

CHAPTER 4

CONSTRUCTION MEANS AND METHODS

This chapter describes the potential means and methods for constructing the Viaduct and Community Grid Alternatives. It presents the anticipated construction schedule, the phases of construction, measures that may be implemented to minimize disruptions to the traveling public and the surrounding communities during construction, and estimates of equipment to be used and the number of construction employees. The information presented in this chapter was used to assess construction effects, which are documented in **Chapter 6, Social, Economic, and Environmental Considerations**.

4.1 INTRODUCTION

In an effort to minimize the total duration of construction for the Interstate 81 (I-81) Viaduct Project (the “Project”) and the resulting disturbances associated with its construction, aggressive construction schedules have been established for the Viaduct and Community Grid Alternatives. For the Viaduct Alternative, six years is the anticipated construction duration. For the Community Grid Alternative, five years is the anticipated construction duration.

The construction means and methods presented in this chapter are based on the current level of engineering design for the Project alternatives, discussions with construction specialists, and past experience on similar projects. While the techniques, phasing, and schedules ultimately implemented for the Project during actual construction may be revised and updated from those presented herein, the procedures reflect the most likely scenarios that have been developed to date.

Phases of this Project may be advanced as a Design-Build project, which places most of the responsibility and flexibility associated with final design and construction implementation on the Contractor, which has not yet been selected by the New York State Department of Transportation (NYSDOT). Therefore, this chapter does not specifically identify or predict locations for elements of construction that would be at the Contractor’s discretion and are unknown at this time. These elements include construction staging areas, office/administrative and support space, disposal and borrow sites, production of concrete at existing permitted batch plants, bridge demolition, new bridge substructure construction, and new bridge superstructure construction. Although these elements are presented for each of the two build alternatives, they are discussed generally, with a focus on typical factors or approaches that a Contractor would consider related to these elements.

Construction equipment types and their durations of use, as well as the number of construction workers anticipated to be required for the construction of each alternative, are presented quantitatively to enable the assessment of construction-related air quality and

noise effects and short-term economic benefits in **Chapter 6, Social, Economic, and Environmental Considerations**.

In the text that follows, the specific roadway elements to be constructed during each phase, the duration of each phase, the maintenance and protection of traffic (MPT) requirements during each phase, and general estimates of equipment and construction workers are presented first for the Viaduct Alternative and then for the Community Grid Alternative.

4.2 NO BUILD ALTERNATIVE

The No Build Alternative would maintain the highway in its existing configuration with routine maintenance and ongoing repairs to ensure the safety of the traveling public, implementing safety measures to the extent reasonable. Structural deficiencies and safety considerations would be addressed as part of NYSDOT's ongoing maintenance program. Routine maintenance efforts would include filling pavement cracks, patching holes in bridge decks, cleaning drainage systems, and operational considerations (e.g., signage and other low-cost improvements). This maintenance and repair program would be undertaken according to NYSDOT's existing construction specifications and protocols and would be part of annual maintenance.

4.3 VIADUCT ALTERNATIVE

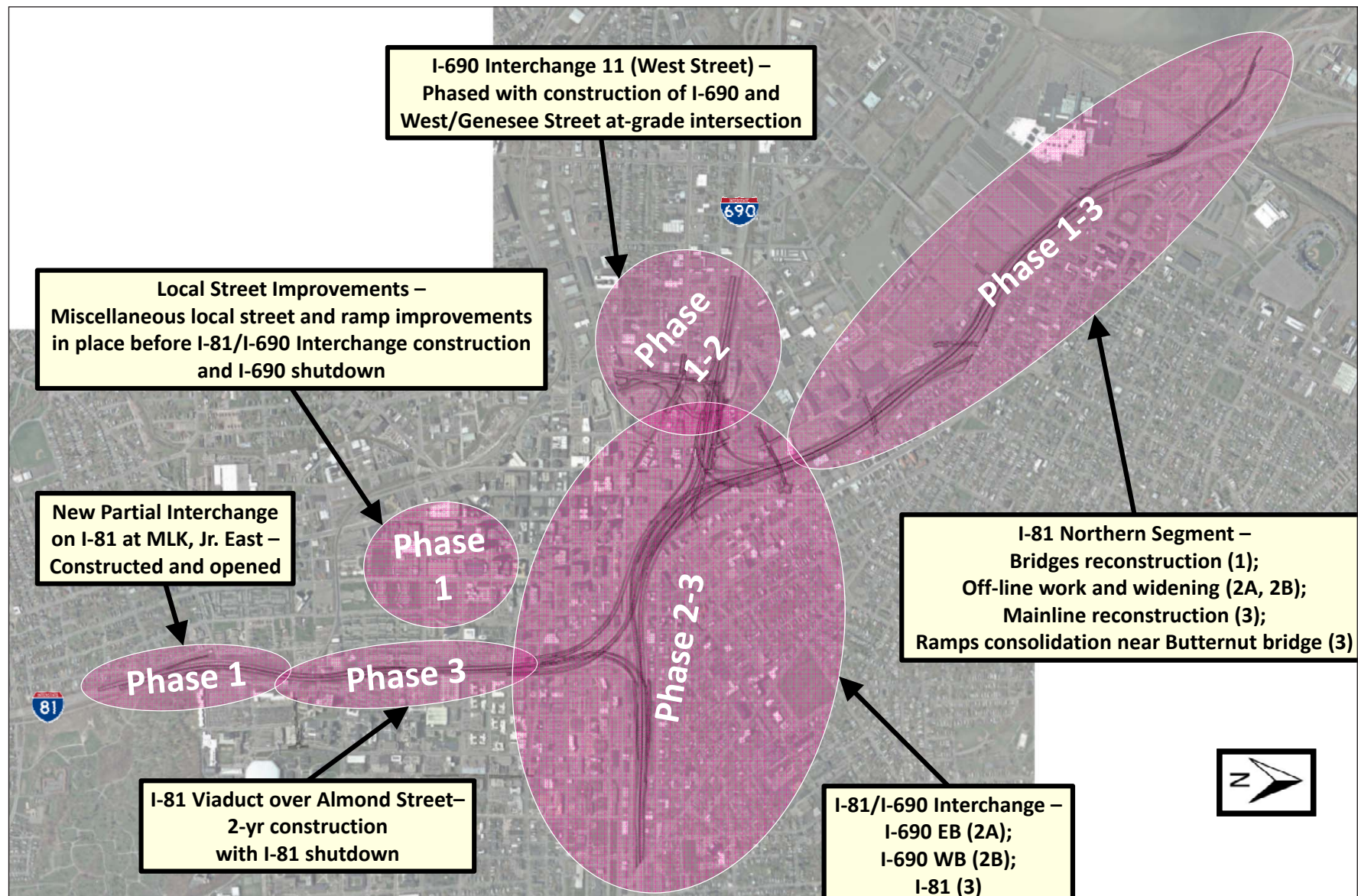
CONSTRUCTION PHASING AND SCHEDULE

The construction evaluation of the Viaduct Alternative is based on a six-year schedule. During this period, construction of the various elements associated with this alternative would progress via four separate phases, designated as Phases 1, 2A, 2B, and 3. Details of each of these phases are provided below, while an overall summary of the phasing is shown in **Figure 4-1**. Although details of utility relocations, drainage improvements, building demolition activities, and intelligent transportation systems (ITS) are not discussed in the following phasing discussions, it should be noted that such activities would be initiated early in Phase 1 and would likely continue into Phase 3.

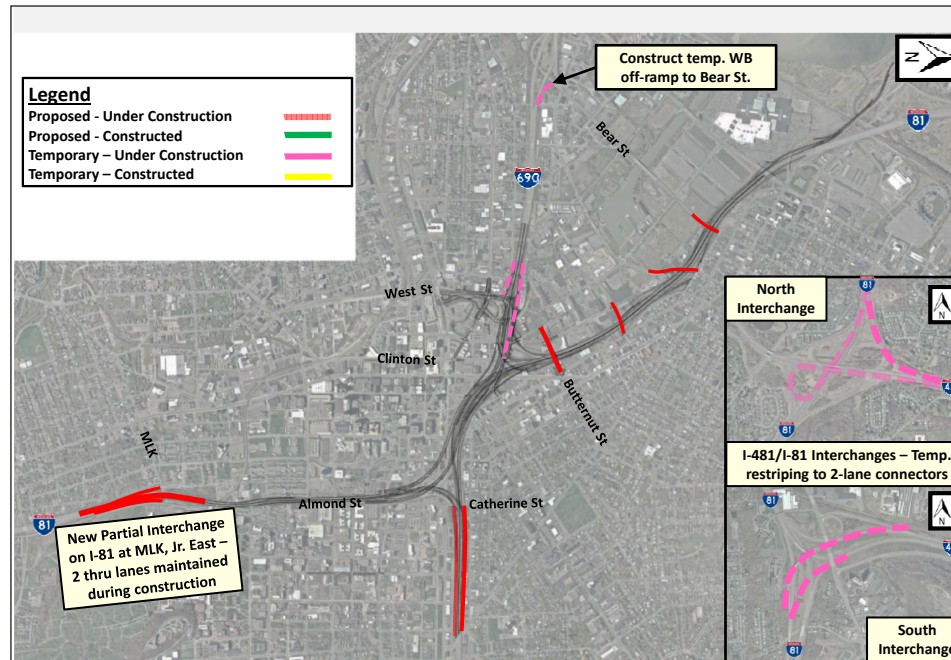
Phase 1—Preparatory Phase

This first phase of construction (Phase 1) is proposed to take approximately one year to complete and focuses on permanent and/or temporary improvements to certain bridges and interchanges, as well as local street improvements to support subsequent phases of construction. Specific improvements to be undertaken during Phase 1 are described below and are shown in **Figure 4-2**, while **Figure 4-3** shows Phase 1 improvements specifically along the I-81 north of the I-690 interchange (referred to hereafter as "the I-81 Northern Segment").

