proposed location of the greenway was partially decided. Because the ROW width along the RR changes so frequently, there will need to be several different combinations of planting strips, pavement widths and barrier types to accommodate the available space. The ROW widths vary even within blocks and for this reason, a set of standard plans were developed for sections of the Greenway using average ROW widths. For the length of the greenway (2.3 miles), a set of reoccurring design elements would be used that help to give it a unifying character. These would consist of the same bench types, solar lighting, either a fence or a wall/fence combination, and similar plant species. Maintaining a standard character with other items such as signage, pavement markings and trash/recycling receptacles will also help to give a certain unified quality to the greenway.

Stadium Segment

The south part of the greenway between Stadium Blvd. and Hoover Ave. is the widest area of the entire greenway. Moving north along the greenway the ROW becomes much narrower. The average ROW width between Hoover and Jefferson, identified as the Stadium segment, is approximately 55', which allows for less separation from the active rail area. As can be seen in (Fig. 34, 35), a combination wall/fence was proposed that allows for a physical separation but does not create a visual barrier.

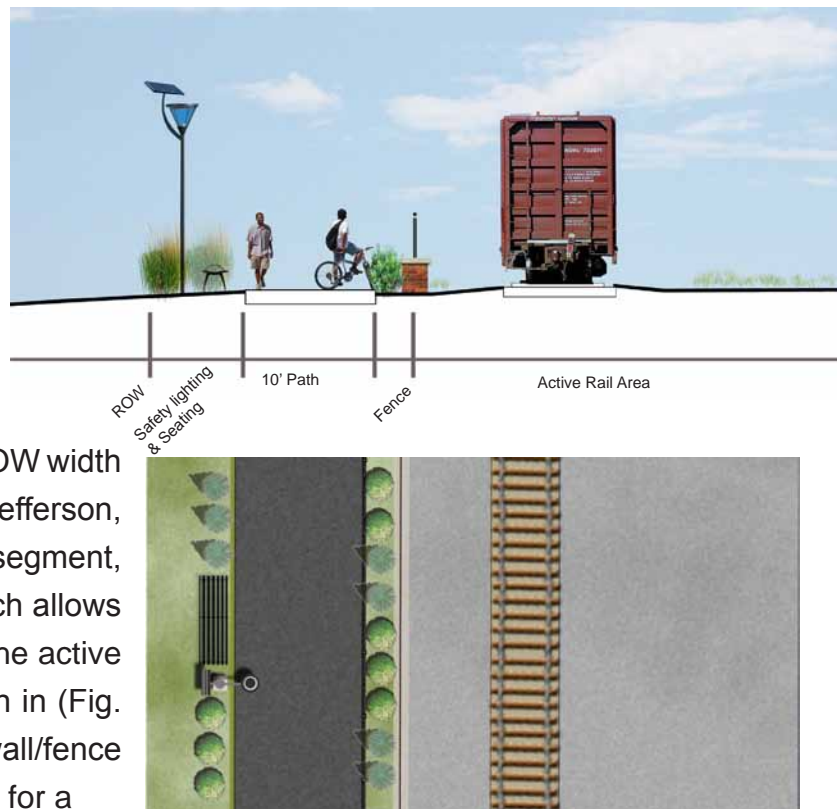


Figure 34: Section of a typical trail layout in the Stadium segment. Total ROW width 55'

Figure 35: Plan of a typical trail layout in the Stadium segment.

Native plants would be used along the edges of the path to help soften the wall and create a more appealing space. A 10' paved path is also shown which would allow for room to pass in both directions.

Turntable Park

Within the RR ROW to the south, near the UM Athletic campus, there exists an area that is wider than anywhere else along the greenway, thanks to several abandoned railroad tracks and an old turntable. This area has a ROW of approximately 155'. Within this area it was proposed that in addition to a simple path, the wider ROW could be used as more of an expanded linear park space (Figs. 36, 37). Trees are proposed in rows following the existing and abandoned tracks, with breaks occurring in these rows to create more open area for passive enjoyment. The abandoned tracks

