

MEMORANDUM

DATE: DECEMBER 4, 2017
TO: PARK CITY MUNICIPAL CO.
FROM: PARAMETRIX
SUBJECT: DRAFT MAIN STREET, SWEDE ALLEY & HILLSIDE AVENUE TRAFFIC CIRCULATION ANALYSIS

I. EXECUTIVE SUMMARY

Park City Municipal Corporation (PCMC) asked Parametrix to evaluate several traffic circulation issues for the planned Main Street Plaza at the south end of its Historic Main Street. This memo represents Parametrix's analysis of conditions in the area and is intended to support the dialogue about the plaza function and to inform the city's decision-making process. Key issues involved in this analysis include a potential new road connecting Main Street and Swede Alley just south of the Wasatch Brew Pub as well as traffic patterns and use of Hillside Avenue to access the downtown area. Parametrix has previously provided analysis to support the plaza dialogue as well as has turning movement templates for the Wasatch Brew Pub road. Finally, Parametrix offers a conceptual feasibility analysis of a potential new road behind the China Bridge garage connecting Marsac Avenue to Swede Alley. The road intent of the road would be to streamline ride-service vehicle access to downtown Park City which may result in diminished traffic on Hillside Avenue.

Plaza Parking Structure and Parking Supply Impacts

Turning radii templates for the garage entrance/exit on Swede Alley indicate that while passenger vehicles can easily navigate the turns, larger vehicles such as pickup trucks and SUVs may find it difficult to make this movement without off-tracking into opposing lanes. This is due to the slight skew of the driveway to the street and the structure abutting the adjacent sidewalk. Slight off-tracking is not uncommon in a historic downtown street grid and is not expected to be a major concern.

The net loss of parking is expected to be 15 spaces. Both areas are transitioning to pay parking which is expected to increase parking turnover and making more spaces available for downtown visitors and patrons on a regular basis.

Hillside Avenue

Hillside Avenue is a short but steep road with part being classified as a minor residential collector and part commercial collector. It is often used as a "back door" route into downtown and neighbors are concerned about its ability to accommodate traffic volumes, especially commercial delivery trucks. In addition, signage on the road itself creates confusion as to which vehicles (those heading up hill or those heading down hill) have the right-of-way on the narrow road. Posting both the YIELD regulatory sign and the YIELD TO UP HILL TRAFFIC warning sign sends mixed messages to drivers as to whether they are legally required to detect and yield to vehicles coming up the hill or whether the decision to yield is left to their own judgment.

Parametrix recommends revising signage on Hillside Avenue based on MUTCD guidance including removal of the YIELD TO UP HILL TRAFFIC warning sign to direct attention to the regulatory YIELD sign, clarify the message for drivers, and establish their legal obligation to yield to vehicles coming up the hill. Parametrix also recommends adding the "TO ONCOMING TRAFFIC" supplementary plaque (MUTCD sign R1-2aP) beneath the yield sign and adding a white yield line to the pavement at the foot of the sign to further establish the requirement for drivers to

detect and yield to any vehicles traversing up the hill. This signing and striping convention is typical for road segments that can only fit one vehicle width, such as narrow bridges, and is compliant with MUTCD guidance.

Attempting to restrict vehicles on Hillside Avenue has been considered by the city. Restrictions based on size, weight, or load of the vehicle are common among local governments and would be best accompanied by designated freight routes for such vehicles. Restricting vehicles based on trip purpose, such as taxis, shuttles or ride-sharing services is not expressly supported within Utah Code. Even so, identifying a vehicle's specific trip purpose in order to ticket and/or fine the driver would be costly, difficult and time consuming for law enforcement.

Treatments at the Main Street/Swede Alley intersection such as narrowing the leg of Main Street may deter drivers from continuing south on Main Street and then using Hillside to leave the downtown area. In addition, clear parking signs pointing visitors towards the China Bridge parking structure may decrease people driving around in search of parking in the area.

Previous analysis of the potential impacts of various alternatives of a new road connection between Main Street and Swede Alley just south of the Wasatch Brew Pub shows that none of the alternatives likely influences the use of Hillside Avenue as a route to downtown destinations.

One-way Main Street Operation

Concerns regarding the use of Hillside Avenue as a route in and out of downtown as well as potential general circulation improvements around a new plaza have led to the suggestion to convert Main Street into a one-way street between Swede Alley and a new connector road south of the Wasatch Brew Pub. For either one-way direction option (northbound or southbound), traffic circulating in the Main Street area will need to take a circuitous route which may prove frustrating to visitors to the area that are looking for parking. In addition, the Wasatch Brew Pub road would need to be wide enough to allow for two-way vehicle travel as well as have turning radii sufficient to allow for all turn directions of relatively large vehicles such as delivery trucks. The footprint of a road like this will impact the design for the Main Street Plaza.

To provide context for the suitability of one-way operation on Main Street between Swede Alley and the Wasatch Brew Pub Road, Parametrix assessed the roadway according to seven criteria generated by the Institute of Transportation Engineers (ITE). Of the seven criteria, four are not met and a fifth criteria depends on the design of the Wasatch Brew Pub Road. Per ITE guidelines, one-way operation is not an advantageous treatment for Main Street between Swede Alley and the Wasatch Brew Pub Road.

China Bridge Road

Parametrix investigated the feasibility of new, limited-use road around the China Bridge parking garage connecting Marsac Avenue with Swede Alley. The intent of the road is to enhance the ability of the ride-service industry to access downtown areas without encroaching on neighborhood streets, such as Hillside Avenue. Various technical issues accompany trying to fit the roadway in the challenging terrain behind the China Bridge garage. Having the roadway depart from Marsac Avenue directly is a simpler option from a traffic conflict perspective as opposed to tying into the access to the upper level of the China Bridge garage. This options may encounter more terrain challenges, however. Near Swede Alley, it is likely the south-facing garage entrance will need to be closed or converted into an exit-only gate. A ride service drop-off/pick-up zone at curbside locations along the east side of Swede Allen likely offers the most capacity, greatest visibility, and operational flexibility for ride-service vehicles. Beyond design details, the system will need to be accompanied by a strong signing and public information component to succeed.

II. BREW PUB PLAZA ANALYSIS BACKGROUND

Park City Municipal Corporation (PCMC) is in the process of designing a public plaza at the “top” (south end) of Main Street, near the street’s intersection with Swede Alley. PCMC hired Parametrix to assess several traffic circulation aspects of the plaza. Over the course of several months, as the plaza concept has evolved – and various issues and concerns have arisen with the community - Parametrix has developed analysis to support the dialogue about the plaza function and to inform the decision-making process.

One of the major points of the plaza design is the roadway design and function of a new proposed flex street connecting Main Street and Swede Alley on the north side of the plaza adjacent to the Wasatch Brew Pub. The purpose of the new street and its ability to facilitate additional opportunities related to circulation and access to and around the Brew Pub Plaza has been at the forefront of the discussion. This includes ideas to temporarily close Main Street to vehicular traffic and functionally extend the plaza activity onto Main Street for organized public events. Additionally, early concepts explored permanent one-way circulation patterns around the plaza. Other related issues to the plaza include the impact to Main Street trolley operation, potential impacts to taxi and shuttle operations, and the impact to off-street parking supply. Traffic patterns on Hillside Avenue were also looked at as ancillary to traffic issues in the area.

Previous Documents

Three memos document the previous Parametrix work to support the plaza dialogue over the last several months.

1. Brew Pub Plaza & Main Street Circulation Analysis (October 2016)
2. Trolley Bus Turn-Around (March 2017)
3. Main Street Plaza Circulation (June 2017)

These memos reflect the evolution of concepts and ideas surrounding the plaza. Some items in the memos address early-stage issues no longer relevant to current plaza plans. Other items address concerns expressed by residents and stakeholders that still remain at the forefront of the plaza operation. This following brief synthesis of previous memo content is provided to frame the current discussion.