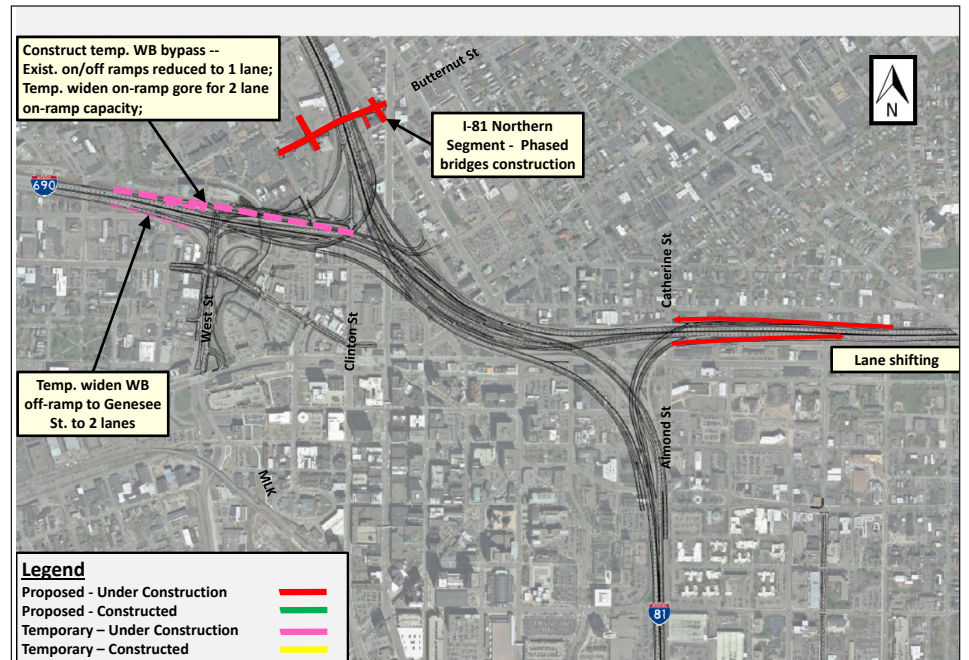
- **New Partial Interchange on I-81 at MLK, Jr. East and Associated I-81 Reconstruction:** A new off-ramp from northbound I-81 to Dr. Martin Luther King, Jr. East (MLK, Jr. East), a new on-ramp from MLK, Jr. East to southbound I-81, and reconstruction of the section of I-81 between a point north of Colvin Street and the New York, Susquehanna and Western Railway Bridge at Renwick Street would be



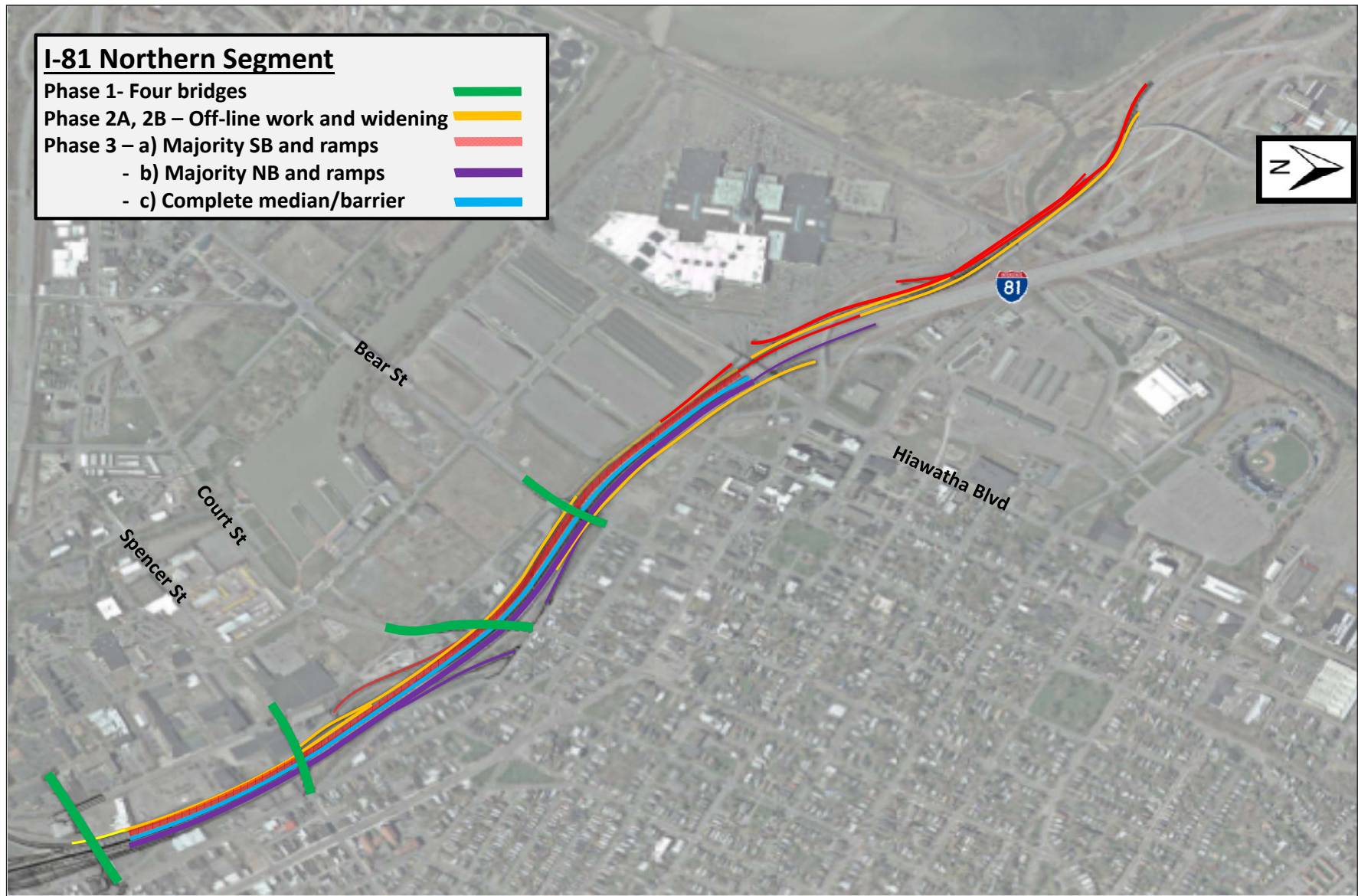
Viaduct Alternative - Overview of Construction Phasing
Figure 4-1



Overview of Phase 1 Improvements



Phase 1 Improvements In Downtown Area



Viaduct Alternative – I-81 Northern Segment Improvements (Phase 1-3)

constructed during this phase and open to traffic before the next phase begins. The new ramps would allow traffic to access University Hill and Downtown from the south, thereby providing a diversion route when the viaduct is under construction.

- **Reconstruction of Partial Interchange at Almond Street/Catherine Street Area:** A new off-ramp from westbound I-690 to Catherine Street and a new on-ramp from Catherine Street to eastbound I-690 would be constructed. These ramps would replace the existing westbound I-690 ramp to Townsend Street and the existing on-ramp from McBride Street to eastbound I-690. It is anticipated that the two existing ramps would be demolished and the new ramps would be completed and open to traffic by the end of this phase. The existing connector from northbound I-81 to eastbound I-690 would be closed early in this phase to allow construction of the new eastbound entrance ramp from Catherine Street.
- **I-81 Northern Segment (Between Clinton Street/Salina Street at Interchange 19 and Route 370 West to Liverpool at Interchange 24):** Reconstruction, realignment, and/or other improvements of the four overpasses crossing the northern section of I-81 (i.e., Butternut Street, Spencer Street, Court Street, and Bear Street) would be completed during this phase to allow widening and realignment of I-81 in future phases.
- **I-81/I-481 South Interchange and I-81/I-481 North Interchange:** Minor improvements to these interchanges would be completed during this phase to accommodate interstate through traffic around Syracuse while the I-81 viaduct is closed in Phase 3. Temporary improvements to be implemented include restriping of existing connector ramps between I-81 and I-481 at each interchange from one lane to two lanes, as well as reggrading/strengthening shoulders and placement of roadside safety features, as required.
- **I-690 Interchange 11 (West Street) and Removal of the West Street Overpass:** Although the majority of the I-690/West Street interchange, including various associated ramps, would be reconstructed in subsequent phases (2A and 2B) while I-690 is shut down, preparation activities required for those improvements are proposed during this first phase. Reconstruction of West Street to convert the existing overpass at Genesee Street to an at-grade intersection would be initiated. Temporary improvements proposed during this first phase to maintain interstate connectivity to and from local roadways include 1) construction of a temporary bypass to the north of the interchange along Evans Street to accommodate westbound I-690 traffic during subsequent phases, 2) construction of a temporary off-ramp from westbound I-690 to Bear Street, and 3) temporary widening to two lanes of the existing off-ramp from eastbound I-690 to Genesee Street.
- **Local Street Improvements:** Temporary improvements and/or mitigation measures to local streets would be completed during Phase 1 to handle diverted traffic during construction in subsequent phases. The temporary improvements include reconfigured travel lanes, added turn bays, temporary signals, street parking removals, and temporary ramp improvements between I-81 and local streets, and are summarized in **Table 4-1**. Various permanent improvements to local streets are also proposed to be initiated and/or completed during this phase.

Table 4-1

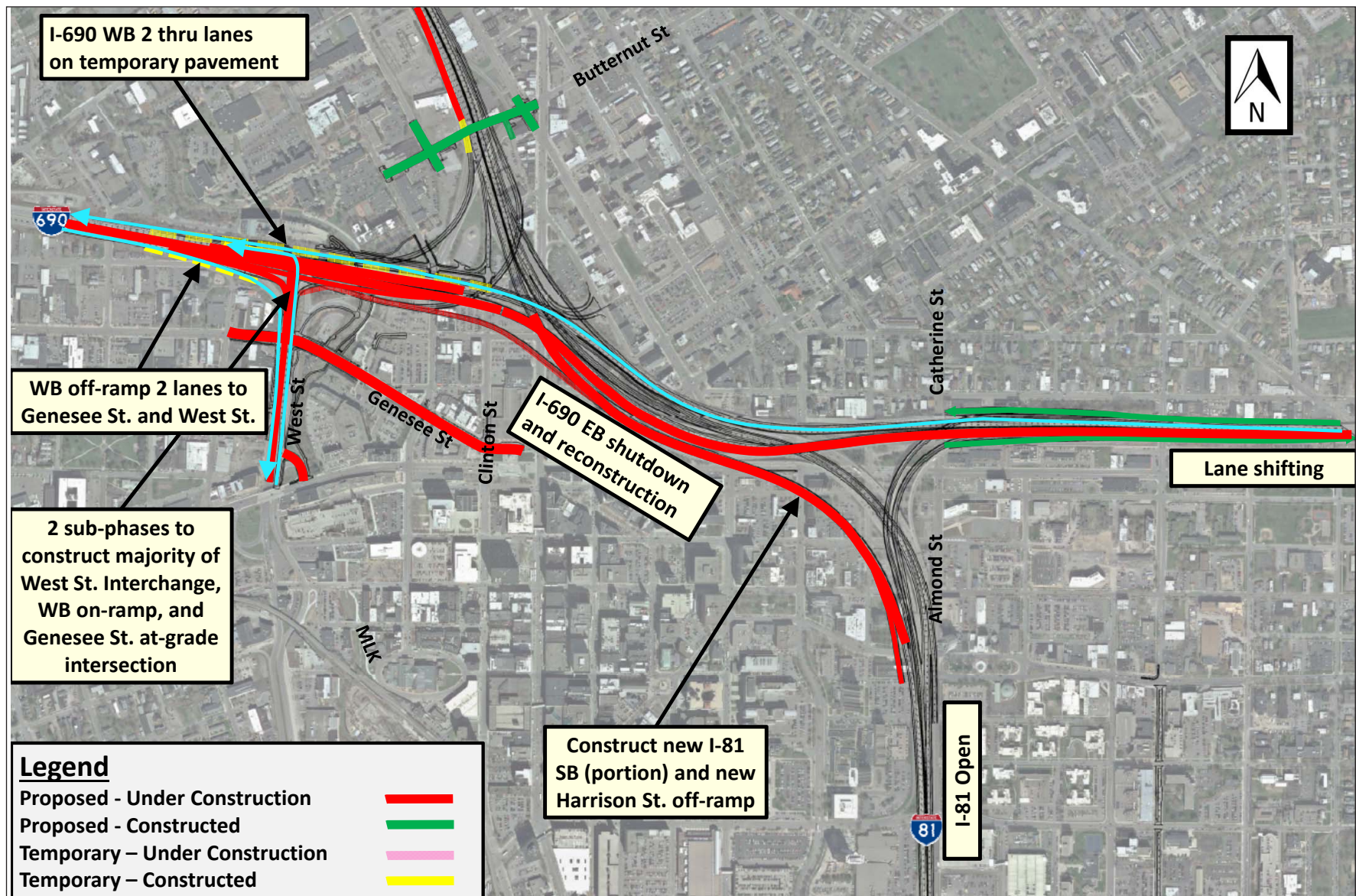
Viaduct Alternative: Phase 1 Local Street Mitigation Measures and Improvements