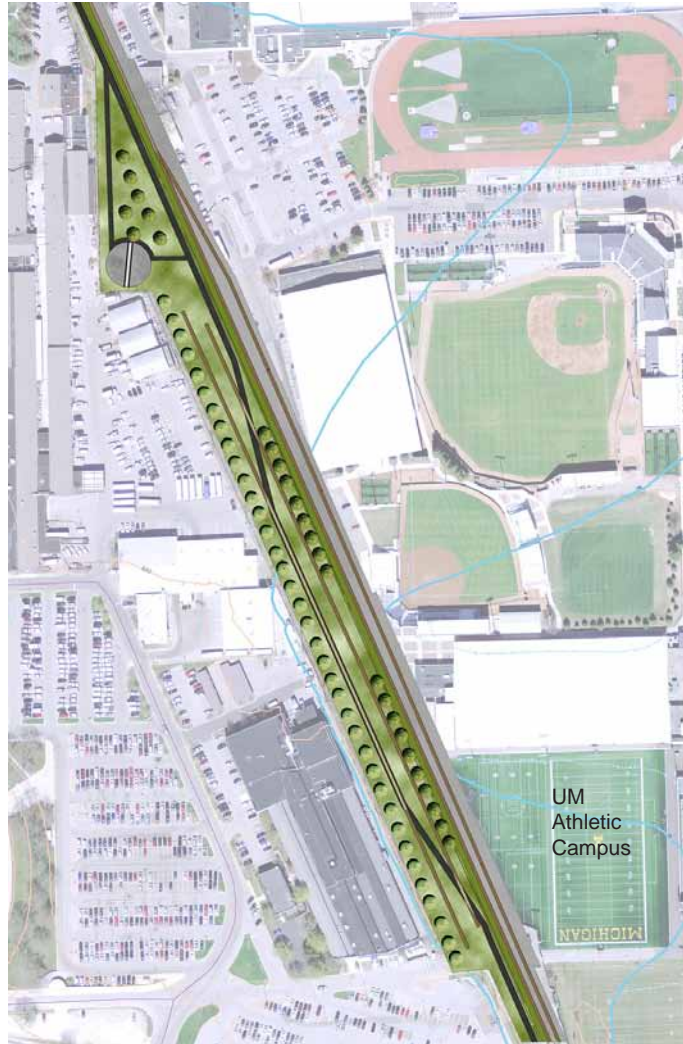
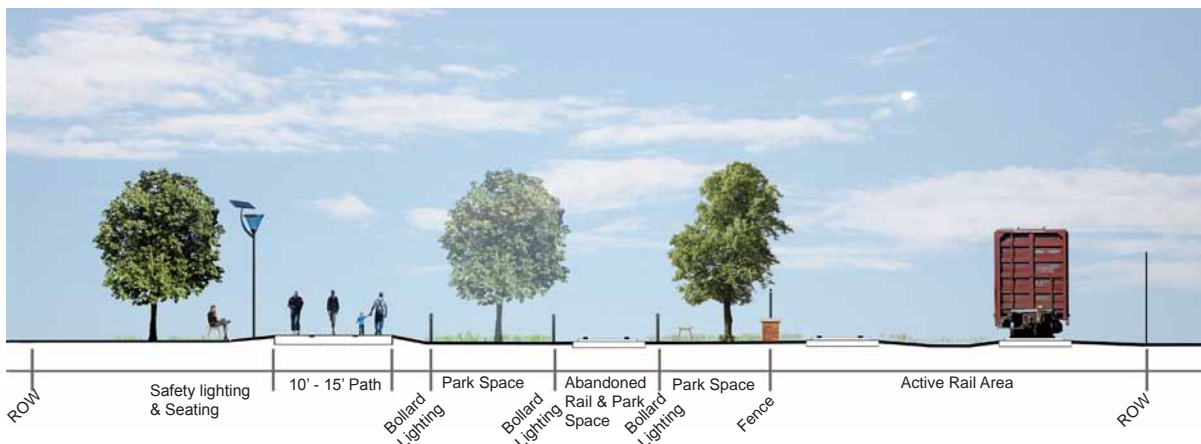


Figure 36: Plan of Turntable Park in the Stadium segment.

Total ROW width 155'
Figure 37: Section of Turntable Park.



were left in the ground and even running through the path in one segment to incorporate the history of the area into the trail. The greenway path itself, which could be as wide as 15' in this area, veers in and out of the rows of trees to make the space more interactive. The straight lines of the trees, rail tracks and path are meant to mimic the action of trains passing each other. The turntable to the north of the park is also incorporated and it was thought this area could be used as more of a sitting and patio area. The reoccurring greenway elements can again be seen in the park. These consist of providing benches along the path, using solar lighting, planting native plants where at all possible to help with aesthetics and the degraded environment of the ROW, and also using a hard wall/fence combination to separate the park and trail space from the active rail area. The wall/fence combination was important to provide the physical separation needed for safety but also allow vision out of the space so that the user did not feel too confined while on the greenway.

Downtown Trail Section

The downtown section of the trail deals with dense land use and narrow right-of-way widths and berm heights; identified as the area between Jefferson and Miller, it has an average ROW width of 65'-85' and presents a new challenge as the railroad is becomes elevated on a berm partway through this section (Figs. 38, 39). The RR increases in elevation as it moves north past William St. so that it can cross N. Main

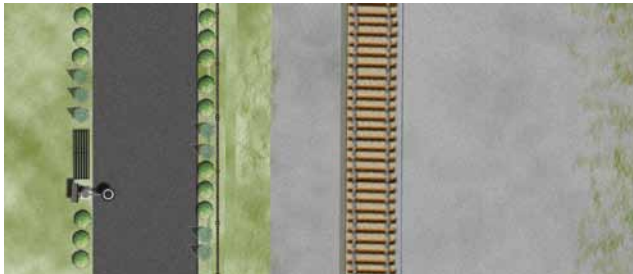
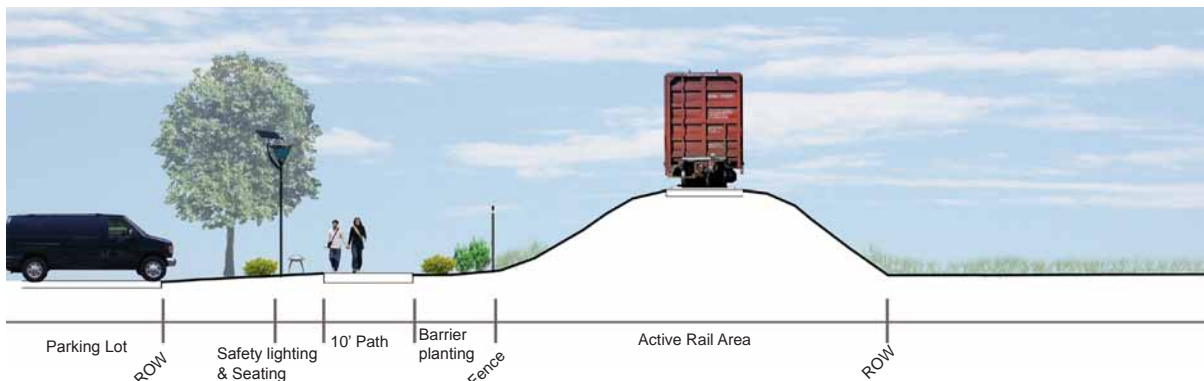


Figure 38: Plan of a typical trail in the downtown segment . Total ROW width 68'-85'.