Brew Pub Plaza & Main Street Circulation Analysis (October 2016)

- *Memo Purpose:* Evaluate initial traffic circulation concepts for roadways around the plaza including one-way loops and closing roadway segments except for organized public events (This analysis was conducted prior to an understanding of the preferred plaza design.)
- One-way circulation loops reduce conflict points and can allow excess roadway width to be converted to other uses
- Configurations that divert travel from Main Street can possibly discourage delivery trips from utilizing Hillside Avenue to reach downtown
- Converting the existing parking lot to the plaza and parking garage results in a loss of 15 parking spaces. Certain circulation concepts with one-way streets could recoup parking spaces by adding more on-street parking
- Most circulation concepts allow the Main Street trolley to reverse direction by turning around the plaza
- Concepts with two-lane width for the connector between Main Street and Swede Alley disrupt pedestrian flow to and from the plaza

Trolley Bus Turn-Around

- *Memo Purpose:* Compare trolley operation if turn-around is moved from Hillside Avenue to a loop around the plaza
- Overall, potential advantages of moving the turn-around appear to be minor compared to the disadvantages

- Moving the turn-around shortens the route and leaves a neighborhood area with no transit service
- The trolley would experience geometrical challenges with tight corners and sight distance at the intersection of Main Street and the new connection between Main Street and Swede Alley
- Moving the turn-around reduces safety concerns related to the trolley currently making U-turns in the middle of the Hillside Avenue intersection

Main Street Plaza Circulation

- *Memo Purpose:* Compare design and operational alternatives of the new connector between Main Street and Swede Alley in consideration of the preferred plaza design
- A new connector with a full, two-lane width including curb, gutter, and sidewalk is likely to constrain the plaza design
- Elimination of the new connector allows the plaza to expand to the north but does not allow Main Street to close for plaza organized public events due to a lack of an alternate traffic route between Main Street and Swede alley.
- The new connector cannot support two-way trolley traffic or two-way truck traffic without significant widening that disrupts the plaza design
- The new connector built to the originally planned width can support Main Street closures during plaza events if the new connector is carefully managed. This may include one-way only operation or limiting heavy vehicle use
- None of the examined alternatives likely influences the use of Hillside Avenue as a route to downtown destinations

In addition to the analysis provided in these memos, Parametrix delivered turning templates to PCMC to illustrate the ability or inability of certain vehicle types to navigate various layouts of the new connector between Main Street and Swede Alley.

III. CURRENT MEMORANDUM

The purpose of this memo is to provide discussion for five remaining items regarding downtown circulation:

1. Curb/intersection radii at the parking garage entrance
2. Plaza effect on parking supply in Park City
3. Operational signage, vehicle deterrence, or vehicle restrictions on Hillside Avenue
4. Analysis of potential one-way operation on Main Street from Swede Alley to King Road/Park Avenue
5. Conceptual review of ride service road from Marsac Avenue to Swede Alley

IV. GARAGE ENTRANCE & EXIT

Parametrix evaluated the intersection radii at the parking garage entrance on Swede Alley. The driveway width meets the minimum width standard at 24'6" wide. Turning radii templates indicate the entrance/exit can easily be navigated by typical passenger cars but presents some challenge to larger-sized vehicles, such as pickup trucks or SUVs. Pickups and SUVs will off-track into opposing travel lanes when turning right into the garage and also turning right out of the garage onto Swede Alley. This is due to both the slightly skewed angle of the driveway to Swede Alley as well as the parking structure coming up to the sidewalk, which minimizes the turning radius. However, it should also be noted that vehicles off-tracking to a small degree is not uncommon, especially in historic areas with narrow streets. Typically, drivers adjust for this by waiting until both directions of travel are clear before turning. Turning templates for passenger cars and pickups are contained in the Appendix.

V. PARKING SUPPLY IMPACT

The existing parking lot at the location of the proposed plaza features 51 off-street parking spaces. The plaza design will provide 36 spaces in the parking garage beneath the plaza, based on the architectural drawings. This results in a net decrease of 15 parking spaces which would push many drivers to park in the China Bridge structure or other downtown parking facilities. More drivers parking at China Bridge and walking to destinations will lessen the amount of vehicles circulating up and down Main Street looking for open parking spaces. The result is fewer traffic impacts and a more walkable environment on Main Street, which is consistent with the goals of various adopted plans and policies for the area. Finally, for the last few months, a portion of the existing parking lot has been utilized for construction staging. This has temporarily decreased the parking lot's capacity by about 17 stalls which is more than the net decrease of 15 stalls expected with the plaza design. Despite the loss of parking, downtown Park City has continued to function adequately.

Figure 1: Construction Staging in Existing Parking Lot



VI. HILLSIDE AVENUE USE AND SIGNAGE

Existing Conditions

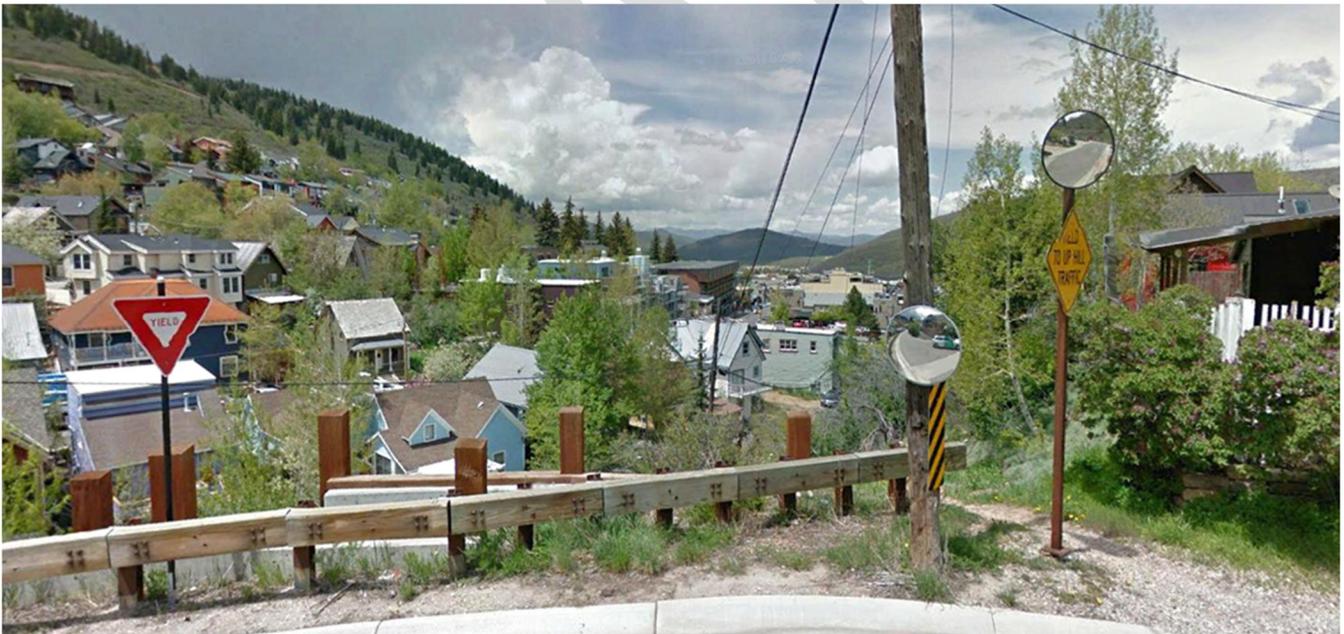
Hillside Avenue is a short but steep road, with part being classified as a minor residential collector and part commercial collector, descending from Marsac Avenue (SR-224) to Main Street. Because of the linear nature of downtown Park City terrain and streets, Hillside Avenue is one of the few vehicular access points to downtown. Whereas other downtown access points are clustered on the north end of Main Street, Hillside is the only connection on the south side. Hillside Avenue is often used as a “back door” route into downtown for visitors, delivery vehicles, hotel shuttles and taxi service vehicles. The challenging alignment of Hillside Avenue as well as being adjacent to residences creates concerns about its ability to support higher traffic volumes.

In addition to the steep grade, Hillside Avenue is a narrow street, featuring approximately 17 feet of pavement width at its most constrained points. The top of the roadway has a tight curve with limited sight distance. Currently, there are multiple treatments attempting to address the challenging roadway geometry. At the upper curve on Hillside Avenue there are two signs: a yellow “YIELD TO UP HILL TRAFFIC” (warning) sign and a YIELD (regulatory) sign. Additionally, there are two convex mirrors positioned on the same curve. One mirror is mounted on the pole above the YIELD TO UP HILL TRAFFIC sign directed at vehicles traveling downhill. The other mirror is mounted on a utility pole facing vehicles driving uphill. Figures 2 and 3 show the placement of the signs and mirrors. No signs are posted for vehicles travelling up hill.

Figure 2: Hillside Avenue Signage and Mirrors (looking west)



Figure 3: Hillside Avenue Signage and Mirrors (looking northwest)



Signing Recommendations

Given the challenging geometry on Hillside Avenue, Parametrix recommends preserving some kind of signage to manage traffic. However, posting both a warning sign and a regulatory sign for essentially the same purpose is redundant, exacerbates visual clutter and diminishes the ability to clearly communicate messages to drivers.

According to the Manual on Uniform Traffic Control Devices (MUTCD) the purpose of a warning sign is to "...call attention to unexpected conditions on or adjacent to a highway, street, or private roads open to public travel and to situations that might not be readily apparent to road users." (MUTCD Section 2C.01.01). The purpose of

regulatory sign is to "...inform road users of selected traffic laws or regulations and indicate the applicability of the legal requirements." (MUTCD Section 2B.01.01) Posting both the YIELD regulatory sign and the YIELD TO UP HILL TRAFFIC warning sign sends mixed messages to drivers as to whether they are legally required to detect and yield to vehicles coming up the hill or whether the decision to yield is left to their own judgment. Furthermore, the specific wording of the YIELD TO UP HILL TRAFFIC warning sign can easily be misinterpreted by drivers. For example, a driver may interpret the sign to mean that *vehicles at the foot* of the hill are meant to yield to *uphill traffic* – vehicles up the hill – the opposite of the sign's intended message.