Location	Temporary Mitigation Measures/Improvements
Southbound I-81 on-ramp from MLK, Jr. East	Construct new ramp with a second lane added; lane can be dropped on the ramp before mainline
Intersection of MLK, Jr. East and Southbound I-81 on-ramp	Add eastbound right-turn bay (approx. 150')
Northbound I-81 on-ramp from Pearl Street	Add second lane starting from the intersection of Pearl and Hickory Streets; continue both lanes
Intersection of Pearl and Hickory Streets	Install temporary signal; restripe two northbound approach lanes to serve 1) left turns and 2) left turns, through traffic and right turns
Intersection of Southbound I-81 off-ramp and Salina Street	Install temporary signal
Westbound Genesee Street between Franklin and Wallace Streets	Remove parking lane; provide two westbound travel lanes
Intersection of Genesee and Wallace Streets	Restripe two westbound approach lanes to prohibit westbound left-turns from West Genesee Street onto Wallace Street
Intersection of Genesee and Franklin Streets	Remove parking (approx. 75') along westbound approach to create an auxiliary through lane; restripe two westbound approach lanes to serve 1) left turns and through traffic and 2) through traffic and right turns
Intersection of James and State Streets	Add protected eastbound left-turn signal phase

Phase 2A—Eastbound I-690 Shutdown and Construction

Phase 2A is proposed to take approximately 1½ years and focuses on reconstruction and realignment of eastbound I-690, improvements to interchange ramps, and various other improvements along eastbound I-690 between Leavenworth Avenue (west of the West Street Interchange) and Lodi Street on the east end, a distance of approximately two miles. In order to facilitate these improvements, eastbound I-690 between West Street and the Catherine Street on-ramp to eastbound I-690 would be closed to traffic during this phase. Westbound traffic would continue to use I-690 during this phase while eastbound traffic would use local roadways. Specific improvements to be undertaken during Phase 2A are described below and are presented in **Figure 4-4**, while **Figure 4-3** shows Phase 2A improvements specifically along the I-81 Northern Segment.

- **Eastbound I-690:** Reconstruction of eastbound I-690 mainline and associated ramps would be completed during this phase.
- **I-690 Interchange 11 (West Street) and Removal of the West Street Overpass:** The intent of the work to be performed at this location during Phase 2A is to fully construct eastbound I-690 and westbound I-690 in the vicinity of this interchange and to partially construct the West Street/I-690 ramps to be completed in Phase 2B. The work included in this phase would include 1) construction of eastbound I-690 in its entirety; 2) construction of westbound I-690 within the limits of the temporary bypass constructed during Phase 1; 3) construction of the proposed eastbound I-690 ramps to and from



Viaduct Alternative - Overview of Phase 2A Improvements

Figure 4-4

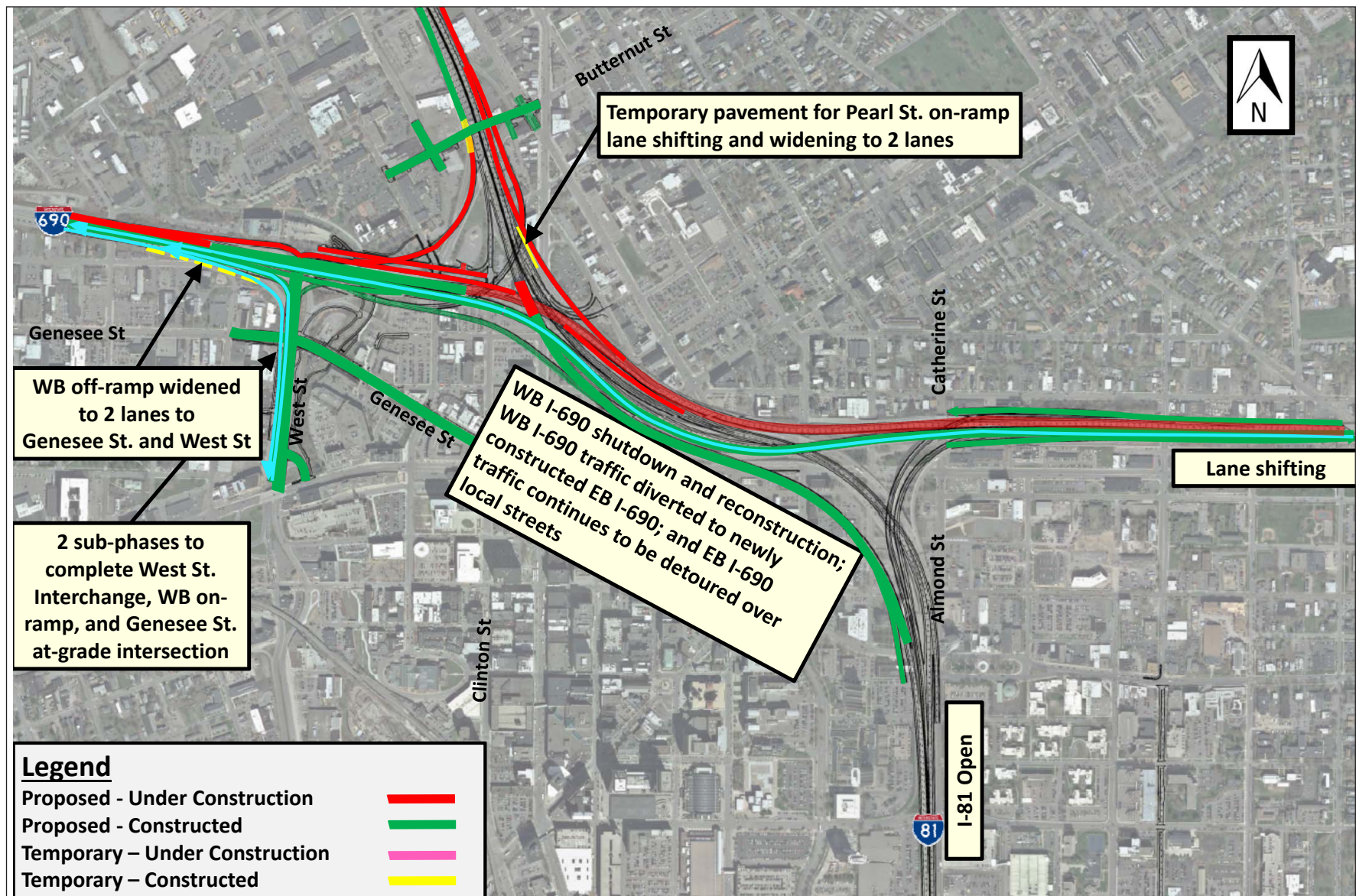
West Street/Genesee Street in their entirety; 4) partial construction of the proposed westbound I-690 ramps to and from West Street/Genesee Street; 5) construction of the West Street/Genesee Street intersection in its entirety, except for the future parking area on the west side; and 6) completion of the eastbound I-690 to southbound I-81 connector ramp.

- **I-81 Northern Segment (Between Clinton Street/Salina Street at Interchange 19 and Route 370 West to Liverpool at Interchange 24):** The intent of the work in this phase is to complete any off-line construction, including grading, widening, ramp realignments, and retaining walls that can be completed while maintaining the existing I-81 mainline and connector ramp capacity. All mainline lanes and ramps would be maintained throughout the duration of this phase.
- **Southbound I-81 within the I-690 Interchange:** The intent of the work to be performed in this location during Phase 1 is to take advantage of the I-690 closure to complete as much of the necessary work on this interchange as possible without impacting on the traffic utilizing I-81. A large portion of the proposed southbound I-81 reconstruction and realignment would be outside the existing footprint of the interchange with I-690, and it would be constructed to run along and immediately south of the newly reconstructed eastbound I-690 mainline between I-690 and Genesee Street. This section of southbound I-81 and the eastbound I-690 to southbound I-81 connector ramp could be constructed while eastbound I-690 is shut down.
- **Harrison Street Off-Ramp:** In conjunction with construction of the segment of southbound I-81 noted above, a portion of the new southbound I-81 exit to Harrison Street would also be completed in Phase 2A. The existing ramp from southbound I-81 to Harrison Street would need to remain open for use throughout this phase, so only the portion of the new Harrison Street ramp that accesses westbound Harrison Street would be built during this phase.

Phase 2B—Westbound I-690 Shutdown and Construction

Phase 2B is proposed to take approximately 1½ years to complete and focuses on reconstruction and realignment of westbound I-690, improvements to interchange ramps, and various other improvements along westbound I-690 between Leavenworth Avenue (west of the West Street Interchange) and Lodi Street, a distance of approximately two miles. To facilitate these improvements, westbound I-690 would be closed to traffic during this entire phase. This phase and its associated shutdown of westbound I-690 would not occur until Phase 2A is completed and the newly reconstructed eastbound I-690 lanes become operational and temporarily available for use by westbound traffic only. Eastbound traffic would continue to use local roadways during this phase. Specific improvements to be undertaken during Phase 2B are described below and are shown in **Figure 4-5**, while **Figure 4-3** shows Phase 2B improvements specifically along the I-81 Northern Segment.

- **Westbound I-690:** During this phase, westbound I-690 would be reconstructed in its entirety within the project limits. Construction of the I-690 mainline as well as the tie-in ends to its associated connectors/ramps would be completed. A new connector ramp from westbound I-690 to northbound I-81 is also expected to be completed, with the