St. and Argo Pond. The berm within the ROW is slightly problematic because even though the ROW width may be greater than needed at the bottom of the berm, the elevation creates even less room to work with for the path itself. A potential solution to this is an easement that could allow an

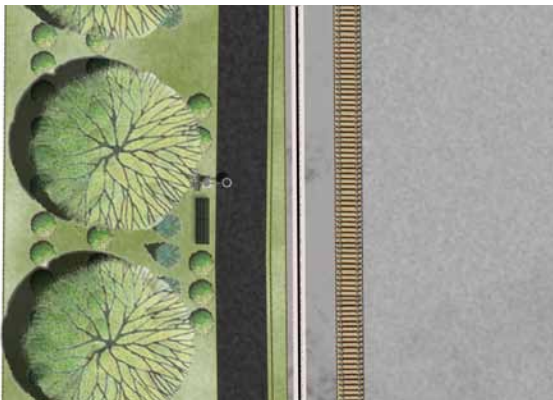
Figure 39: Section of a typical trail in the downtown segment .



expansion of greenspace into unused property adjacent to the railroad. In this segment a fence is proposed because it would take up less space than a fence and wall combination. However, using the wall/fence combination as a partial retaining wall for the berm would actually allow for more room as the bottom of the berm could be shifted slightly. Again, designs through this section propose a 10' path and planting strips on each side. As the ROW width changes along the route the planting strips can widen or narrow accordingly.

River Trail Segment

The River segment runs from Miller to N. Main St., where it reaches the Huron River, Argo Dam, and the Border to Border trail. This segment has an average ROW of 110' (Fig. 40, 41). The RR in this area is elevated; however, on the west side of the tracks the berm meets grade with the bordering neighborhood. There is a significant portion of this segment to the east that is an active rail area and could not be used for the greenway. The wider ROW allowed for more plantings and even some trees.



Planting sections that are particularly focused with seasonal interests would add valuable character to the trail. The path in this segment would again be 10' and the typical reoccurring design features can be seen.

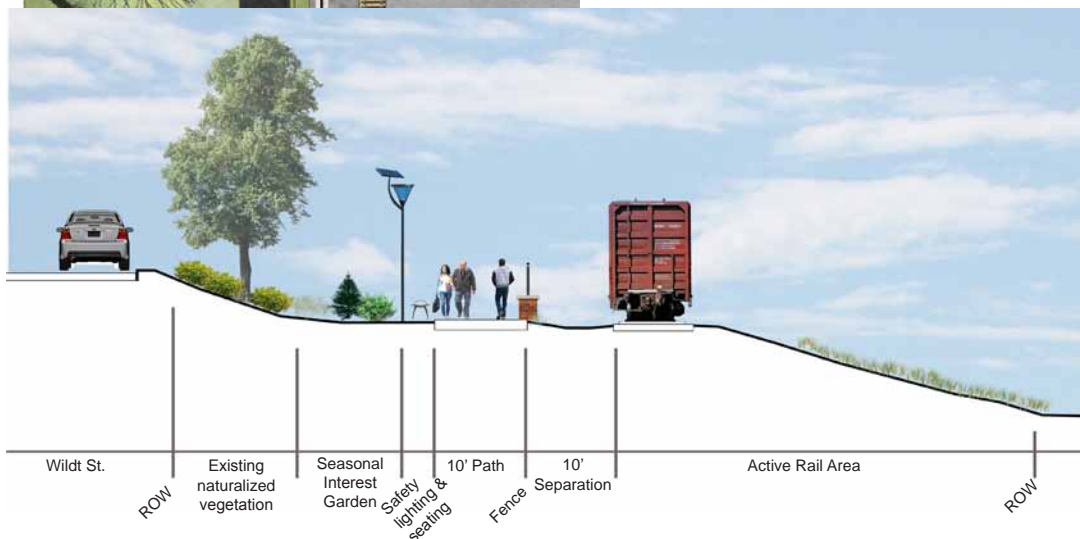


Figure 40: Plan of a typical trail layout within the River segment. Total ROW width 110'.

Figure 41: Section of a typical trail layout within the River segment.

Site Design: 721 N. Main

721 N. Main is the largest of the three city-owned parcels identified for inclusion into the greenway (Fig. 46, 47). Since a large portion of this site is outside of the floodway, the practicum team chose to site a potential mixed-use building to support residential and commercial uses, providing an exciting node of activity on-site. The floodway portion of the site was mostly restored to an oak barrens land cover to provide habitat for native plants, pollinators, and birds. The barrens area also serves to absorb and slow stormwater runoff in the event of a large rainstorm. The main stormwater capture structure on this site takes the form of two large rain gardens that are connected by a bioswale to provide water filtration, conveyance, and bank-full storage for the site. The Ann Arbor Community Center is adjacent to 721 N. Main which creates a unique opportunity to foster community interaction while letting residents enhance their “green thumbs” through community gardens—community based urban agriculture plots have been steadily increasing in popularity throughout the city.