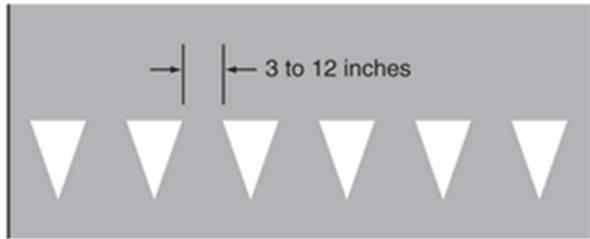
Parametrix recommends removal of the YIELD TO UP HILL TRAFFIC warning sign to direct attention to the regulatory YIELD sign, clarify the message for drivers, and establish their legal obligation to yield to vehicles coming up the hill. Parametrix also recommends adding the "TO ONCOMING TRAFFIC" supplementary plaque (MUTCD sign R1-2aP) beneath the yield sign and adding a yield line to the pavement at the foot of the sign to further establish the requirement for drivers to detect and yield to any vehicles traversing up the hill. This signing and striping convention is typical for road segments that can only fit one vehicle width, such as narrow bridges, and is compliant with MUTCD guidance.

Figure 4 illustrates the "TO ONCOMING TRAFFIC" plaque. Figure 5 depicts the MUTCD example of a yield line. Figures 6 through 8 depict real-world examples of this sign convention. Table 1 summarizes the MUTCD guidelines for the plaque and the yield line.

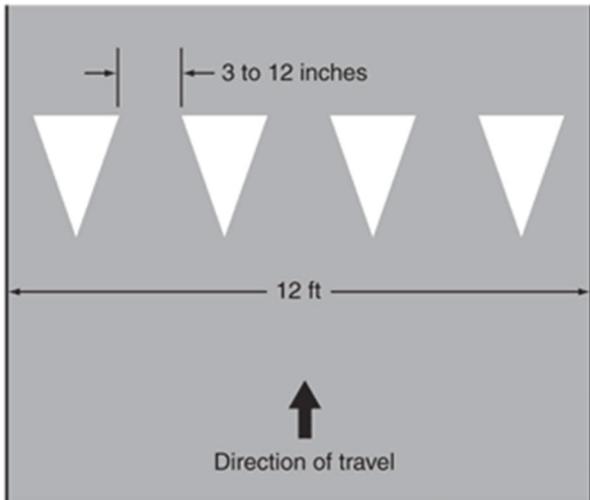
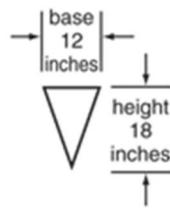
Figure 4: MUTCD R1-2aP Sign



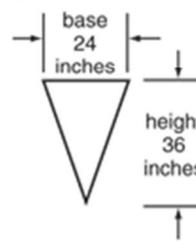
Figure 5: MUTCD Yield Line (MUTCD Figure 3B-16)



(a) Minimum Dimensions



(b) Maximum Dimensions



Notes:
Triangle height is equal to 1.5 times the base dimension.

Yield lines may be smaller than suggested when installed on much narrower, slow-speed facilities such as shared-use paths.

Figure 6: Example of Yield Sign and Supplementary Plaque – Wind Cave National Park, SD



Figure 7: Example of Yield Sign and Supplementary Plaque – Pine Hill Road near Harrisburg, PA



Figure 8: Example of Yield Sign and Supplementary Plaque – Hana Highway in Maui, HI



Table 1 Yield Plaque and Yield Line MUTCD Guidance

Element	MUTCD Reference	Description
Plaque	Section 2B.10.09	Where drivers proceeding straight ahead must yield to traffic approaching from the opposite direction, such as at a one-lane bridge, a TO ONCOMING TRAFFIC (R1-2aP) plaque may be mounted below the YIELD sign.
Yield Line	Section 3B.16.03	Yield lines may be used to indicate the point behind which vehicles are required to yield in compliance with a YIELD (R1-2) sign or a Yield Here To Pedestrians (R1-5 or R1-5a) sign.
	Section 3B.16.07	Yield lines shall consist of a row of solid white isosceles triangles pointing toward approaching vehicles extending across approach lanes to indicate the point at which the yield is intended or required to be made.

Vehicle Restrictions on Hillside Avenue

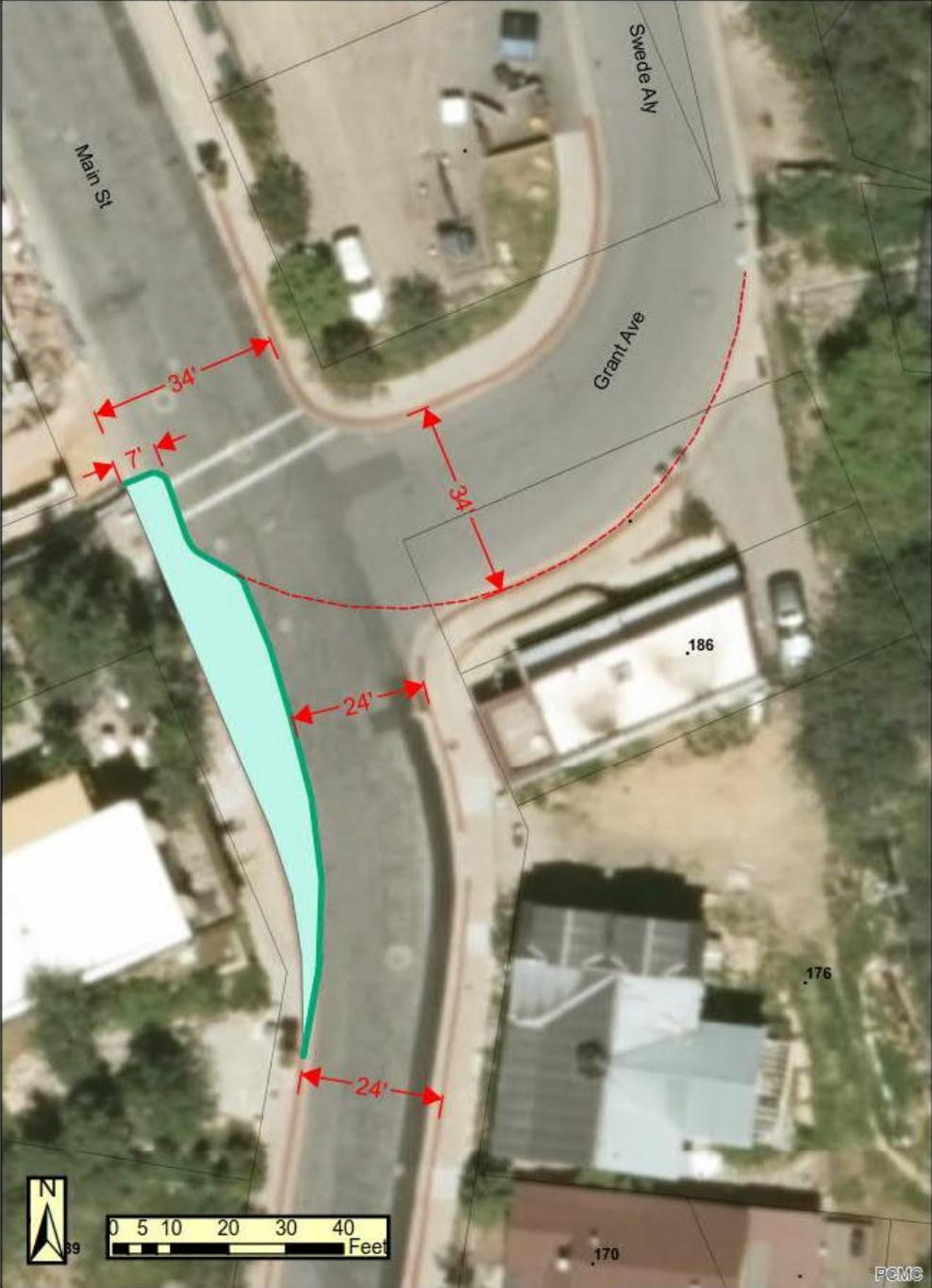
Restricting different types of vehicle traffic on Hillside Avenue has been suggested as a way to manage traffic on the road. Many cities, counties and states restrict vehicles on some roads based on size of the vehicle or type and weight of load in order to not place undue wear and tear on the road (see Utah Code 72-7-41). This is a common practice and often done in concert with identifying freight or oversize vehicle routes that are on roads built to sustain larger and heavier vehicles. Based on the construction specifications of Hillside Avenue and/or other potentially limiting factors, this may be a consideration for the city. Restricting vehicles based on trip purpose, such as taxis, shuttles or ride-sharing services is not expressly supported within Utah Code. Even so, identifying a vehicle's specific trip purpose in order to ticket and/or fine the driver would be costly, difficult and time consuming for law enforcement.