Viaduct Alternative - Overview of Phase 2B Improvements

Figure 4-5

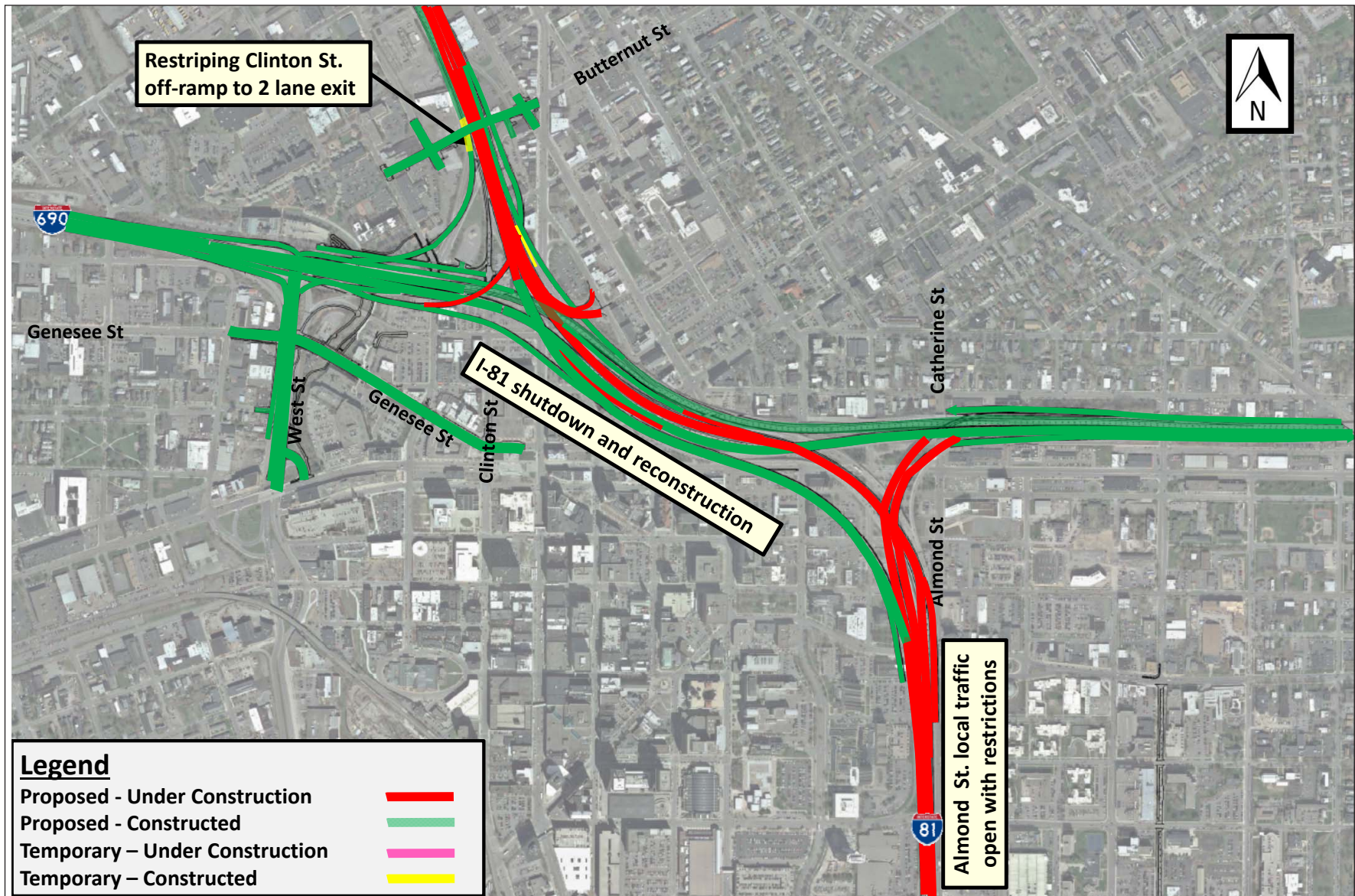
widening of northbound I-81 under Butternut Street Bridge proposed to open to traffic in the next phase.

- **I-690 Interchange 11 (West Street) and Removal of the West Street Overpass:** The intent of the work at this location during Phase 2B is to complete and fully open the West Street interchange. Construction of the remaining portions of the I-690/West Street interchange, including proposed ramp improvements associated with westbound I-690, would be completed during this phase. Once westbound traffic can be placed on the new westbound section near the end of this phase, then any remaining work on the median edge of eastbound I-690 would be completed to the permanent condition. West Street reconstruction would also be completed during this phase once the new West Street to westbound I-690 on-ramp is opened. The realigned Evans Street and bridge could also be constructed while completing westbound I-690 near the West Street interchange area.
- **I-81 Northern Segment (Between Clinton Street/Salina Street at Interchange 19 and Route 370 West to Liverpool at Interchange 24):** The intent of the work in this phase is to complete any off-line construction, including grading, widening, ramp realignments, and retaining walls that can be completed while maintaining the existing I-81 mainline and connector ramp capacity. All mainline lanes and ramps would be maintained throughout the duration of this phase.
- **Southbound I-81 within the I-690 Interchange:** Once westbound I-690 is shut down, the southbound I-81 work initiated during Phase 2A would continue in the vicinity of the westbound I-690 construction. Work on southbound I-81 would be limited to efforts that can be done without impacting the capacity of southbound I-81.

Phase 3—I-81 Shutdown and Construction

Phase 3 is proposed to take approximately two years to complete and focuses on replacement of the I-81 viaduct through the I-81/I-690 interchange area, as well as improvements along I-81 north of I-690 and improvements along Almond Street. Sequenced construction would allow traffic mitigation with local street improvements and modified interstate ramps. Specific improvements to be undertaken during Phase 3 are described below and are shown in **Figure 4-6**, while **Figure 4-3** shows Phase 3 improvements specifically along the I-81 Northern Segment.

- **I-81 Viaduct over Almond Street (Between MLK, Jr. East and Genesee Street):** The viaduct demolition and reconstruction would commence once I-81 is shut down between MLK, Jr. East and Genesee Street. Construction of new Almond Street would be completed toward the end of this phase, after the overhead I-81 viaduct structure is reconstructed.
- **Northbound I-81 (Between Genesee and Butternut Streets):** The section of northbound I-81 between Genesee Street and Butternut Street would be built as soon as I-81 is shut down. The only area that would require sub-phasing in this section is the northbound I-81 mainline edge at the new Pearl Street on-ramp entrance gore area. It is expected that this entire northbound I-81 section through the I-690 interchange would



be constructed and ready to open to traffic by completion of the I-81 viaduct over Almond Street.

- **Southbound I-81 (Between Genesee and Butternut Streets):** The majority of southbound I-81 between Genesee Street and Butternut Street would be constructed in previous phases while I-690 is shut down. Early in this phase and as soon as existing southbound I-81 is closed to traffic, the remaining portion of new southbound I-81 can be constructed. Once constructed, the segment between Genesee Street and Butternut Street would allow southbound I-81 access to eastbound I-690 and the new Harrison Street exit ramp. Until this segment is complete and southbound I-81 access to the new Harrison Street exit is available, the temporary two-lane width for the Clinton Street off-ramp and the Salina Street exit ramp would need to remain in place. Southbound I-81 through traffic would not be available until the remaining I-81 viaduct over Almond Street is complete.
- **Clinton Street Off-Ramp:** The intent of the work in this area during Phase 3 is to temporarily widen the ramp from one lane to two lanes, until southbound I-81 can be completed later in this phase. Once traffic from the north is able to use the new Harrison Street off-ramp, the temporary Salina Street ramp can be closed and reconstruction of the Clinton Street exit ramp could start. Once the Salina Street exit ramp is closed, any remaining work on the new southbound I-81 highway can also be completed.
- **I-81 Northern Segment (Between Clinton Street/Salina Street at Interchange 19 and Route 370 West to Liverpool at Interchange 24):** During this phase, sequenced reconstruction of the I-81 Northern Segment mainline would take place while still maintaining three through lanes of traffic in each direction in this segment of I-81. The available outer width of southbound I-81 along this segment would be constructed first, followed by the outer edge of northbound I-81. The associated ramps connecting to Bear Street, Court Street, Spencer Street, Destiny USA, State Route 370, and Old Liverpool Road would happen concurrently with construction of the outer edges of the I-81 mainline. The existing I-81 mainline pavement would then be reconstructed to its proposed permanent condition using travel lane shifting and phased construction.
- **Southbound I-81 to Eastbound I-690 Connector:** The existing I-81 mainline over James Street is in the way of this proposed connector. Therefore, once southbound I-81 is shut down and demolished, this connector ramp can be completed and opened.
- **Harrison Street Off-Ramp:** A portion of the southbound I-81 off-ramp to Harrison Street would have been constructed in Phase 2A, thereby providing access to westbound Harrison Street only. During this phase, the remainder of the off-ramp would be constructed, including the new connection to Almond Street.
- **Harrison Street On-Ramp:** The Harrison Street on-ramp to northbound I-81 would be completed early in this phase of construction.
- **Pearl Street On-Ramp:** A new Pearl Street entrance ramp with an associated part of mainline I-81 would be completed by sequenced construction and opened early in Phase 3.

- **Reconstruction of the Remaining Three I-81/I-690 Connectors (Northbound I-81 to Eastbound I-690; Westbound I-690 to Southbound I-81; and Northbound I-81 to Westbound I-690):** These connectors would each be constructed at the same time as the associated section of the I-81 mainline construction.
- **Completion of the Two Missing I-81/I-690 Connectors (Southbound I-81 to Westbound I-690 and Eastbound I-690 to Northbound I-81):** Most of the construction of the two missing interchange connectors would have been completed in previous phases during the I-690 shutdown. However, the last sections that tie in to the I-81 mainline near Butternut Street bridge would need to be constructed in Phase 3, after the Harrison Street entrance and exit ramps open to traffic and before completion of the reconstructed I-81 viaduct over Almond Street.

MAINTENANCE AND PROTECTION OF TRAFFIC (MPT)

MPT during construction is closely linked to the project phasing described above. Whereas the above subsection presents the physical improvements proposed to be undertaken during each of the four construction phases for the Viaduct Alternative, this subsection presents information regarding the movement of traffic during construction.

It should be noted that traffic demand management (TDM) techniques can potentially be used to aid in managing the movement of traffic during construction, but these techniques are not specifically discussed in the phased MPT discussions that follow. A variety of TDM techniques that could be used during construction would be evaluated during final design and are discussed further in **Chapter 5, Transportation and Engineering Considerations**.

Phase 1—Preparatory Phase

During the first phase of construction, various individual ramps are expected to be closed at times and travel lane shifting for interstate through traffic is expected to allow room for construction to proceed. Localized detouring is expected at times in various locations, with traffic using nearby local streets and next available ramp access. Specific improvements to be provided during Phase 1 are described below.

- **New Partial Interchange on I-81 at MLK, Jr. East and Associated I-81 Reconstruction:** The two new ramps to be constructed during this phase (i.e., the off-ramp from northbound I-81 to MLK, Jr. East and the on-ramp from MLK, Jr. East to southbound I-81) would be needed in subsequent phases when I-81 is shut down, in order to facilitate traffic mitigation and diversion from the Almond Street corridor to other local streets. I-81 travel lane shifting would be required during construction in this area to maintain a minimum of two lanes of traffic in both directions. No road closures or detours associated with any of the proposed construction during this phase would be required.
- **Reconstruct Partial Interchange at Almond Street/Catherine Street Area:** The two new ramps to be constructed during this phase would replace the existing westbound I-690 ramp to Townsend Street and the existing entrance ramp from McBride Street to eastbound I-690. Both of the existing ramps would stay open until the new ramps are