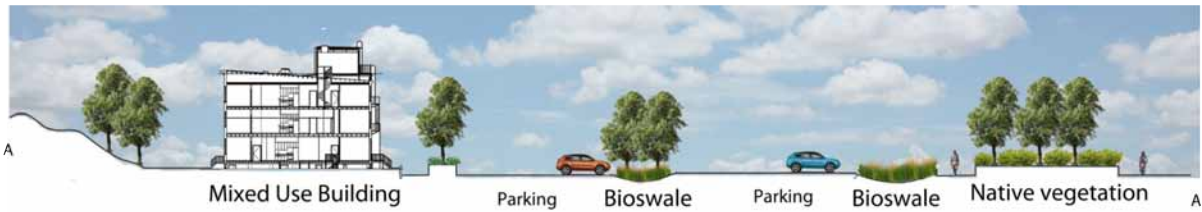


Figure 46: Site plan for 721 N. Main

Figure 47: Section for 721 N. Main

Spur Park

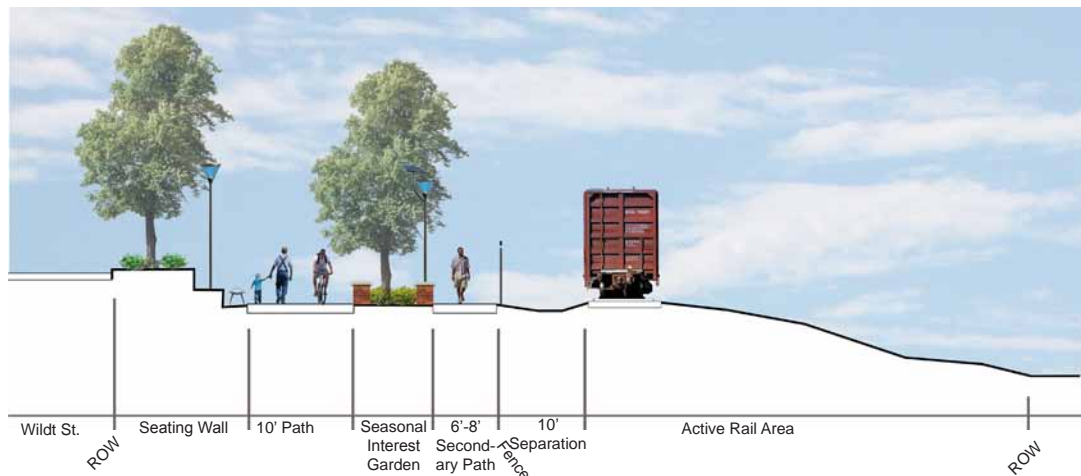
Spur Park is designed to serve as a gateway for those entering and exiting Ann Arbor via the Border to Border (B2B) trail along the Huron River Greenway (Fig. 48, 49). This section of linear park is similar in form to the Turntable Park on the southern end of the Allen Creek Greenway in that it incorporates an existing, abandoned set of railroad tracks into a secondary pathway, has ample space for increased vegetation, and employs the characteristic site elements of the linear parks (bollard lighting and the wall/fence combination).



The abandoned track in this section is the remnant of the connection between the Ann Arbor Railroad and the Norfolk-Southern Railroad (Amtrak currently uses this line).

Figure 48: Site plan for Spur Park

Figure 49: Section for Spur Park. Total ROW width 110'.



North Main Crossing

The northern end of Spur Park is a gateway to Ann Arbor and the point at which the Allen Creek Greenway can connect into the regional trail network (the B2B trail). In order to safely make this connection, however, one must overcome three major obstacles: the crossings of N. Main St, the Norfolk-Southern Railroad, and the significant vertical elevation change, while maintaining accessibility for everyone. The practicum team chose to address all three of the challenges with a single solution, a pedestrian bridge (Fig. 50). This bridge would run parallel to the existing railroad bridge, capitalizing



Figure 50: Proposed bridge crossing N. Main and Norfolk Southern railroad tracks.

Figure 51: Example of proposed spiral pedestrian bridge

on the existing elevation at the northern end of the Spur Park. Once traversing N. Main St. and the Norfolk-Southern Railroad, the bridge will ramp down in a helical form and land at the existing grade of the B2B trail. Because there is limited land to work with on the north side of the Norfolk-Southern Railroad, in order to maintain proper track clearance, the bridge would have to extend over Argo Pond. This extension over the water would have minimal impacts on environmental quality and would provide a scenic vista for pedestrians on the greenway. Finally, the B2B trail currently uses Argo Dam as a crossing point to access the B2B on the opposite side of the river. As it is now, the crossing does not foster pedestrian connectivity across the river because of its access points, usable width, and surface material. The practicum team recommends making modifications to the walkway on top of the dam to make it accessible and friendly to wheeled devices (strollers, rollerblades, etc.).

Next Steps: Phased Implementation

As previously mentioned, the practicum team is aware that the goals for the greenway outlined in this paper will require a phased installation approach in order to be implemented (Fig. 52). Using GIS software, field observations, and research into the socio-political and historical context of the greenway site, described above, four phases of development were decided. Phase 1 is the immediate implementation of a signed street route for bicycles and pedestrians which would raise awareness of the plans for the Allen Creek Greenway. When developing the street routes for Phase 1, existing conditions of the streets were important. Phase 1 was meant to be an option that could be done immediately through the use of existing bike routes, sidewalks and simple signage and stencils on sidewalks and roads. This phase would give the greenway some important publicity in the community and could help gain support for the actual greenway. The team developed several options for street routes and selected the route farthest to the west as preferred because it follows the path of the future greenway the closest and comes nearest to the three opportunity parcels. The street options could either use the Broadway Bridge to connect to the Border to Border (B2B) trail to the north or go along N. Main and connect to the B2B trail using an access road by the canoe livery at Argo Pond. To the south Packard Rd. was chosen as the terminus/connection for the street routes because it has existing bike routes in both directions. These street route options could act as a starting point for the greenway and also become separate designated trail segments once the greenway is developed.

Phase 2 is the acquisition of the three opportunity parcels. These three properties, First and William, 415 W. Washington and 721 N. Main, were identified by the Allen Creek Greenway Task Force to be the best city owned-parcels for the Conservancy to acquire. As this process had already started before the culmination of this project, parts of this phase could happen relatively quickly. The development of these three properties will create much needed open and green space in the downtown area. It will also act as a publicity boost to gain support for the greenway. The development of these three parcels will help to make the greenway more than a path: it will join outdoor spaces that have multiple uses and make them all stronger through this connection.

Phase 3 is the implementation of the greenway within the RR ROW. This means that the RR, City, and Conservancy will have reached an agreement regarding installation of the path, whether this be an easement or some other type of agreement. The team realizes that this phase could be broken into many different pieces and it may need to be for management and financing purposes. It may be necessary to