Treatments to Main Street/Swede Alley Intersection

In addition to signage on Hillside Avenue aimed to inform drivers, there are treatments at the intersection of Main Street and Swede Alley that might deter drivers of commercial and passenger vehicles alike from continuing south on Main Street and eventually onto Hillside. The most effective way to influence driver behavior at this intersection, short of outright prohibiting vehicles or a one-way travel scenario, is to narrow the roadway or "neck down" at the intersection so that the more obvious vehicle movement is continuing from Main Street to Swede Alley or vice versa and so that continuing south on Main Street becomes a more difficult maneuver. Figure 9 shows a potential new curb alignment at the intersection that would discourage drivers accordingly.

Another strategy to discourage vehicles from continuing south on Main Street, especially of those visiting the Historic Main Street area, is to provide signs indicating additional parking only to the east on Swede Alley and only to the north on Main Street. Currently, there are signs indicating that parking is available both to the south and to the east, encouraging people to continue south. The Main Street/Swede Alley intersection would be a logical location for a sign indicating the availability of parking in the China Bridge parking ramp or in other nearby locations. Additionally, signs for drivers approach the intersection on Swede alley could also direct drivers to the right towards downtown rather than the left towards Hillside Avenue. This could be part of an overall parking signage and real-time availability program for the city, directing people to under-utilized locations such as Sandridge using Marsac Avenue or China Bridge using Swede Alley in order to minimize congestion on and near Main Street.

Figure 9: Example Curbing to Encourage Main Street-Swede Alley Circulation



Source: PCMC

VII. ONE-WAY MAIN STREET OPERATION

Concerns regarding visitors, delivery vehicles, and taxi services using Hillside Avenue as a route in and out of downtown as well as potential general circulation improvements around a new plaza have led to the suggestion to convert Main Street into a one-way street between Swede Alley and a new connector road south of the Wasatch Brew Pub. It is suggested that the impedance created by a one-way street will direct some Hillside Avenue traffic to other downtown entrances, such as Park Avenue, Main Street and Heber Avenue. The following discusses several of the expected benefits and impacts of one-way operation.

Pavement Width

Main Street has 30 feet of pavement width between Swede Alley and the new connector road. One-way travel will only utilize a portion of the pavement width which means excess pavement could conceivably be devoted to other uses, such as additional on-street parking. Approximately eight on-street parking spaces could be added to the west side of Main Street where parking is prohibited. Businesses located on the potential one-way section of Main Street may benefit from additional on-street parking adjacent to their business.

Direction of One-way Operation

One-way operation on Main Street may deter some downtown access traffic from utilizing Hillside Avenue, but not all. If Main Street is one-way northbound, then traffic exiting downtown to the south will be impeded and would need to take a circuitous route using the new connector road and Swede Alley. If it is one-way southbound, traffic entering downtown from Daly Avenue or Hillside Avenue will likely move to Swede Alley and then use the Wasatch Brew Pub road if their destination is on Main Street.

For either one-way scenario, traffic circulating in the Main Street area will need to take a circuitous route which may prove frustrating to visitors to the area that are looking for parking. In addition, the new connector road would need to be wide enough to allow for two-way vehicle travel as well as have turning radii sufficient to allow for all turn directions of relatively large vehicles such as delivery trucks. The footprint of a road like this will impact the design for the Main Street Plaza by requiring more area dedicated to the road and less available for the plaza.

An alternative scenario is to leave the road to primarily function as a two-way street but to make it one-way only during organized public events. While this may offer some benefit during times of heavy plaza-related traffic, the same caveats related to the design of the new connector road still apply: it would need to be wide enough to accommodate two-way travel plus the turning radii for commercial vehicles. The impacts to the plaza of such a road do not justify the limited benefit for a small number of days during the year.

Figure 10: Conceptual One-way Operational Extents on Main Street



Guidelines for One-Way Operation

To provide context for the suitability of one-way operation on Main Street between Swede Alley and the new connector road adjacent to the Wasatch Brew Pub, Parametrix assessed the roadway according to guidelines generated by the Institute of Transportation Engineers (ITE). The guidelines are found in the Traffic Engineering Handbook (p. 227) and provide generalized criteria to be met when considering one-way street conversion. The criteria, along with application to Main Street, are discussed below.

Criteria: A specific traffic problem is alleviated and the overall efficiency of the transportation system improved.

Application: Converting a short section of Main Street to one-way operation is a local treatment that doesn't resolve any issues and only potentially adds to out-of-direction travel, especially for visitors to the area. Impeding travel on one street has the potential to create as many, or more, traffic issues than it seeks to relieve.

This criteria is not met.

Criteria: Parallel streets of adequate capacity and suitable abutting land use, preferably not more than a block apart, are available or can be constructed.

Application: Swede Alley is a parallel street of adequate capacity and although it would not officially function as a one-way couplet, would provide capacity in the opposite direction.

This criteria is met.

Criteria: One-way streets provide adequate traffic service to the area traversed and carry traffic through and beyond the congested area.

Application: A one-way portion of Main Street would provide sufficient capacity for the expected travel demand.

This criteria is met.

Criteria: Safe transition to two-way operation can be provided at the end points of the one-way sections.

Application: The one-way section would be bracketed by intersections at Swede Alley and the Wasatch Brew Pub road. Drivers turning on to or off of the new connector road from Main Street would need to cross a busy sidewalk, creating unsafe pedestrian conflict points. Likewise, without significant widening that would impact the plaza design, the intersections of the Wasatch Brew Pub cannot support turning movements from larger vehicles.

This criteria is not met.

Criteria: Proper transit service can be maintained.

Application: One-way operation on Main Street would require that the trolley use the new connector road to continue its route on Main Street which requires that the design of this new road be able to accommodate the trolley.

This criteria could be met contingent on the plaza design is modified to support trolley turn requirements.

Criteria: The streets are consistent with the master street or highway plan and compatible with abutting land uses.

Application: One-way operation of Main Street is not currently supported in any master street transportation plan or policy.

This criteria is not met.

Criteria: The overall advantages significantly outweigh the disadvantages.

Application: The intended advantage of one-way operation better circulation around the Main Street Plaza. The primary disadvantages (out-of-direction travel, requiring a larger connecting road between Main Street and Swede Alley, and increased conflict points with pedestrians) apply most to the properties that look to benefit from the advantages. Thus, it is uncertain whether the advantages outweigh, or even equal, the disadvantages.

This criteria is not met.

As discussed above, four of the seven ITE criteria are not met. One of the remaining criteria could be met but is contingent on the plaza design supporting trolley turn movements. The ITE guidelines suggest one-way operation is not an advantageous treatment for Main Street between Swede Alley and the new connector road.

VIII. CHINA BRIDGE ROAD

Parametrix explored the feasibility of a new access road between Marsac Avenue and Swede Alley. Conceptually, the roadway (termed the China Bridge Road in this report) would descend from Marsac Avenue around the east and south sides of the China Bridge parking garage and connect to Swede Alley near the parking garage's southern-most driveway. The intent for the China Bridge Road is to serve as a new downtown connection and possibly a staging area exclusive to ride-service vehicles. This may include taxis, limousines, resort shuttles, and ride-sharing vehicles like Uber and Lyft. In addition to the new roadway, it is desired to feature potential ride service drop-off and pick-up areas possibly located near the China Bridge garage. Together, the roadway and drop-off and pick-up system may offer an alternate route to Hillside Avenue for ride-service vehicles and may contribute to diminished traffic in that area.

Figure 11: Access to Downtown Park City with Potential China Bridge Road



Existing Conditions

Upper Parking Garage Entrance

The concept for the potential China Bridge Road is to descend from Marsac Avenue in the vicinity of the China Bridge parking garage. The garage shares a driveway with the PCMC City Hall south parking lot. After a 25 foot throat, the driveway terminates at a T-junction where vehicles must immediately turn right towards the City Hall parking lot or left towards the upper level of the China Bridge garage. The 25 foot throat length is only enough storage for one vehicle. Additionally, the short throat length and the immediate T-junction result in a compressed area where drivers encounter multiple turning conflicts with constrained sight distances and limited space for decision-making. A potential departing point for the China Bridge Road from the shared driveway is at the curve into the upper level of the China Bridge garage. Here, the tight curve would present conflicts for vehicles turning out of the garage and those traveling straight into the China Bridge Road.

Just south of the driveway on Marsac Avenue is a crosswalk connecting the China Bridge garage and Shorty's Stairs. Continuing south, Marsac Avenue climbs higher than the China Bridge garage producing a steep side slope between Marsac Avenue and the garage. There is also an eight-stall Lower Sandridge parking lot located on the west side of Marsac Avenue. The east side of the China Bridge garage features a narrow, concrete walking path that descends to a small, landscaped plaza adjacent to the garage's southernmost entrance. The walking path runs through the narrow space between the garage and the Marsac Avenue side slope. The area is also used for snow storage from the City Hall parking lot.