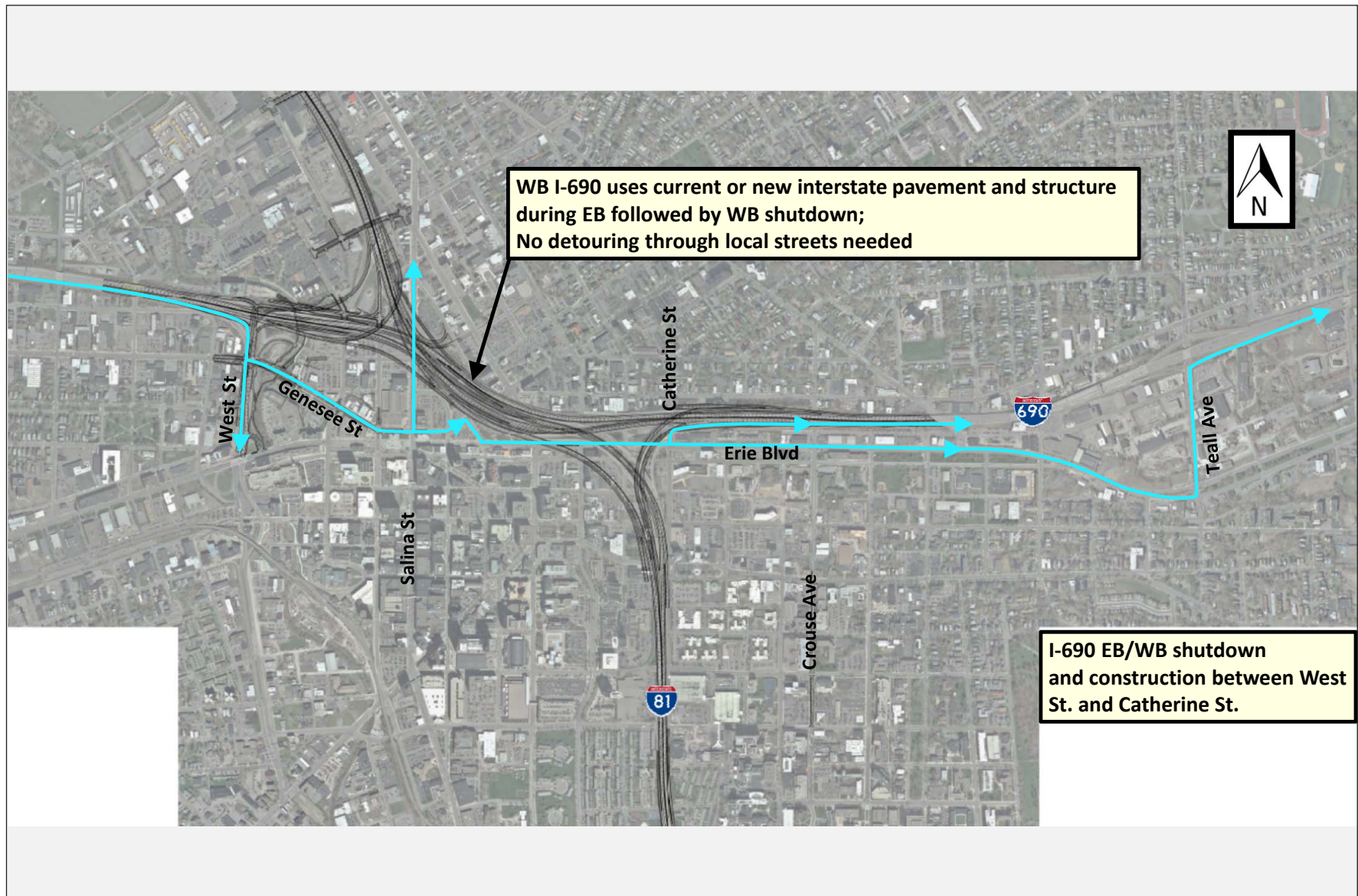
completed and open to traffic. The existing connector ramp from northbound I-81 to eastbound I-690 would have to be closed during this phase, thereby diverting traffic to the northbound I-81 ramp to Adams Street, and either Almond Street or McBride Street to access eastbound I-690 during the ramp closure.

- **I-81 Northern Segment (Between Clinton Street/Salina Street at Interchange 19 and Route 370 West to Liverpool at Interchange 24):** East-west traffic across I-81 would be maintained at all times, either through the use of staged construction of individual bridges or by keeping at least two of the four bridges open to traffic at any one time. During specific bridge closures, traffic would need to use local streets such as Clinton Street, Sunset Avenue, State Street, Genant Drive, and Salina Street. The need to remove and replace the existing retaining wall along I-81 near State Street would not affect the ability to maintain east-west movement of traffic across I-81 at any time.
- **I-81/I-481 South Interchange and I-81/I-481 North Interchange** Temporary improvements to these interchanges are proposed during construction to accommodate traffic movements during subsequent construction phases. However, these temporary improvements can be made while maintaining traffic through these areas with travel lane shifting or shoulder closures.
- **I-690 Interchange 11 (West Street) and Removal of the West Street Overpass:** Proposed temporary improvements are required to be made during this phase in order to facilitate I-690 shutdown and construction during the next two phases, including the following:
 - Westbound I-690 Bypass at Evans Street: This bypass would be constructed utilizing shoulder closures and temporary lane closures on westbound I-690 during this phase, and the northbound West Street to westbound I-690 ramp would be reduced to one lane.
 - Westbound I-690 Off-Ramp to Bear Street: This temporary ramp needs to be in place to replace the Geddes Street exit ramp for the subsequent phases of I-690 shutdown. The West Street to westbound I-690 entrance ramp would become a left-hand entrance ramp, thereby potentially causing a weaving concern at the current exit ramp to Geddes Street. In addition, the Bear Street exit ramp would serve as a detour route during construction. During Phase 1, no detouring of traffic would be required.
 - Widening Eastbound I-690 Off-Ramp to Genesee Street: Travel lane shifts are expected to allow for the widening of this ramp to occur during Phase 1. A temporary easement is required at the northeast turning corner on Belden Avenue where local traffic may be restricted to a single lane. However, no traffic detours are required.
- **Local Street Improvements:** Local traffic detours as well as lane shifts would accommodate the various proposed street improvements during this phase (see **Table 4-1**). As design and traffic analysis continue to progress for the Viaduct Alternative, greater detail regarding local street improvements would be developed.

Phase 2A—Eastbound I-690 Shutdown and Construction

During Phase 2A, eastbound I-690 between West Street and Crouse Avenue would be closed to traffic, but westbound I-690 would remain open with a temporary bypass at the West Street interchange (see Phase 1 discussion above). Eastbound motorists would exit I-690 via West Street and use city streets to access their destinations, as described in more detail below. Several connectors and ramps would also need to be closed during this phase. The westbound I-690 to southbound I-81 connector may stay open throughout this phase, depending on traffic needs, which would still leave two lanes of width for eastbound I-690 to be constructed at the bottleneck gore area. Specific improvements to be undertaken during Phase 2A include the following:

- **Eastbound I-690:** Shifting of traffic lanes along eastbound I-690 is required at both ends of the detour zone to shift traffic to local streets. Eastbound traffic would exit before or at the West Street interchange. Traffic destined for Downtown or the University Hill area would continue south on West Street or travel along Genesee Street and Erie Boulevard eastward. Traffic headed north of I-690 would take either the Bear Street interchange or the West Street interchange to Genesee Street and turn north on Salina Street. Traffic that needs to get back onto eastbound I-690 toward East Syracuse would use Catherine Street or Erie Boulevard to Teall Avenue to access eastbound I-690. These detours would be in effect for Phases 2A and 2B (see **Figure 4-7**).
- **I-690 Interchange 11 (West Street) and Removal of the West Street Overpass:** Westbound I-690 traffic would shift to the two-lane temporary bypass along Evans Street that would have been completed during Phase 1. Other ramps would also need to be closed or modified, including the following:
 - West Street Entrance Ramp to Eastbound I-690: This ramp would be closed starting early in Phase 2A, together with the spur to Herald Place. Motorists would generally use the same detour routes described in the above discussion of eastbound I-690 traffic.
 - Westbound I-690 Exit Ramp to West Street: This ramp would be closed as soon as westbound I-690 traffic switches to the temporary bypass. Vehicles traveling from the east would use either the exit to Catherine Street or the temporary exit to Bear Street, and then follow the local street system to various Downtown destinations.
 - Eastbound I-690 Exit Ramp to West Street: This ramp would serve as the last access point for Downtown traffic during the I-690 shutdown and, therefore, would need to stay open throughout Phases 2A and 2B. Two lanes of traffic would be maintained with modified configuration and phased construction using the existing spur to Genesee Street that would be temporarily widened in the previous phase, until the new ramp could be opened during Phase 2B.
 - West Street Entrance Ramp to Westbound I-690: This ramp would serve as the first interstate access point for motorists traveling westerly from Downtown and the University Hill area during I-690 shutdown and, therefore, would need to stay open with two-lane capacity throughout Phases 2A and 2B. Modified configuration and phased construction are proposed at this area. In this regard, the on-ramp would



Viaduct Alternative - MPT Phase 2A/2B Detours of I-690 Eastbound Traffic

- maintain its existing route during the early part of this phase, with widening to the inside gore area proceeding in order to give sufficient room to accommodate the westbound bypass, and then switching the new eastbound I-690 traffic to the West Street off-ramp as a temporary access route once this new ramp and associated eastbound I-690 are in place. This switch clears out the last stream of live traffic going through the middle of the West Street interchange area, and allows completion of the flipped interchange configuration.
- West Street: West Street would remain open in both directions during the I-690 shutdown using phased construction. However, traffic lane modifications and restrictions would occur during reconstruction, first to the southbound lanes followed by the northbound lanes, in order to remove the overpass bridges and embankments. The existing auxiliary road pavement of West Street from Genesee Street to Tracy Street would be used to accommodate West Street southbound traffic during Phase 2A.
 - **I-81 Northern Segment (Between Clinton Street/Salina Street at Interchange 19 and Route 370 West to Liverpool at Interchange 24):** I-81 mainline lanes and ramps would be maintained throughout this phase.
 - **Southbound I-81 within the I-690 Interchange:** Construction of portions of southbound I-81 and the eastbound I-690 to southbound I-81 connector ramp during this phase are critical to maintaining traffic in future phases, but would be done outside the limits of existing I-81 and, therefore, would not impact maintenance of traffic on I-81.
 - **Harrison Street Off-Ramp:** The existing southbound I-81 off-ramp to Almond Street and Harrison Street would remain open throughout this phase, but there may be minor interruptions on the spur ramp to westbound Harrison Street while the new ramp spur is being constructed. During construction, temporary widening and lane shifting would be utilized to maintain traffic in this area.

Phase 2B—Westbound I-690 Shutdown and Construction

During Phase 2B, westbound I-690 traffic would use a portion of the new eastbound I-690, while eastbound traffic would continue using the same detouring routes as detailed in Phase 2A and in **Figure 4-7**. Several connectors and ramps would be closed during this phase. Specific improvements to be undertaken during Phase 2B are as follows:

- **Westbound I-690:** During Phase 2B, westbound I-690 traffic would shift onto the new eastbound structure over Crouse and Irving Avenues, continue through the I-81/I-690 interchange area, and switch back to westbound pavement after the West Street interchange over Van Rensselaer Street.
 - Westbound I-690 to Northbound I-81 Connector: Once westbound I-690 is shut down, the westbound-northbound connector would be closed and reconstructed. Traffic from westbound I-690 would need to exit at Catherine Street and use Erie Boulevard and State Street to reach northbound I-81. To accommodate these detoured vehicles as well as other traffic detours during Phase 3, the Pearl Street

- entrance ramp would need to be expanded to two-lane capacity until the end of construction. Temporary widening of the northbound I-81 mainline to the east at a point just north of State Street and using the lane space of the existing westbound-northbound connector to enter northbound I-81 would accommodate the temporary two-lane ramp.
- Westbound I-690 to Southbound I-81 Connector: This connector would remain open for part of Phase 2B, but would be changed from a left-hand exit to a right-hand exit. The existing ramp would be closed to allow completion of the new westbound I-690 lanes, and would remain closed until the new connector ramp and the new I-81 viaduct over Almond Street are completed. Traffic from westbound I-690 to southbound I-81 would exit at Catherine Street and continue south via Almond or Townsend Street to access MLK, Jr. East where the entrance ramp to southbound I-81 can be used.
 - **I-690 Interchange 11 (West Street) and Removal of the West Street Overpass:** As westbound I-690 traffic is using the new eastbound structure through this interchange area, closure and reconfiguration of associated ramps would occur:
 - Eastbound I-690 to West Street Exit Ramp: Traffic would continue using the spur to Genesee Street until the new westbound I-690 ramp to West Street opens. Demolition of this existing spur to Genesee Street would not likely require traffic detours.
 - West Street Entrance Ramp to Westbound I-690: Traffic would continue using the pavement of new eastbound I-690 to the West Street off-ramp in order to access westbound I-690. In this regard, the traffic would use a temporary left entrance until the new ramp opens.
 - West Street: West Street would stay open with sequenced modifications to complete the West Street interchange. Some travel lane shifts would occur while the western edge of West Street is being constructed later in this phase.
 - **I-81 Northern Segment (Between Clinton Street/Salina Street at Interchange 19 and Route 370 West to Liverpool at Interchange 24):** I-81 mainline lanes and ramps would be maintained throughout this phase.
 - **Southbound I-81 within the I-690 Interchange:** No specific traffic mitigation procedures are needed for the continued construction along this segment during this phase.