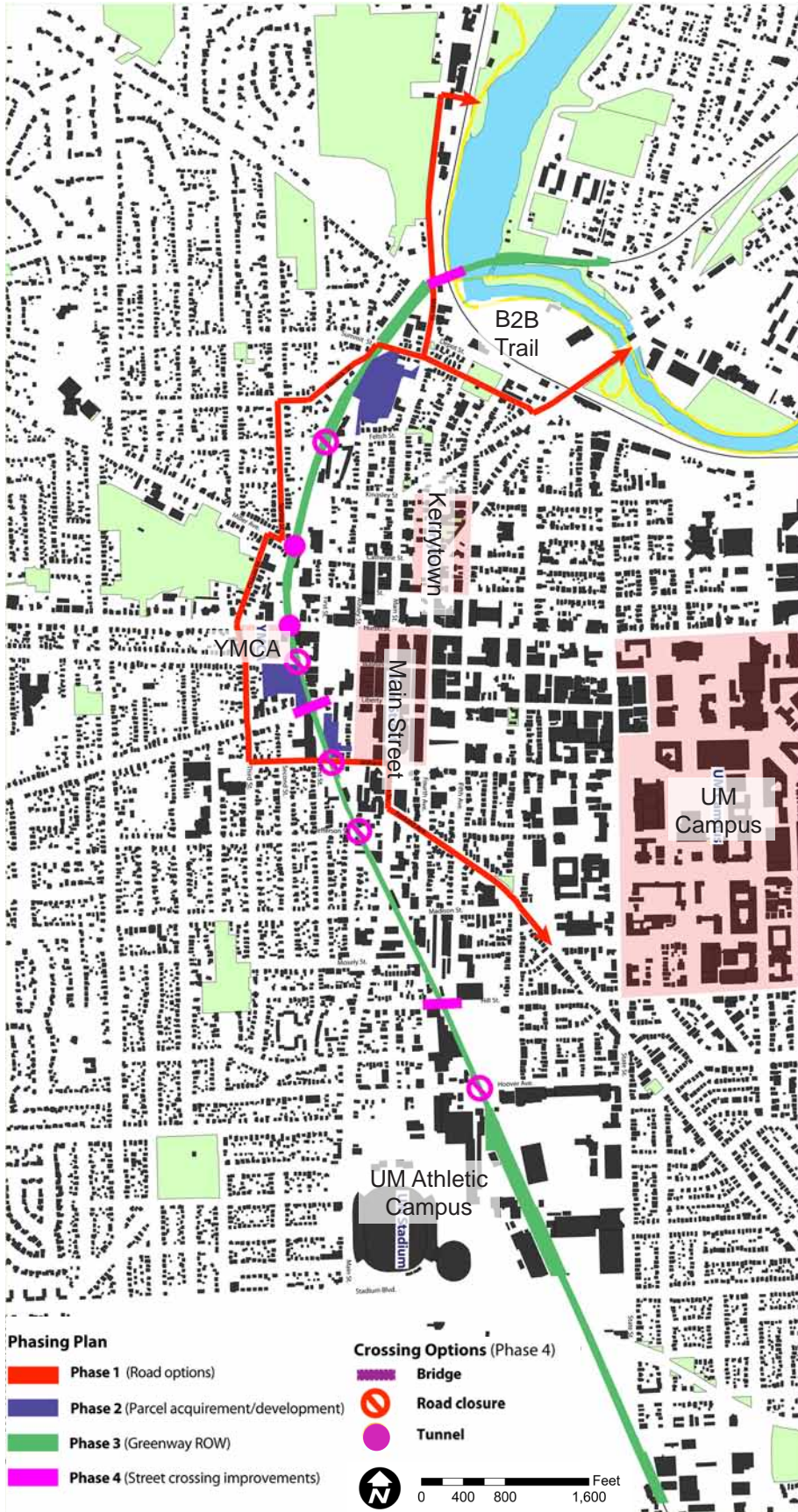


Figure 52: Diagram of proposed installation phases of the Allen Creek Greenway

develop the greenway starting at one end or the other so that it acts as an extension to the connecting trail. One strong development option would be to begin at the north end, connecting to the Border-to-Border trail, and working south. The development of the 3 parcels could also be done in this manner.

The transportation data was also important when developing Phase 4 crossing improvements. Based on the road hierarchy developed from the WATS, each crossing was studied to determine the best improvement option (Fig. 52). Pedestrian crossings for the greenway on higher and intermediate traffic roads were usually proposed as a tunnel or bridge. This way the pedestrian gained the most separation from the vehicles. This also was justified because closing most of these roads would cause too great of change in traffic patterns. The lower volume road crossings were proposed to either stay as they are with signage improvements or have a road closure. The roads that were selected to be closed were those that would not create huge changes in traffic patterns. These improvements may be several decades in the future but it was decided that these three types of crossing improvements would create a greatly improved experience while traveling on the greenway.

Conclusion

In an urbanized area such as Ann Arbor, finding contiguous land that is centrally located within the city to construct a greenway is uncommon. The current land use framework of the corridor formed by the railroad ROW, with typically lower levels of development (compared to adjacent areas), specific hydrologic functions, and close proximity to some of the most vibrant areas of the city, presents a unique opportunity for urban infill projects, as suggested by the DDA's Downtown Transition Zone plan and Bole et al's 2005 economic impact study. These infill projects will be anchored by the Allen Creek Greenway and will enhance the characteristics of Ann Arbor that make it such a great place to live: economic vitality, high quality of life, environmental quality, and cultural vibrancy.

Water systems are highly interconnected; water quality and volumes in tributaries have significant influence on greater streams, rivers, and lakes. The increased urbanization around Allen Creek has resulted in impaired water quality and the highest risk of flooding within the city limits. Because it outlets into the Huron River, the defining natural feature of the area, one of the most important functions of the Allen Creek Greenway is to promote healthy hydrology in the Allen Creek watershed, thereby improving the quality of the greater river network. Locating the greenway within the floodplain and floodway of the Allen Creek watershed provides a buffer zone around the buried creek that reduces water volumes entering the pipe, filters contaminants out of surface runoff, and significantly reduces the risk of potential damage and property loss in the event of a flood. According to the City of Ann Arbor (2007, p.67) "most floodplain managers would agree that the best use for the floodplain is open space".

The open space created by the greenway serves more functions than promoting natural hydrology. Open space allows for portions of this highly disturbed area to be restored to pre-settlement land cover types, including: oak barrens, mixed hardwood forest, and prairie. Natural vegetation in these systems provides habitat for a range of flora and fauna which promotes biodiversity and increases the City's ecological resiliency and ability to adapt to a shifting climate.