Figure 12: Vehicle Turning into Driveway (looking south)



Figure 13: Multiple Vehicles at Driveway (looking north)

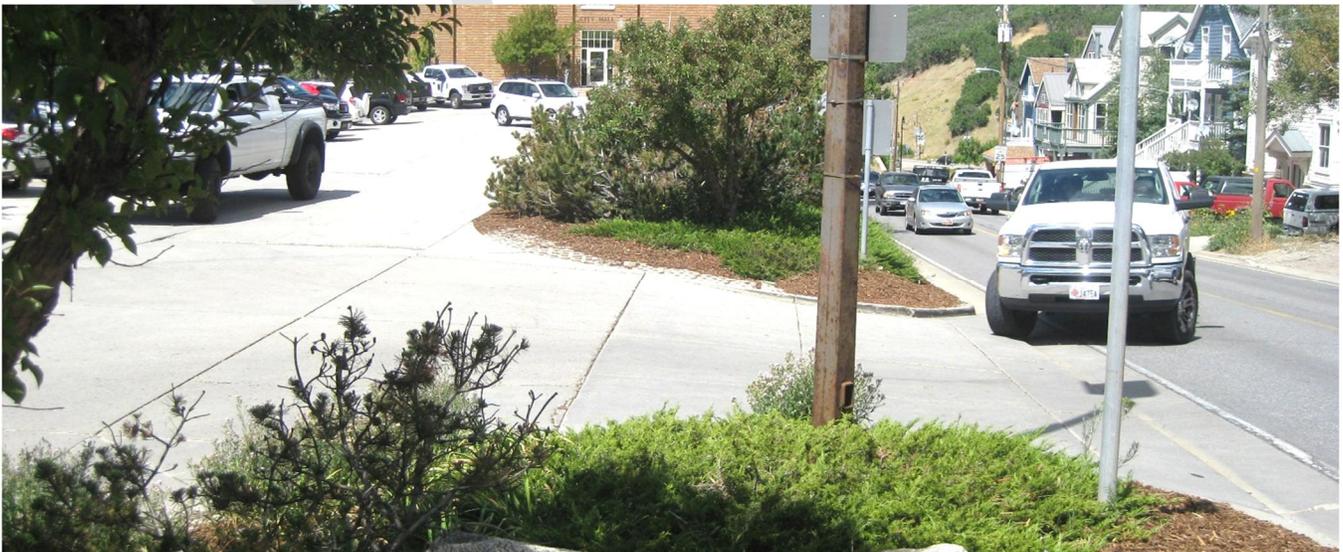


Figure 14: Tight Curve to China Bridge Garage Upper Level



Figure 15: Walking Path on East Side of China Bridge Garage



Lower Parking Garage Entrances

The China Bridge garage has four driveways connecting to Swede Alley. Two of the driveways connect to the north half of the garage and the other two driveways connect to the southern half of the garage. The two halves of the garage are interconnected but, due to the tiered layout of the garage, a driver entering the north half needs to ascend one or two levels to access the south half the garage. The southernmost driveway exits the south face of the garage instead of the west face of the garage fronting Swede Alley like the three other driveways. A short section of pavement curves from the south face of the garage to connect to Swede Alley. This garage connection is positioned in the vicinity of where the China Bridge Road would likely run. Additionally, there are landscaping elements and a set of stairs to the Lower Sandridge parking lot that would likely be disturbed by the China Bridge Road.

Figure 16: Connection to Entrance on South Face of China Bridge Garage (closed for maintenance in photo)



Figure 17: Landscaping Elements and Stairs on South Side of China Bridge Garage



Swede Alley Frontage

The west side of Swede Alley primarily features the back sides of businesses that front onto Main Street. The east side is dominated by the China Bridge garage, the Bob Wells Plaza and Parking Lot, and the Old Town Transit Center. Positioned one block east of Main Street, Swede Alley is an important downtown circulator for individuals looking for parking. Pedestrians frequently cross Swede Alley walking between Main Street attractions and the China Bridge garage. For most of Swede Alley, on-street parking is prohibited. The few spaces that existing are located adjacent to the Bob Wells Plaza and restricted to 30 minute parking.

Figure 18: Swede Alley



Termini

With the intent of joining Marsac Avenue to Swede Alley in the vicinity of the China Bridge garage, there are a few options for integrating the China Bridge Road with the existing roadway network.

Marsac Avenue

At the eastern termini by Marsac Avenue, there are two primary connection options:

1. Extend from the upper China Bridge garage entrance
2. Veer directly off Marsac Avenue south of the shared City Hall/China Bridge access driveway

Option 1 is able to take advantage of existing pavement. It also avoids the steep grades adjacent to Marsac Avenue that would be more impacted with Option 2. However, as mentioned previously, there are turning conflicts, tight curves, and sight distance constraints associated with having the China Bridge Road extend from the curve into the upper level of the China Bridge garage. Option 1 would also add more traffic volume to the bottleneck associated with the short throat length for the City Hall/China Bridge garage shared driveway. Finally, the compressed maneuver area would make signage and wayfinding more difficult for those navigating to the garage, City Hall, and the China Bridge Road.

Option 2 simplifies the access into the China Bridge Road by separating it from the City Hall/China Bridge garage activity. The main challenges are the side slopes at the connection with Marsac Avenue as well as possible impacts to a concrete drainage pipe beneath Marsac Avenue. Additionally, geometry would likely not support left-turns into the driveway from vehicles on northbound Marsac Avenue. A potential mitigation would be to direct northbound vehicles to turn around at the SR-224 roundabout and return to make a right turn from southbound Marsac Avenue. Both options are illustrated in the Appendix.

Swede Alley

Several features influence or constrain the China Bridge Road connection to Swede Alley. As mentioned previously, south of the China Bridge garage is a garage access road, a small plaza, and stairs up the hillside. There is also a creek with accompanying landscaping features adjacent to the garage access road. The plaza will likely be impacted with any design and the garage access road and the creek are positioned such that the China Bridge Road must impact one or the other. At this point of analysis, disturbing the creek is not the ideal condition. Besides the environmental impact, the option would result in side-by-side driveways on Swede Alley – one for the garage access road and one for the China Bridge Road – which creates turning conflicts and confusion for drivers.

Placing the China Bridge Road in the same footprint as the garage access road requires modifying the use of the south face garage entrance. The garage entrance can no longer support ingress movements since it would have drivers turning left in the face of potential China Bridge Road traffic coming down and around the corner of the garage. The limited sight distance would make such a turn hazardous. Allowing egress-only still presents a challenge for sight distance, though somewhat reduced since drivers would be making a right turn instead of a left turn. Another option is to close the entrance completely. Either way, the loss of, or modification to, the south face access to the garage is not anticipated to be detrimental since the garage would still feature four other driveways – three on Swede Alley and one from Marsac Avenue.

Roadway Width and Design elements

At its core, the concept for the China Bridge Road is to convey traffic one-way from Marsac Avenue to Swede Alley. This can be accomplished with a single lane-width of pavement, perhaps 10 feet at the narrowest. Even with this configuration, treatments to the side slope from Marsac Avenue are likely required due to the constrained space on the east side of the China Bridge Garage (see Figure 19). Retaining walls or other slope mitigations would be an important design element of the road. Adding other features, such as sidewalk or space for ride-service parking and staging would expand the amount of slope mitigation needed.

Sidewalk

The existing sidewalk behind the China Bridge garage conveys foot traffic from Marsac Avenue down to the level of Swede Alley. If eliminated, pedestrians could utilize the staircases within the China Bridge garage to complete the same trip. This path may not be as aesthetically desirable as the current sidewalk, but a sidewalk sandwiched between the China Bridge Road and the garage or retaining walls may not be any better.

Parking/Staging

Conceptually, the China Bridge Road could also offer space for parallel parking to be used as staging or waiting areas for ride-service vehicles. The amount of parking space provided may be limited by the terrain constraints from Marsac Avenue side slopes and the curvature around the garage (see Appendix). Extra width to provide parallel parking on the east side of the China Bridge garage would add to the encroachment on the side slope. Parking along the tight curve may be limited because vehicles cannot maneuver in and out of spots located directly on the curve. Additionally the sight distance around the curve and setbacks from the garage entrance may limit spaces further. A conservative estimate suggests no more than 10 parked vehicles could be accommodated on the China Bridge Road.

Figure 19: Constrained Width on East Side of China Bridge Garage



Snow Storage

In winter months, the sidewalk behind the China Bridge garage is the storage location for snow removed from the top level of the garage and the City Hall parking lot. If the China Bridge Road were constructed, snow may need to be stored within the parking lots themselves – likely displacing a few parking stalls – or else hauled off site.

The narrow roadway width and the shadows from the China Bridge garage and the Marsac Avenue side slopes would make it difficult to store snow from the China Bridge Road on the roadside. Likely, the snow would need to be pushed down the road and out to Swede Alley or hauled off site.