Phase 3—I-81 Shutdown and Construction

To facilitate accelerated construction, I-81 would be shut down between MLK, Jr. East and Butternut Street during Phase 3. Five of the proposed eight interstate connector ramp improvements between I-81 and I-690 would also be closed while three connections (i.e., westbound I-690 to northbound I-81; I-81 to southbound I-690; and eastbound I-690 to southbound I-81) would be open. The West Street interchange would also be fully operational.

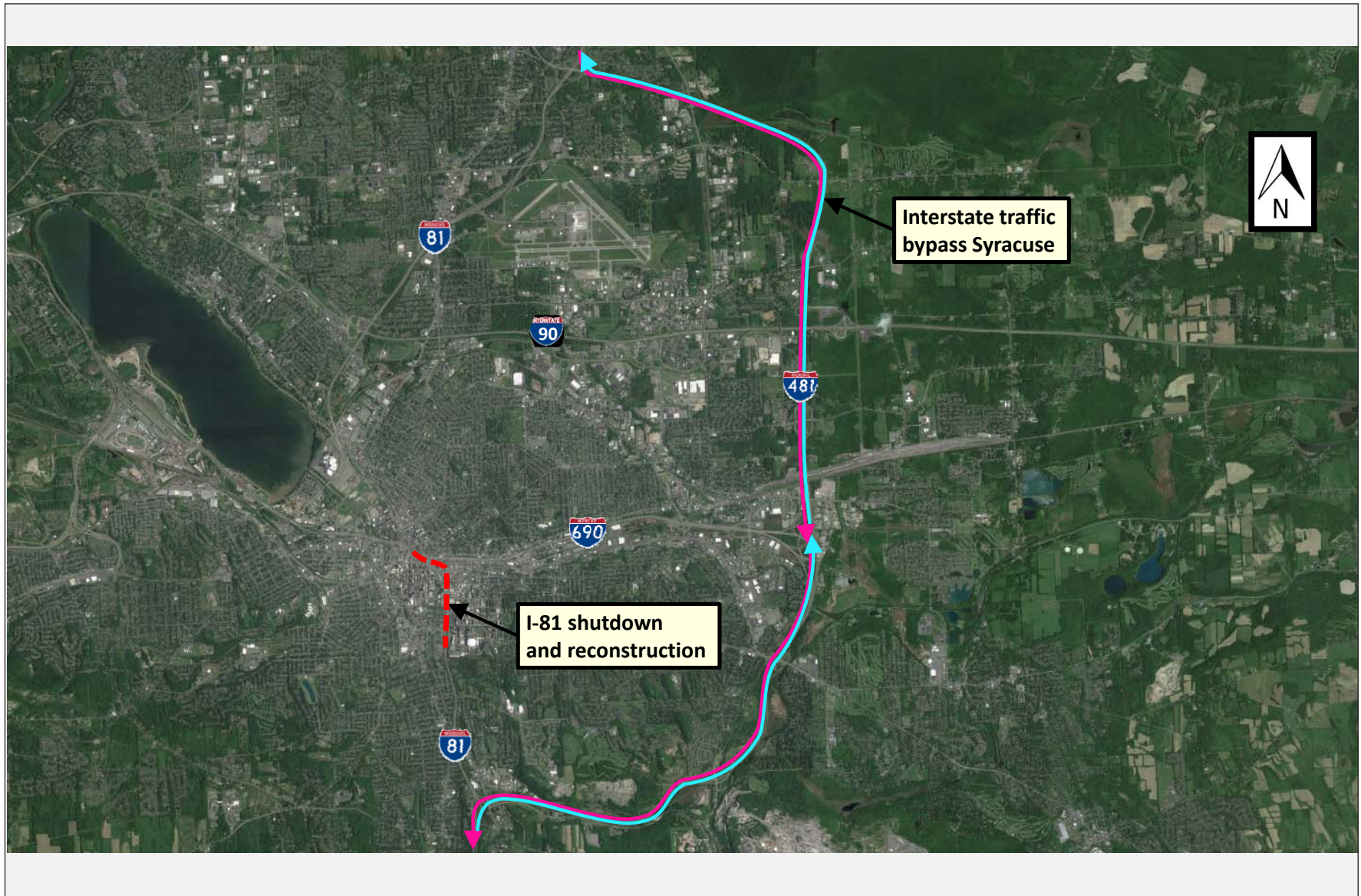
While the I-81 viaduct is closed, I-81 through traffic from the north would divert to I-481 at the I-81/I-481 North Interchange and continue along I-481 to the I-81/I-481 South Interchange where they would re-enter southbound I-81. For through traffic originating from the south, the reverse movement would be used. This detour route is shown in **Figure 4-8**.

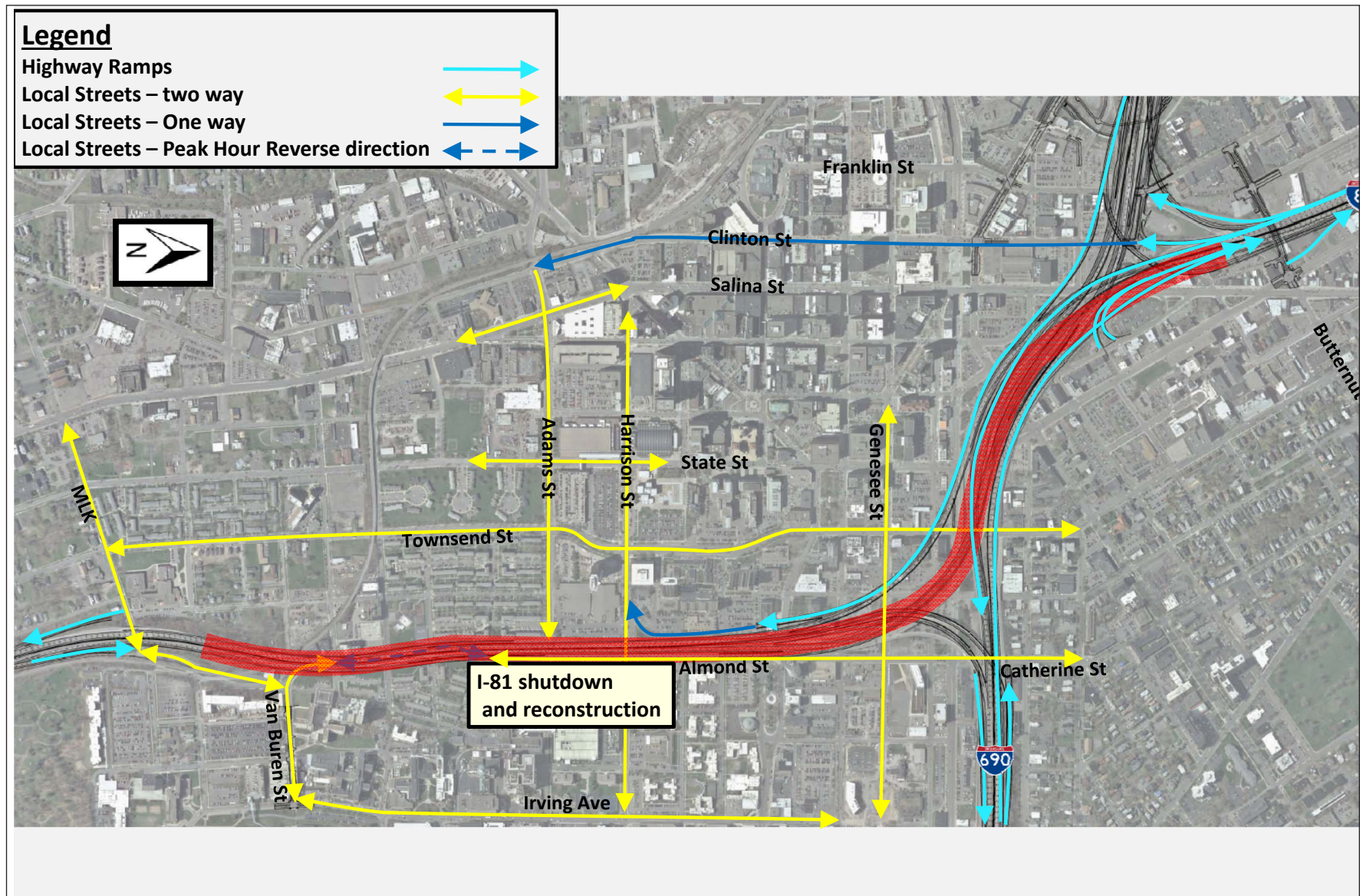
It should be noted that approximately 12 percent of the total traffic volume currently using I-81 through Downtown Syracuse is attributed to through traffic having both origins and destinations beyond the limits of the two I-81 interchanges with I-481. This through traffic would likely detour to I-481 during Phase 3.

The rest of the traffic going to or through Downtown would need to exit I-81 either from MLK, Jr. East at the southern end or from Clinton/Franklin Street at the north end. Local streets could be used for detouring (see **Figure 4-9**). Heavier usage of north-south arterials is expected due to the displaced I-81 traffic movements during this phase, as well as major east-west streets providing connectivity back to the interstate system. Most of the local streets would have already been improved as part of the local street improvements proposed during Phase 1 (see previous **Table 4-1**).