The greenway serves as open space that is well connected to the larger landscape matrix and ecologically diverse, as well as highlighting ecosystem services and promoting health and well-being for the City's residents through active and passive recreation opportunities. As noted earlier in this report, open space has been shown to improve cognitive function and wellbeing by providing a greater sense of connection to nature. Interpretive signs located throughout the greenway will enhance this connection to nature by illustrating precisely how the greenway system and its

components improve urban ecology and thereby quality of life and human health.

A critical component of improving human health and well-being through the Allen Creek Greenway is non-motorized transportation. The greenway provides recreational opportunities for bicycling, walking, jogging, and many other activities that improve physical health. Creating an off-road pathway means improved safety by minimizing interactions with automobiles. As noted in the Alta Planning + Design study, there are many instances of rails-with-trails that do not decrease pedestrian safety. In fact, by providing a clear pathway to use, safety is actually improved. Connecting the greenway to the B2B trail will create a green spur into the heart of Ann Arbor, promoting regional non-motorized connectivity. Strong transportation networks are often key drivers of urban form along the corridors they create.

The City of Ann Arbor is a strong supporter of mixed use development, which is made stronger by non-motorized transportation and walkability. Ahern and Searns indicate that greenways spur sustainable development along their length; the City should provide zoning that promotes mixed use and walkability along the greenway and within the downtown core. The Allen Creek Greenway is mentioned by name in numerous City master plans like the DDA's downtown plan (Fig. 53). The greenway is a centrally located feature in the DDA's future downtown interface and would anchor and encourage the intent of the zoning overlay district (gradual change in scale through reduced FARs) (Fig. 54). The practicum team recommends that the City go beyond encouraging the development of the greenway and begin to implement zoning to facilitate its development. For example, zoning overlays could encourage an open floodway, restrict new development in the floodplain, and even zone the land of the floodplain to be mixed-use or residential. The purpose of zoning the land to mixed-use

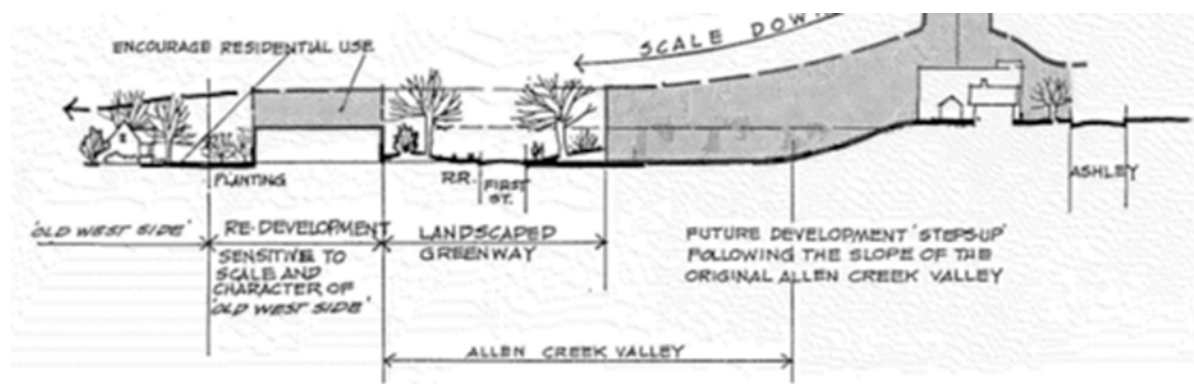


Figure 53: Cross-section of the greenway in relation to the downtown interface zone density changes and the topographic change of the Allen Creek valley.

(City of Ann Arbor, 2009a, p.29)