Drop-off/Pick-up

With ride-service vehicles using the China Bridge Road to navigate into downtown Park City and also possibly staging on the roadway itself, there are potential locations to develop drop-off and pick-up locations to complement the function of the roadway. One block from Main Street, Swede Alley offers quick access for both pedestrians and ride-service vehicles coming from the China Bridge Road. Four options are presented to locate designated drop-off and pick-up locations on or adjacent to Swede Alley:

1. Current 30-minute parking zone only
2. Expanded parallel parking zone
3. Bob Wells Parking Lot
4. Flag Pole Parking Lot

Current 30-Minute Parking Zone Only

As mentioned previously, most of Swede Alley frontage currently prohibits on-street parking. The one zone that allows on-street parking is adjacent to the Bob Wells plaza and parking is allowed for 30 minutes only. This area is 185 feet long and can store about seven typical-sized vehicles. Converting this area to a designated ride-service drop-off and pick-up zone requires the least amount of capital impacts – perhaps as simple as modifying signage. However, the space does not provide much capacity, especially considering peak season activity or special events. Additionally, the existing 30 minute parking capacity may need to be relocated elsewhere in downtown.

Expanded Parallel Parking Zone

The sections of Swede Alley where on-street parking is prohibited has a pavement width of approximately 30 feet. This is wide enough to support two travel lanes and parking on one side of the street. Thus, the second option is to expand the drop-off and pick-up zone beyond the 30 minute parking zone to other areas of Swede Alley. After accounting for setbacks from driveways and crosswalks, there is space to increase capacity by about 16 parallel parking spaces. Additionally, this would allow for the opportunity to create user-specific stations for drop-off and pick-up. For example, one station could be designated for hotel and resort shuttles while one station is for taxis and another station for ride-sharing vehicles such as Uber and Lyft. Adjacent to the China Bridge garage, there may be enough sidewalk width to construct pull-out areas. The pull-outs would improve visibility on Swede Alley for activity at garage driveways and crosswalks. This option also may only require signing changes and curb painting, unless pull outs are constructed next to China Bridge garage. Again, the existing 30 minute parking capacity may need to be relocated.

Bob Wells Parking Lot

The Bob Wells Parking Lot is positioned downhill from PCMC City Hall just north of the China Bridge garage. The parking lot could be reconfigured as an oval-shaped pick-up/drop-off loop for ride-service vehicles. The loop could accommodate approximately 15 – 20 queued vehicles depending on whether the loop encroaches into the plaza area. This option would require more capital costs due to reconfiguring the parking and installing curbs and walkways as part of the loop. Given the tight turning radii, it may be difficult for larger ride-service vehicles, such as hotel and resort shuttles, to navigate the loop. Also, without further design analysis, it is uncertain whether

there would be enough width to move around parked vehicles in the loop or whether vehicles would have to slowly proceed in a single-file stream. The option would displace about 43 parking stalls.

Flag Pole Parking Lot

The Flag Pole Parking Lot is situated at the north end of Swede Alley, adjacent to the SR-224 roundabout. The lot offers a more conducive shape for a drop-off/pick-up loop than the Bob Wells lot but would not feature as much capacity – perhaps 10 to 12 vehicles. The parking lot also is not as centrally located to downtown destinations as other options and would disturb 60 existing parking spaces.

Other Drop-off/Pick-up Elements

Beyond the specific location discussion, establishing a strong theme for the signing, striping, and wayfinding for a drop-off and pick-up zone is a critical component of a successful system. Consistent signing (especially if drop-off/pick-up areas are dispersed along Swede Alley) will be important to direct users to the correct locations. The signs could feature a unique design and color scheme to stand out from other regulatory street signs or wayfinding signs in Park City and to build users' confidence in the system. Also, since parking is a premium in Park City, clear signage will be needed to keep non ride-service vehicles from parking in curbside pick-up areas.

Because of the variety of user types, clear signs are necessary to match patrons with the right service. Resort shuttle riders expect a clearly-marked shuttle will pick them up at a specific station at consistent times. Taxis – also well marked – look for individual riders or small groups on-demand and at varying locations. Ride-share drivers also look for on-demand individuals or groups, but the vehicles are typically not well marked. Additionally, ride-share drivers are more likely to be unfamiliar with the system and will need clear directions on how to use it.

Figure 20: Potential Drop-off/Pick-up Zone Locations

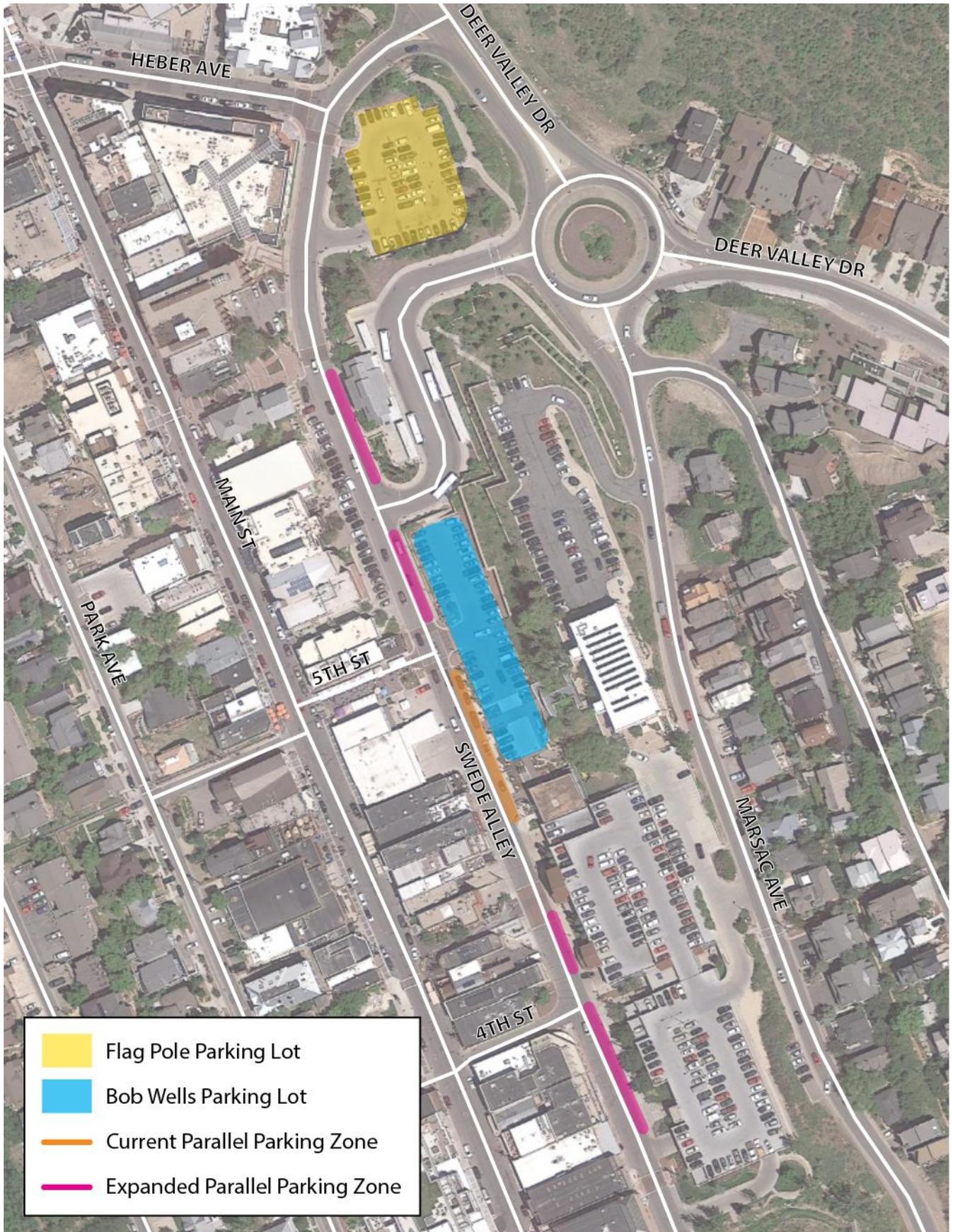


Figure 21: Swede Alley Pavement and Sidewalk Width Adjacent to China Bridge Garage



Figure 22: Bob Wells Parking Lot



Operations

Aside from the engineering and design considerations of the China Bridge Road, there are several operational aspects that should be discussed. First, allowing parallel parking on the China Bridge Road for ride-service vehicle staging may not prove especially useful. The staging capacity is severely constrained by terrain creating the possibility that vehicles overflow into Marsac Avenue during peak times. Additionally, many drivers will likely stage in the drop-off/pick-up areas anyway in an effort to simplify driving efforts, increase visibility, or attract walk-up business. Since prevention of this behavior would require rigorous enforcement it may be just as easy to formally facilitate staging in the drop-off/pick-up zones themselves. Due to their different needs and clientele,

resort shuttles, taxis, and ride-sharing vehicles could be separated into unique zones along Swede Alley or among one or more previously-discussed parking lot conversion options.