Specific improvements to be undertaken during Phase 3 include the following:

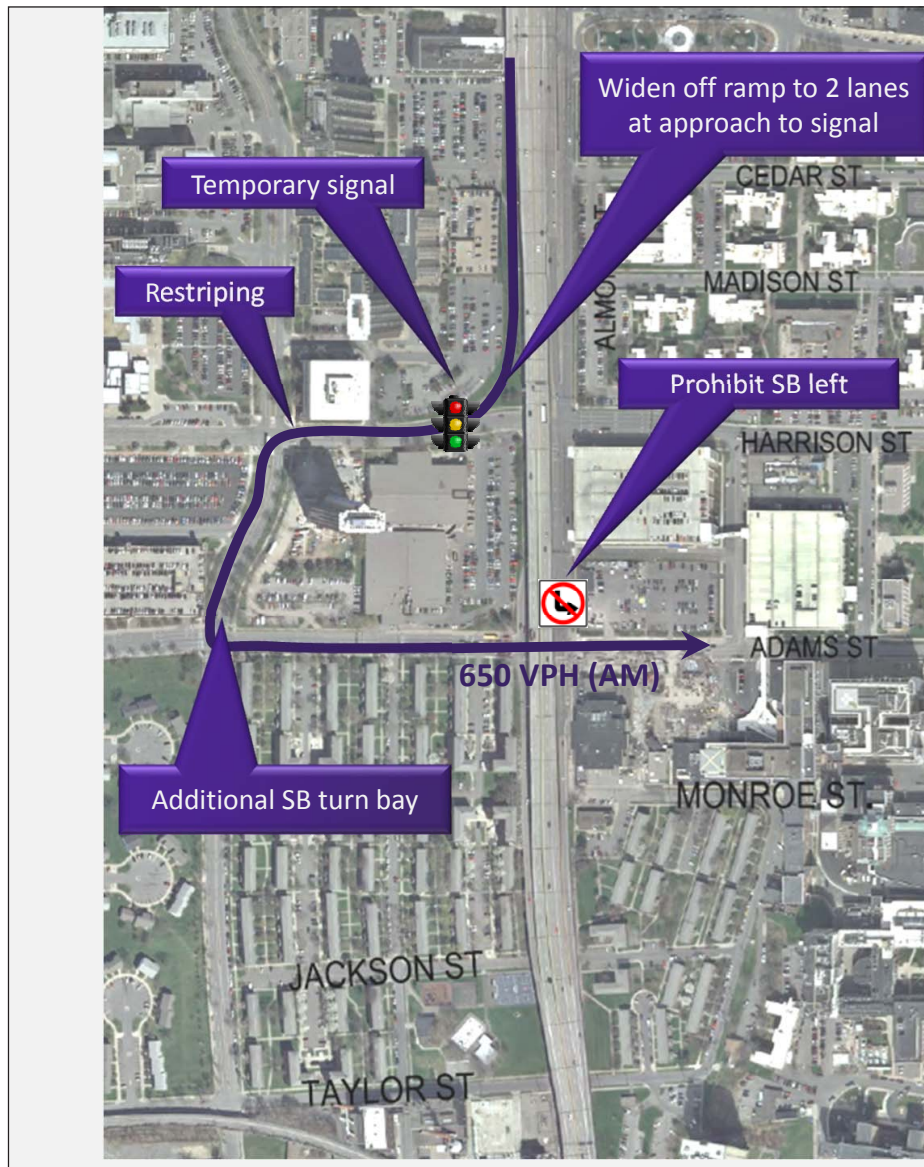
- **I-81 Viaduct over Almond Street (Between MLK, Jr. East and Genesee Street):** Traffic mitigation during Phase 3 contributes to the majority of the detouring needs that has been summarized above. The entire city grid, as well as the alternative interstate route of I-690 and I-481 in combination, would be used in Phase 3. I-81 could potentially re-open to traffic later in Phase 3, once reconstruction of the viaduct over Almond Street has been completed, even though reconstruction of Almond Street, the I-81 off-ramp to Clinton Street and the removal of existing ramps near Butternut Street would be ongoing. Almond Street would be used as part of the detouring routes and would remain open with restrictions. At a minimum, two-way traffic could be maintained on Almond Street from Adams Street northward, while one lane of traffic with alternating direction per peak hour would be maintained between Burt and Adams Streets. Access from Almond Street to I-81 at Adams and Harrison Streets would be closed to alleviate traffic pressure from this heavy construction zone, with the exception of the Harrison Street exit ramp (see below).
- **Northbound I-81 (Between Genesee and Butternut Streets):** No specific detouring of traffic desiring to use I-81 northbound is required during this phase, other than that described in the above MPT summary for Phase 3.
- **Southbound I-81 (Between Genesee and Butternut Streets):** Once eastbound I-690 is re-opened, the portion of southbound I-81 that was built in Phase 2A could open partially to allow eastbound I-690 traffic to access the new Harrison Street ramp and provide an alternative access route to University Hill and Downtown.
- **Clinton Street Off-Ramp:** The Clinton Street off-ramp from southbound I-81 serves as the last crucial southbound exit during I-81 shutdown. Temporary modification of this off-ramp from a one-lane to two-lane exit is required before I-81 could resume carrying traffic. Once traffic from the north could pass this exit on southbound I-81 to use the





previously constructed new Harrison Street off-ramp, the temporary off-ramp to Salina Street can be closed and reconstruction of the Clinton Street off-ramp could begin. Once the Salina Street off-ramp is closed, the remaining construction of southbound I-81 can be completed in this area.

- **I-81 Northern Segment (Between Clinton Street/Salina Street at Interchange 19 and Route 370 West to Liverpool at Interchange 24):** Three through lanes of traffic in each direction in this segment of I-81 would be maintained and open to traffic throughout this phase. The access ramps from Butternut Street to northbound I-81 and from southbound I-81 to Franklin, Clinton, and Salina Streets would be maintained and open to traffic with minor modifications until the section of I-81 through Downtown Syracuse is reconstructed and open to traffic.
- **Southbound I-81 to Eastbound I-690 Connector:** This short but crucial connector ramp is expected to be completed as soon as existing I-81 can be closed to traffic. Once constructed, this connector ramp could open to traffic, allowing southbound I-81 traffic to access eastbound I-690 as well as Downtown and University Hill destinations via the Teall Avenue interchange. Opening of this ramp would relieve some of the pressure on the Clinton Street and Salina Street exits.
- **Harrison Street Off-Ramp:** As noted, a portion of the new southbound I-81 exit to Harrison Street would be built during Phase 2A and would open at the start of Phase 3, providing alternative access from eastbound I-690 to Downtown and University Hill. During Phase 3, only access to westbound Harrison Street would be provided, as the ramp to Almond Street would be closed. To mitigate closing the Almond Street spur, traffic destined to the east side of Almond Street would be detoured over Townsend Street and Adams Street. The temporary measures designed to mitigate traffic movements on this detour and to absorb this traffic stream within the local street system in this area during this phase are graphically presented in **Figure 4-10** and include:
 - Create a jug-handle movement to access the University Hill area and to temporarily replace the heavily used spur to Almond Street;
 - Prohibit the Almond Street southbound lane to access directly onto Adams Street;
 - Redirect the Almond Street southbound lane to Adams Street via Townsend Street to become eastbound travel on Adams Street;
 - Divert traffic from southbound I-81 away from the intersection of Almond and Harrison Streets and onto the existing slip ramp;
 - Create a two-phase signal operation at Almond Street; and
 - Redirect traffic onto the higher capacity eastbound approach at Adams Street.
- **Harrison Street On-Ramp:** The new Harrison Street entrance ramp to northbound I-81 could open once the portion of proposed northbound I-81 through the middle of the interchange has been completed. This would alleviate demand at the Pearl Street entrance ramp.



- Prohibiting SBL from Almond onto Adams reroutes approx 650 vehicles
- Traffic from I-81 SB diverted away from intersection of Almond and Harrison and onto existing slip ramp
- SBL from Almond to Adams redirected via Townsend to become EBT on Adams
- 2 phase signal operation at Almond
- Traffic is and redirected onto higher capacity EB approach at Adams St

Viaduct Alternative -
MPT Phase 3 Harrison Street Off-Ramp Traffic Mitigation Measures

Figure 4-10

- **Pearl Street On-Ramp:** Once I-81 is closed, the existing Pearl Street entrance ramp serves as the primary access point for Downtown traffic going north via I-81. Existing Pearl Street would remain open while the new Pearl Street ramp is being constructed during this phase. The existing Butternut Street/State Street ramp would also need to stay open to accommodate detoured traffic until I-81 could reopen. A short-period closure of one of the legs of this ramp is expected. Local street improvements proposed in this area to accommodate traffic include restriping the northbound approach and installing a temporary signal at the intersection of Pearl and Hickory Streets and installing a temporary signal at the intersection of the southbound I-81 off-ramp and Salina Street.
- **Reconstruction of the Remaining Three I-81/I-690 Connectors (Northbound I-81 to Eastbound I-690; Westbound I-690 to Southbound I-81; Northbound I-81 to Westbound I-690):** Construction and completion of these connector ramps would be sequenced during the I-81 mainline construction. Traffic mitigation during reconstruction of these connectors is an integrated activity engaging the entire city grid, which was summarized above in the introduction to these bullets.
- **Completion of the Two Missing I-81/I-690 Connectors (Southbound I-81 to Westbound I-690 and Eastbound I-690 to Northbound I-81):** The new connectors would be opened to traffic at completion of the entire Project.

CONSTRUCTION MEANS AND METHODS

This section describes the primary means and methods to construct the Viaduct Alternative. As stated in **Section 4.1**, the development of specific construction means and methods generally depends on the Contractor. Therefore, the construction means and methods discussed below identify some of the factors that the Contractor may consider.

Construction Staging Areas

During construction, the Contractor would likely establish temporary areas for various purposes in relative proximity to the Project. These may include laydown areas, storage areas, and staging areas, but for purposes of this discussion, all of these potential types of sites are referred to as “staging areas.” Staging areas would offer space to complete many tasks throughout the course of construction. Unassembled construction equipment would be delivered to and assembled within these sites and workshops may be placed to allow for service and maintenance of equipment throughout the duration of the construction. Light-duty bridge and wall components would also be delivered to, and stored within the staging areas until they are ready to be used in the construction process, and larger bridge elements would be prepared and/or further assembled until they are ready for placement into their final positions, which could include the preconstruction of temporary shielding, utility hangers, and conduits.

Construction of the Viaduct Alternative would entail a wide range of construction activities throughout the Project Area. The Contractor would be responsible for identifying construction staging areas. It is expected that the Contractor would seek out underutilized sites such as vacant parcels or land currently used for surface parking, of which there are

numerous sites within the overall Project Area. The deliveries would be made by road and would be subject to load and dimension limits for the affected roadways. The Contractor would be required to prepare a delivery plan that addresses the effect to roadways and the means and methods of coordination and permitting the delivery of oversized loads.

Office/Administrative and Support Space

Office space would be required for construction administration, inspection, and engineering staff. Interconnected trailers adjacent to the assembly sites would be ideal structures to support this need. It would also be possible, however, for the Contractor to rent office space in nearby communities if the trailers are unattainable for any reason. Designated parking for employees would be a consideration. It would be preferable to have on-site space allocated for this purpose but, if necessary, employees could be shuttled from remote parking areas to the construction sites.

Disposal and Borrow Sites

The Contractor would identify disposal and borrow sites outside the Project Area. Due to the high cost of disposal and borrow, the Contractor would generally seek to reuse material within the Project Area to the greatest extent possible through phasing of all earthwork tasks. If the Project is split into multiple construction projects, the opportunity to reuse material within the Project Area may be reduced; however, in an effort to present a more conservative scenario, the equipment and staff estimates provided later in this section assume that each phase would be constructed as a separate contract.

Concrete Batch Plant

Depending on the volume of cast-in-place concrete that the Contractor plans to use, one or more concrete batch plants may provide the concrete needed to construct the bridge foundation, piers, and deck. Typically, a batch plant would occupy approximately three acres of land. The location(s) for the plant would be strategically assigned such that the material would be deliverable to the construction site within 90 minutes of load-out to allow concrete to be poured in place before curing initially sets in the truck. Due to the urban nature of the Project Area and the plant requirements, a batch plant or plants would likely be located outside of the Project Area although a local concrete provider could also be used if available. The Contractor would be responsible for any permits needed, including any appropriate environmental review, to locate the batch plant(s).

Bridges and Buildings Demolition

Much of I-81 and I-690, including associated ramps in Downtown Syracuse, would be demolished and reconstructed as part of the Viaduct Alternative. This demolition would generally occur within the existing footprint, and temporary shielding may be required for street crossings, temporary road closures, delivery and removal of materials via city streets, access times to and from the work zone, and in the vicinity of existing buildings to be kept in place. In addition, based on current level of design, demolition of 24 existing buildings required for right-of-way or other improvements would be necessary and may require temporary shielding as well.