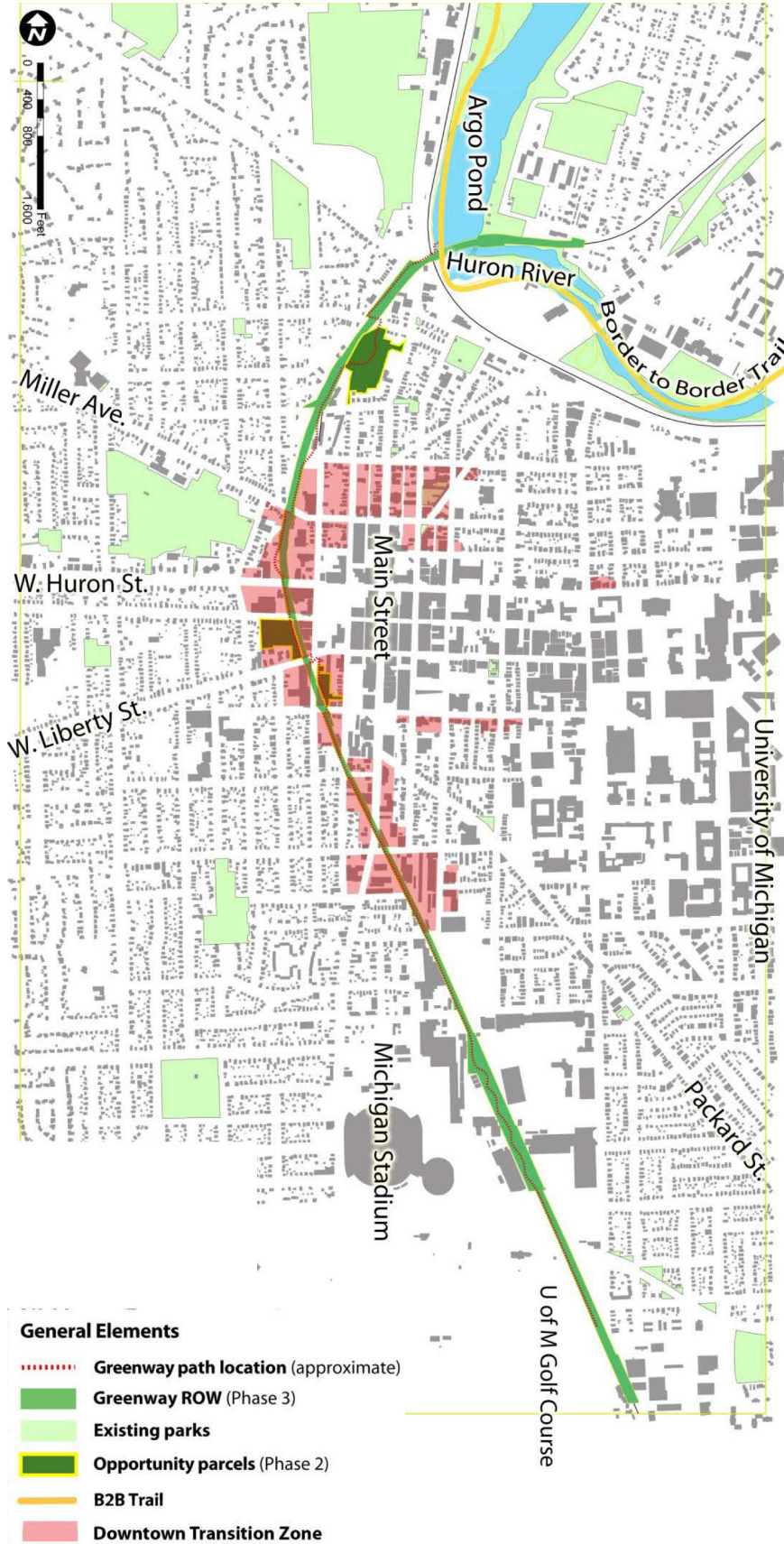


Figure 54: Diagram showing the centrality of the Allen Creek Greenway route to the DDA's downtown interface zone

or residential would provide greater incentives for the aforementioned transfer of development rights (TDR) program. The City could designate strategically located areas in the downtown to act as the receiving zones for the development rights from the floodplain and interface zone's reduced floor area ratios (FARs) to maximize economic return while promoting open space in the Allen Creek valley.

In order to move the Allen Creek Greenway further through its development it is important to set major milestones for the planning process in combination with progressive policy and zoning from the City of Ann Arbor. The practicum team has outlined four of these milestones that each represent a large step towards a realized vision of the greenway in the phasing section. The four phases (on-street routes, city owned parcel development, trail installation within the railroad ROW, and improved pedestrian crossings) represent manageable, incremental steps towards construction of this complex, multi-jurisdictional amenity. One of the most important questions that still remains is: where should development of the greenway begin? There are three obvious answers to this question: the northern section, middle section, and southern section. However, the team's research has shown that there are two options that would work best, the northern end or the southern end.

Beginning in the center at First and William or 415 W. Washington has the advantage of being highly visible and having high use potential because of its proximity to the downtown core. However, the downtown segment is not recommended as the starting point because it has the narrowest ROW widths, making path construction more challenging and possibly requiring access easements. Additionally, between Madison St. and Miller Ave., there are many intersections with roads as the planned path approaches the downtown area, creating a rapid sequence of "stop-and-go" for greenway users (especially difficult on bicycles because of their faster speeds). Lastly, this section lacks in connectivity to the regional trail network and runs the risk of becoming two typical parks (First and William and 415 W. Washington) instead of a part of a larger, linear park system.

One starting point would be the northern end of the greenway that contains the connection to the B2B trail, Spur Park, and 721 N. Main St. The major strengths of starting on the northern end are: a wide ROW to construct the trail, potential development of 721 N. Main, and promotion of regional connectivity through the B2B trail. This connection would likely draw the support of Washtenaw County Parks and Recreation while creating a non-motorized gateway to the city. Additionally, if funding is available to construct the pedestrian bridge to traverse N. Main St. and the Norfolk-Southern Railroad, it would create a highly visible landmark for the city and the Allen Creek Greenway.

Another starting point would be the southern end of the greenway by Turntable Park and the football stadium. Starting on the southern side has the disadvantage of not directly connecting into the B2B trail; however, this option is strong because it likely has the greatest amount of support from the Ann Arbor Railroad to minimize high-volume, regular trespassing on the tracks during sporting events at the University of Michigan's football and basketball stadiums. Additionally, it has the widest typical ROW available for path development which improves the perception of safety from the railroad and is the simplest for construction. An additional benefit of this section being developed first is that it would get the University of Michigan to be part of the critical first step. The design team has perceived a great deal of local support for the greenway project, but it seems as if many of the stakeholders are waiting for someone else to "make the first move". If the University, a major employer and landowner in the city, is part of the first step, it is likely that other stakeholders will be more inclined to provide services, funding, and support to move the project towards complete construction.

The Allen Creek Greenway has been in the making for over three decades and has built strong support from local governments and the citizens of Ann Arbor. It is the hope of the practicum team that this report and associated design recommendations add to the growing body of research and studies by producing a comprehensive vision for the entire length of the greenway that can be used to gain additional support from the key stakeholders. With the potential prominence of the greenway as a recreational amenity and sustainable economic development generator, the design team believes that the next step should be to gain wide spread public support and knowledge of the project and its benefits. One of the best ways to do this is by including the citizens of Ann Arbor early on in the design process with a design charrette or other means. Strong public support for the greenway is an excellent way to urge one of the key stakeholders to take the crucial first step in commitment to what should be a defining feature of Ann Arbor. The Allen Creek Greenway is nearly two and a half miles of multi-functional landscape infrastructure and a cultural amenity that represents a critical step towards enhancing the city's sustainability, economic development, and cultural vitality, now and into the future.

Appendix I: Glossary of Terms

Bankfull- The amount of water that a water feature, like a creek, can hold within the stream channel before it overflows to flood stage. Allen Creek reaches bankfull stage with the 1.5 year storm or 2.3 inches of rainfall in a 24 hour period.

Baseflow- The base amount of water flowing through a hydrologic feature from groundwater seepage; typically stream flow is comprised of baseflow in combination with surface runoff.

Box culvert- A culvert is a device used to channel water; a box culvert is enclosed, rectangular in shape and often made of concrete.

Brownfield- A federal designation of property on which the expansion, redevelopment, or reuse may be complicated by the presence or potential presence of a hazardous substance, pollutant, or contaminant. Contamination is often in the soil or groundwater and frequently from former industrial or commercial uses; can also include contaminated structures.