Finally, educating drivers and users expands beyond signage in the immediate vicinity. Pamphlets, web-based maps, and other information items can establish the Swede Alley area as the ride-service hub for downtown Park City. To gain driver compliance, clear signage is needed well in advance of downtown, such as on SR-224, SR-248, and Bonanza Drive to direct ride-service drivers to the new China Bridge Road, since access to the road may not be immediately obvious. The merits of the China Bridge Road will establish themselves over time for experienced drivers, but continual education for the high-turnover Uber and Lyft drivers will be a necessary.

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IX. APPENDIX

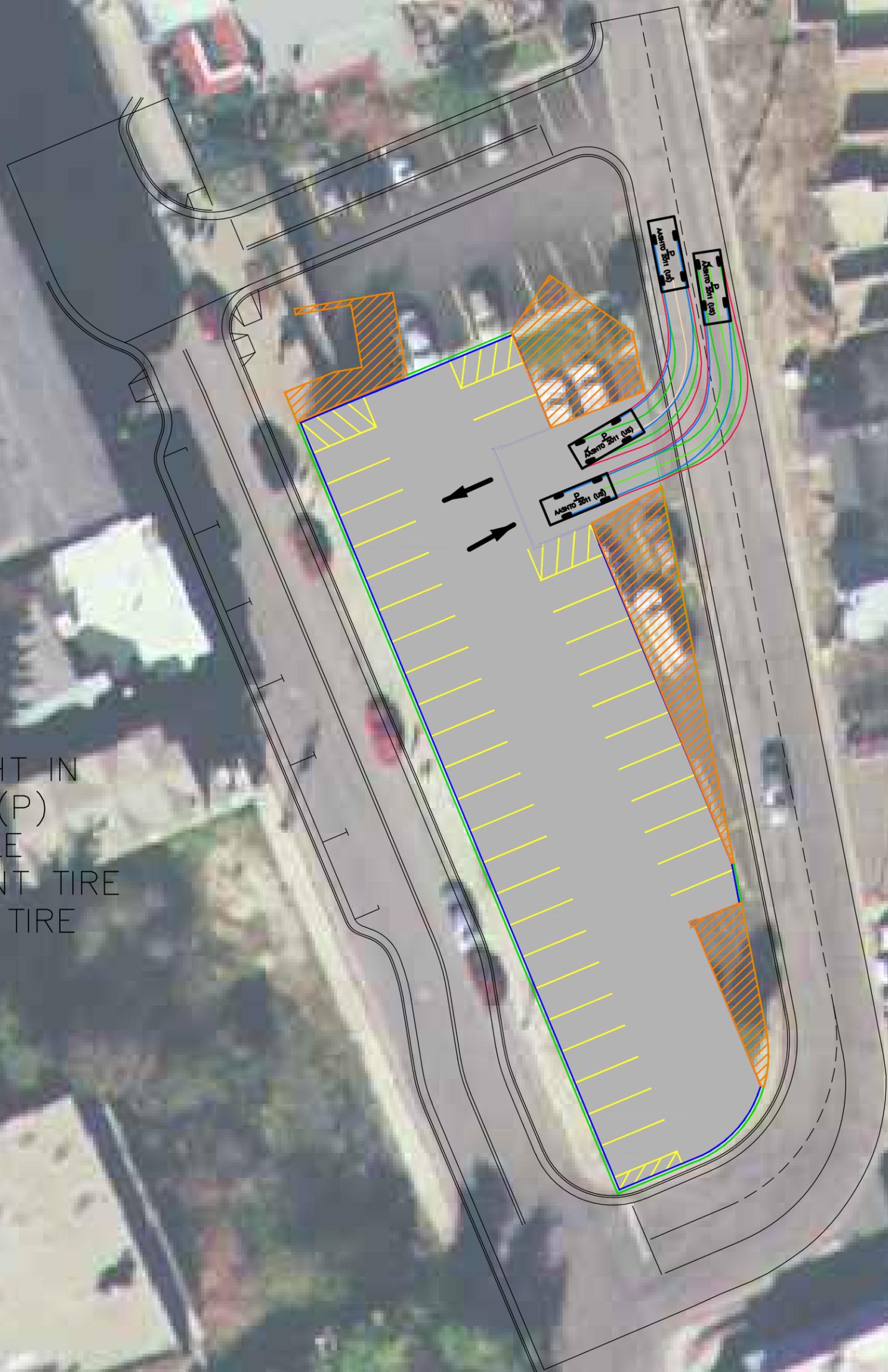
Turning Templates:

1. Passenger Car: Left Out & Right In
2. Passenger Car: Right Out & Left In
3. Pickup Truck: Left Out & Right In
4. Pickup Truck: Right Out & Left In
5. China Bridge Road Concept 1
6. China Bridge Road Concept 2
7. China Bridge Road Concept 3

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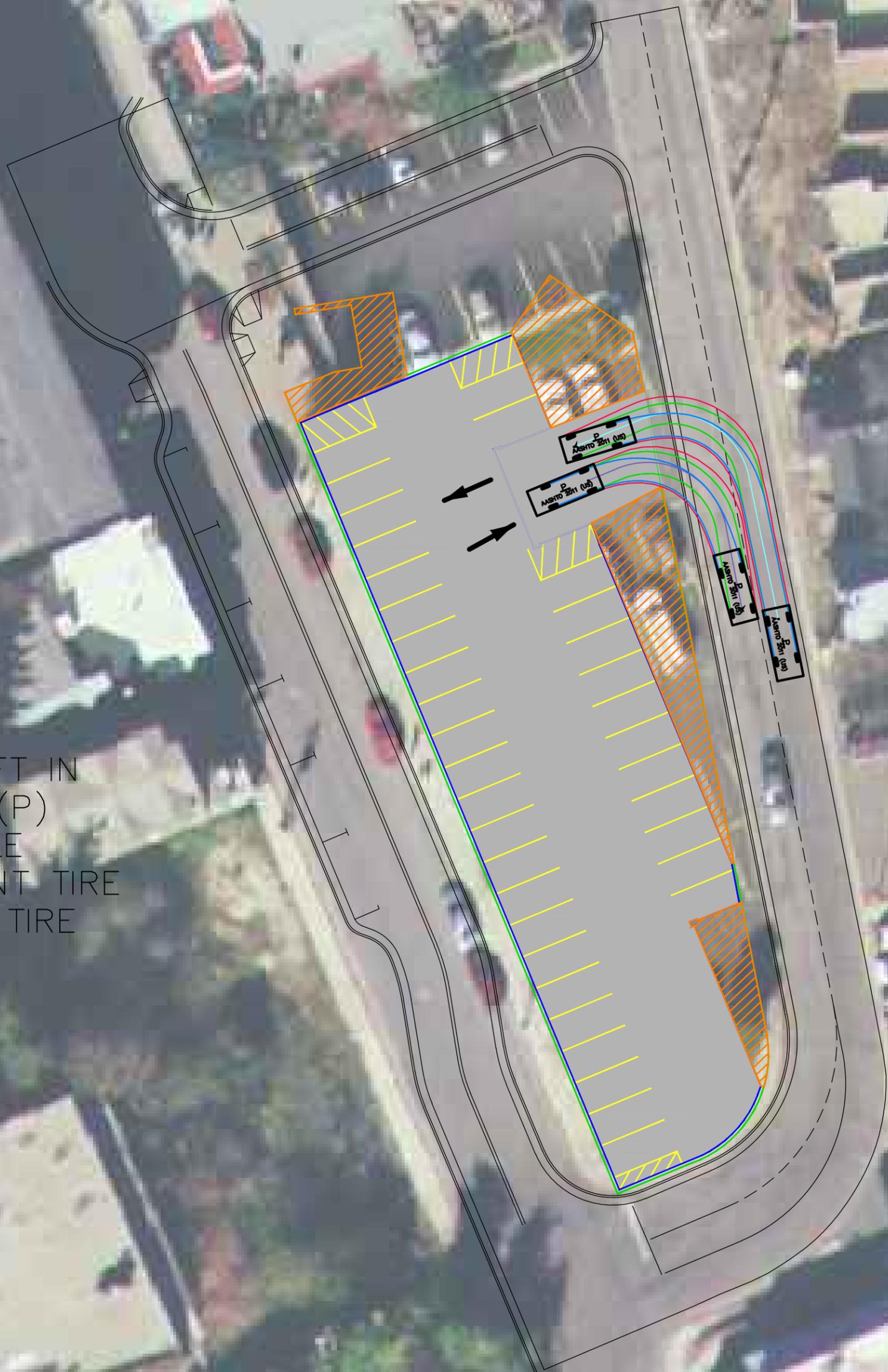