Catchment Area- The limits of an area that all drains to a single location, typically used to describe a specific site.

Contaminants and pollutants- May include hydrocarbons, heavy metals, chlorides, excess nutrients from fertilizers, suspended solids (solid particles from construction and erosion), and bacteria.

Contaminant Loading- The process by which runoff that has 'washed' surfaces picks up contaminants, measured by concentration of contaminants.

Corridor- A landscape ecology term referencing narrow areas of similar land cover, such as meadows under power lines or vegetated streambanks, which contrast with the surrounding land use and form pathways for flows of living creatures and / or inorganic material.

Cues to care- Visual cues in the landscape which symbolize the presence of human intention and can serve to alter people's perception of the landscape.

Ecosystem services- Benefits humans obtain from ecosystems; they can range from food production to cleansing water to psychological well-being. Some can be quantified monetarily.

Design Storm- A modeled storm used when designing and sizing a stormwater

structure; used to predict frequency, volume, peak flows, amount of runoff, and storm duration. Often referred to as the x-year storm, for example a 100 year storm is a storm intensity that has a 1% chance of occurring every year.

Digital elevation model (DEM)- A raster file containing precise elevation point data at regularly spaced, horizontal intervals, which can be used for a range of modeling and analysis functions.

First flush- Initial surface stormwater runoff after a rain event that has been found to contain the highest concentrations of contaminants because it 'washes' all of the urban surfaces, picking up contaminants and carrying them into receiving water bodies.

Floor area ratio (FAR)- The ratio of the total floor area of buildings on a certain location to the size of the land of that location.

Floodplain- The area of land adjacent to a water body that has the potential to flood during a certain frequency rain event (i.e. the 100 year floodplain is the limits of flooding for the 100 year design storm).

Floodway- Federally defined area around a waterbody that must be reserved in order to discharge the base flood without cumulatively increasing the water surface elevation more than a designated height. Communities must regulate development in these floodways to ensure that there are no increases in upstream flood elevations (FEMA).

Green space- Any space which is primarily vegetated and provides aesthetic, ecological, or cultural value based on its vegetated cover.

Greenbelt- A belt of recreational parks, farmland, or uncultivated land surrounding a community; often preserved through use of land use zoning or other regulatory tools.

Greenway—Linear green spaces which often connect to larger regional green networks; can be urban or rural but often follow other linear landscape features.

Groundwater Recharge- Percolated water that reaches the level of the groundwater table, replenishing the natural supply of water in the soil's pore space.

GIS- Geographic Information Systems, computer software that allows the operator to perform complex analyses using spatially-based data

Hydrology- The processes that describe how water is distributed and moves through a specific area.

Impervious/Impermeable Surface- Surfaces such as roads, roofs, parking lots, and compacted soils that have a very low infiltration capacity and produce a large volume of runoff.

Infill- The use of vacant land and property within a built-up area for further construction or development, especially as part of a neighborhood preservation or increased density program.

Infiltration- The process by which water enters into the upper horizon (layer) of soil.

Infiltration Capacity- Measured by the infiltration rate, determines how much water can be infiltrated per hour.

Landscape matrix- The general character of a landscape in contrast to a specific patch or corridor of land cover.

Low Impact Development (LID)- Techniques that mimic natural hydrology, minimize site disturbance, and utilize a decentralized approach to control water quality and quantity; examples include porous paving and rain gardens.

Mixed-use development- Development which allows or encourages more than one type of use in a building or set of buildings. For example, retail on the first floor, commercial office space on the 2nd and 3rd floors, and residential space on the upper floors of a building.

Non-Point Source Pollution- Pollution that comes from dispersed sources (i.e. cars slowly leaking fluids on the road over time).

Non-Motorized Transportation- Any form of transportation that is propelled only by human power (bicycles, rollerblades, walking, jogging, etc.)

Open space-Urban areas which are predominantly open and undeveloped; usually synonymous with urban green space.

Overflow Preventer- A structure that is designed to prevent overflow and flooding from a LID structure.

Outfall- The discharge point of the stormwater system where water is released, often into a larger water body.

Patch-A significant area of land which shares the same land cover or landscape characteristics in contrast to the larger landscape matrix; often connected by corridors of similar land cover to other patches.

Parkway-A significantly landscaped wide road or highway.

Peak Flow- The point during a precipitation event where the storm intensity has peaked and the maximum amount of water is being conveyed through the stormwater system or a natural system (river, stream, etc.).

Percolation- The process by which water that has infiltrated into the soil continues to move downward via gravity.

Pervious/Permeable Surface- A surface that allows water to infiltrate, resulting in minimal runoff.

Point Source Pollution- Source of pollution that emanates from a specific area (i.e. leaking underground tank or industrial outflow pipe).

Pre-settlement Conditions- The characteristics and qualities that would describe the land before humans caused significant disturbance to it.

Rail-with-Trail (RWT)- A trail which follows an existing, active rail line; often located within the right-of-way.

Right of Way (ROW)- In the case of a railroad, it is the land on which they own the title in order to lay permanent tracks; ROW can also be used to describe an easement.

Runoff- Water from a precipitation event that does not infiltrate into the soil and flows over the surface of the land.

Smart Growth- urban planning techniques that concentrates growth in the center of a city to avoid urban sprawl; often utilizes the idea of creating areas in which people can “live, work, and play” in order to symbolize the benefits of this land use typology.

Sprawl- Land use expanding from a more dense urban core into a surrounding rural landscape which is often driven by large lot development, causing an inefficient use of land compared to the services offered. Only navigable by motorized transportation.

Stormwater- Any precipitation that hits a surface (rain, snowmelt, etc.), in the built environment. It needs to be managed to prevent flooding due to large quantities of impervious surfaces.

Stormwater Structures- Designed and constructed facilities that serve different functions in managing stormwater (i.e. rain gardens, permeable pavement, bioswales, typical curb and gutter systems, etc.).