LARGE CAR
LEFT OUT/RIGHT IN
AASHTO 2011 (P)
1" = 30' SCALE
GREEN = FRONT TIRE
BLUE = REAR TIRE
RED = BODY



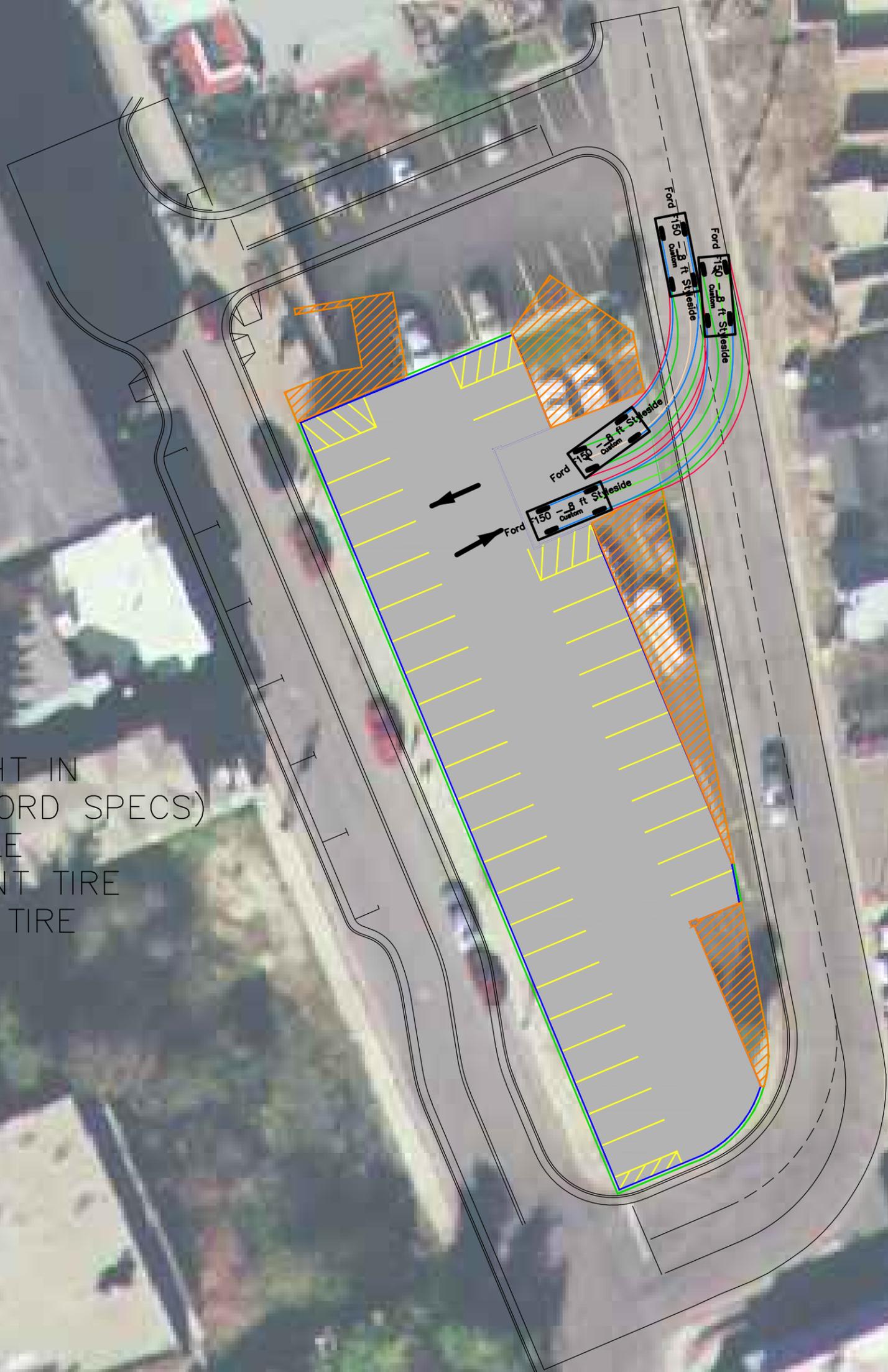


LARGE CAR
RIGHT OUT/LEFT IN
AASHTO 2011 (P)
1" = 30' SCALE
GREEN = FRONT TIRE
BLUE = REAR TIRE
RED = BODY



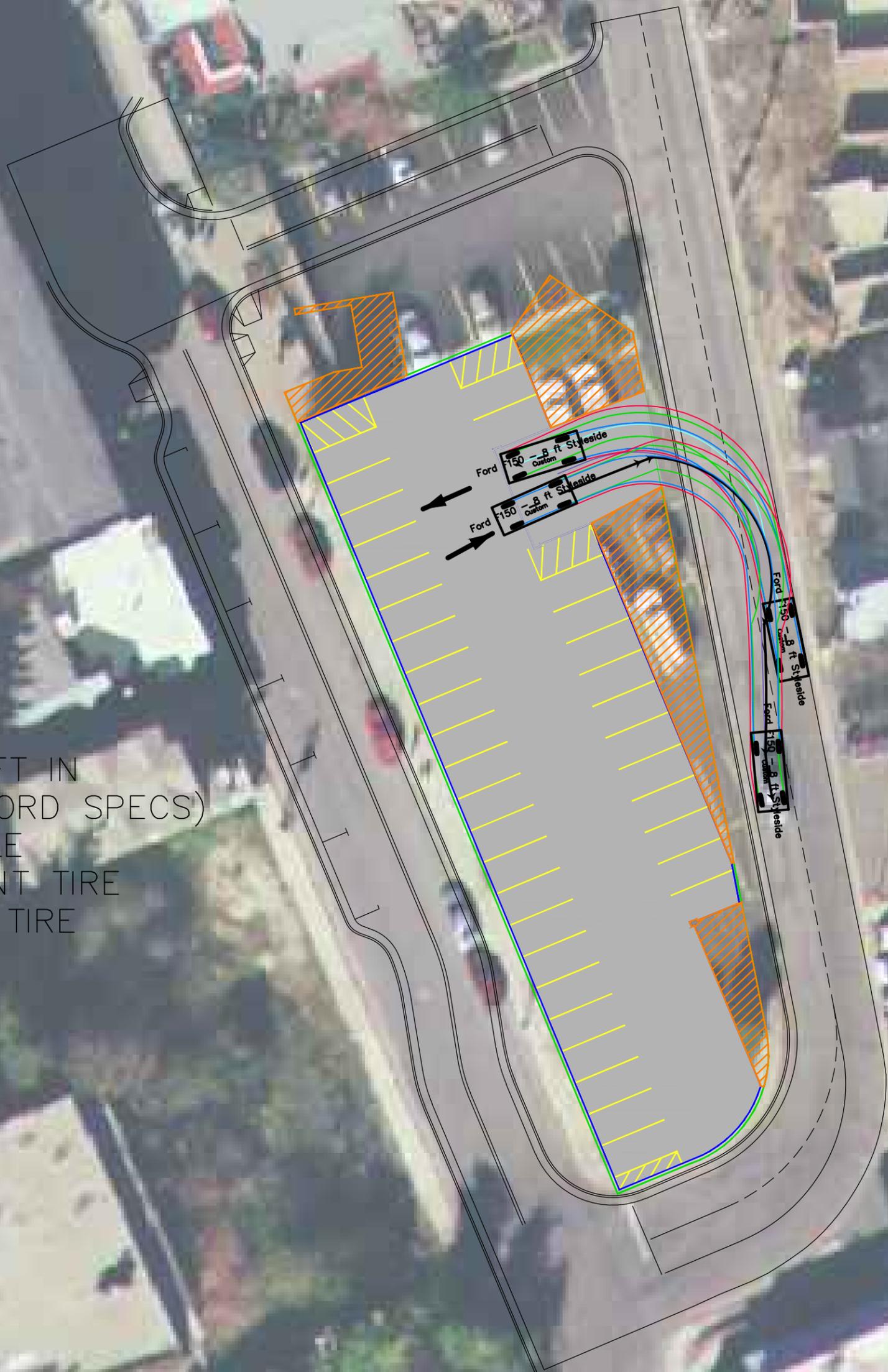


PICKUP TRUCK
LEFT OUT/RIGHT IN
FORD-F150 (FORD SPECS)
1" = 30' SCALE
GREEN = FRONT TIRE
BLUE = REAR TIRE
RED = BODY





PICKUP TRUCK
RIGHT OUT/LEFT IN
FORD-F150 (FORD SPECS)
1" = 30' SCALE
GREEN = FRONT TIRE
BLUE = REAR TIRE
RED = BODY



CONCEPT LAYOUT
SINGLE LANE
W/SIDEWALK (ONE-WAY)

1" = 30' SCALE



CONCEPT LAYOUT
SINGLE LANE
W/SIDEWALK
AND PARKING
(ONE-WAY)

1" = 30' SCALE



CONCEPT LAYOUT
SINGLE LANE
W/SIDEWALK (ONE-WAY)
AND NEW DRIVEWAY

1" = 30' SCALE

47' CENTERLINE
RADIUS

4' SIDEWALK

10' ONE-WAY
LANE

47' CENTERLINE
RADIUS

PARKING
DRIVEWAY
(EXIT ONLY)

CURB AND
GUTTER

EXISTING
CREEK