Processing to smaller elements could be completed off-site in order to reduce air and noise issues in the direct vicinity of the work sites. A lead and/or asbestos survey would be required to identify, locate, and quantify such materials that would need abatement prior to demolition (see **Section 6.4.9, Asbestos** and **Section 6.4.10, Hazardous Wastes and Contaminated Materials**). In addition, extensive coordination with the affected utility agencies would be required prior to demolition. The exact means and methods for structural demolition would be determined by the Contractor and would be dependent on the structural type of the existing elements. Demolition of existing bridge structures in an urban environment can pose unique challenges for the construction, especially at locations where existing bridge spans over local streets with active traffic are involved. An on-site detour with staged construction would be used to facilitate the actual demolition.

Under-deck protective shielding would be installed prior to the existing bridge deck concrete removal to ensure that no debris would fall into active traffic below the deck. One option for deck removal that could be considered would be to saw cut the deck and remove it from the structure. After the deck removal, existing girders would be picked and removed by overhead crane or access from local streets. Existing girders would be cut into manageable length for transportation out of the job site. Existing concrete substructures would be saw cut and removed in segments to make way for the new structure construction.

An alternative approach that NYSDOT has used previously for deck removal involves a hoe ram and dropping it onto a demolition blanket supported by shielding, or dropping it onto a street with a one-foot bed of sand and then hoisting into a truck. Street closures were permitted by the City of Syracuse for short durations to accommodate this construction technique. In areas of the Downtown where less-sensitive land uses exist, this approach could be a viable solution for bridge demolition.

New Bridge Substructure Construction

For the portions of I-81, I-690, and ramps that would be rebuilt, the exact design of the new substructure would be performed during final design if a Design-Bid-Build process is not utilized or by the Contractor if a Design-Build process were utilized. The proposed piers would likely be cast-in-place multi-columns with concrete pier bents or steel straddle (capbeam) bents. Steel straddle bents would be used primarily at locations where vertical clearance is critical or placement of the foundations directly beneath the superstructure is impractical. The concrete pier bents would be founded on pile foundations attached through a concrete pile cap wherever practical, whereas drilled shaft foundations would be used in areas sensitive to vibration and noise. Drilled shaft foundations would also be installed at selected pier bents to provide a more efficient foundation solution. Abutments would be of a semi-integral type to eliminate the deck joint at the end of the bridge. Abutment and wingwalls footings would be founded on piles as well.

Existing soil borings data and studies of the existing bridge record plans have indicated that the underlying soils at the Project Area generally consist of silt and clay with bedrock or shale. The depth of bedrock varies along the project alignment from approximately 20 to 70 feet below ground. As such, the placement of a new structure in the area would require the use of pile foundations for poor soil to provide stability and minimize settlement. Piles or

drilled shafts for the new bridge would bear on bedrock at a depth of approximately 50 feet below ground.

The existing abutments and piers of the I-81 viaduct and I-690 mainline and associated interchange ramps would be removed down to the top of footing elevation and the pile foundations would be abandoned in place. All new bridge foundations would be constructed and positioned to avoid the existing pile foundations.

Impact hammers would be used to drive piles to design elevation. Cast-in-place concrete pile caps would be installed to support the column above. For drilled shaft construction, rotary auger and steel casing would be employed. After the excavation has been carried to its design full depth, the base of the shaft would be cleaned, inspected, and approved, and the shaft would be completed by placing the reinforcement and concrete.

Formwork for the column would be installed for the casting of columns and followed by pier cap construction. Similarly, if steel straddle bent would be used, the complete fracture critical steel capbeam would be fabricated in an approved steel fabrication facility and be assembled on-site and lifted in place by crane as soon as the columns are ready to support it.

Alternate construction methods such as the use of prefabricated precast pier caps with mechanical couplers can be advantageous for substructures that are located adjacent to or above traffic or rails, and where there are strict time and space limitations around the elements. The use of prefabricated elements can allow the Contractor to get in quickly and complete the construction within a limited timeframe.

New Bridge Superstructure Construction

Completion of the new bridge superstructure associated with the I-81 viaduct and the I-690 mainline and associated interchange ramps would include piers, columns, bridge deck, roadway finishes, and lighting. Much of the material would be pre-fabricated or pre-cast at various locations and delivered to the project site via truck; further pre-assembly on site may be possible to add temporary shielding and utility hangers. At the construction site, these elements would be lifted into place by cranes for the most part with self-propelled modular transporters utilized for smaller spans at critical locations as identified above.

Due to the curved alignments with various radii required for the proposed roadway, it has been determined that straight precast girders would not be reasonable due to the geometry and curvature limitations. The preferred superstructure type would consist of multiple segments of continuous spans of straight and curved steel multi-girders. The girders and deck would be made continuous, where practical, at the piers to minimize the amount of deck joints. Also, steel girders can minimize the proposed superstructure depth over the desired span length, help reduce interstate profile impacts, and accommodate staged construction.

Proposed plate girders would be assembled on-site and lifted to final position by overhead crane or access from local streets. Cast-in-place concrete decking would then be installed span by span in segments. Alternate construction methods such as the use of prefabricated elements can expedite the constructability of a bridge, especially on sites that have difficult constraints. The use of prefabricated bridge deck panels could potentially minimize or

eliminate the need for workers to install and remove formwork. This is especially beneficial for bridges over water and active highways during construction.

CONSTRUCTION EQUIPMENT AND EMPLOYMENT

Table 4-2 provides a breakdown of the major types of equipment that could be used on-site during construction. The equipment listed primarily relates to the heavy civil and structural activities associated with the Project (e.g., demolition, superstructure construction and earthworks), and which could have the greatest effect in terms of air emissions, particulates, and/or noise generation.

As shown in **Table 4-2**, demolition activities associated with the Viaduct Alternative would begin early in the six-year construction period and continue to the end. Superstructure construction, however, would not begin until after Phase 1 of the Project has been completed and would then continue until the end of construction. In terms of earthwork, some activities would occur throughout project construction, while others would begin after Phase 1.

For each equipment type, **Table 4-2** lists engine type (diesel, gasoline or electric); engine size (horsepower); the number of each equipment type to be employed; the percentage of time during a typical eight-hour workday that each equipment type would likely be in use; and the percentage of time that each equipment type would likely be in use during the duration of each task.

One of the factors used to estimate the on-site construction equipment and their durations of use is the number of on-site staff-hours by category of worker involved in constructing the heavy civil and structural elements of the Project. Estimates were developed based on the expertise and experience of construction estimators and various factors typically used by such estimators, and were primarily used to develop the number of hours of heavy vehicle usage and construction activities that could have the greatest effect on air quality and noise.

Table 4-3 shows estimates of construction employment. The estimates relate only to the Contractor's on-site construction workers directly involved in the actual demolition and/or construction of the Project. Staff-hours associated with ancillary functions such as office/administrative work, material deliveries, construction inspection, construction management, landscaping, design engineering, safety oversight, and various vendor activities have not been estimated. In addition, the indirect and induced employment associated with manufacture of materials to be used on-site, shipping of materials, and local services to accommodate the construction workers have not been estimated.

Table 4-3 shows staff-hours related to both on-site demolition and construction activities. As shown in the table, 1,271,528 staff-hours spread across the four construction phases and six years of total construction are estimated for this alternative. Of this total, 396,960 staff-hours would be involved in bridge demolition activities while 874,568 staff-hours would be involved in new construction activities. A further split of these numbers by individual construction phase is also presented.

Table 4-2
Viaduct Alternative: Construction Equipment

Work Task	Start Date	End Date	Equipment Type	Engine type	Size (hp)	Qty	Daily Use*	Average Use**
Demolition	Month 1	Month 72	Hyd. Excavator, 1 C.Y.	Diesel	150	2	85%	2%
Demolition	Month 1	Month 72	Backhoe Loader, 48 H.P.	Diesel	48	2	85%	2%
Demolition	Month 1	Month 72	Backhoe Loader, 80 H.P.	Diesel	80	6	85%	22%
Demolition	Month 1	Month 72	Vibrating Plate, Gas, 21"	Gasoline	5	1	50%	3%
Demolition	Month 1	Month 72	Lead, 90' high	N/A	-	1	85%	26%
Demolition	Month 1	Month 72	Conc. Hammer Attach.	N/A	-	4	85%	34%
Demolition	Month 1	Month 72	Dump Truck, 12 C.Y., 400 H.P.	Diesel	400	1	85%	34%
Demolition	Month 1	Month 72	Cutting Torch	N/A	-	4	80%	36%
Demolition	Month 1	Month 72	Welder, Gas Engine, 300 amp	Gasoline	300A	1	85%	7%
Demolition	Month 1	Month 72	Lattice Boom Crane, 150 Ton	Diesel	300	1	85%	13%
Demolition	Month 1	Month 72	Acetylene Torches, 5 ", 1/2" weld size	N/A	-	2	20%	14%
Superstructure	Month 13	Month 72	Concrete Bucket, 1 C.Y.	N/A	-	2	85%	14%
Superstructure	Month 13	Month 72	Concrete Pump (Small)	Diesel	400	2	100%	40%
Superstructure	Month 13	Month 72	Concrete Vibrator	Electric	20A	4	70%	75%
Superstructure	Month 13	Month 72	Lead, 90' high	N/A	-	5	85%	60%
Superstructure	Month 13	Month 72	Hammer, Diesel, 41k ft-lb	Diesel	220	2	90%	55%
Superstructure	Month 13	Month 72	Cutting Torch	N/A	-	7	80%	79%
Superstructure	Month 13	Month 72	Pickup Truck, 3/4 Ton	Diesel	300	15	100%	31%
Superstructure	Month 13	Month 72	Welder, Gas Engine, 300 amp	Gasoline	300A	7	85%	81%
Superstructure	Month 13	Month 72	Crawler Crane, 75 Ton	Diesel	250	4	100%	25%
Superstructure	Month 13	Month 72	Lattice Boom Crane, 150 Ton	Diesel	300	4	85%	23%
Superstructure	Month 13	Month 72	Hyd. Crane, 25 Ton	Diesel	250	2	85%	17%
Superstructure	Month 13	Month 72	Hyd. Crane, 55 Ton	Diesel	300	2	85%	14%
Superstructure	Month 13	Month 72	S.P. Crane, 4x4, 12 Ton	Diesel	200	1	35%	12%
Superstructure	Month 13	Month 72	Hand Tools	Electric	20A	40	85%	40%
Superstructure	Month 13	Month 72	Acetylene Torches, 5 ", 1/2" weld size	N/A	-	5	20%	40%
Earthworks	Month 13	Month 72	Hyd. Excavator, 1 C.Y.	Diesel	150	5	85%	11%
Earthworks	Month 1	Month 72	Hyd. Excavator, 3.5 C.Y.	Diesel	200	4	85%	5%
Earthworks	Month 13	Month 72	Backhoe Loader, 48 H.P.	Diesel	48	1	85%	33%
Earthworks	Month 13	Month 72	Vibrating Plate, Gas, 21"	Gasoline	5	1	50%	29%
Earthworks	Month 1	Month 72	Sheepsfoot Roller, 240 H.P.	Diesel	240	2	90%	7%
Earthworks	Month 1	Month 72	Dozer, 300 H.P.	Diesel	300	1	85%	49%
Earthworks	Month 13	Month 72	Loader, Skid Steer, 30 H.P.	Diesel	30	1	85%	22%
Earthworks	Month 1	Month 72	Dump Truck, 12 C.Y., 400 H.P.	Diesel	400	20	85%	40%
Earthworks	Month 13	Month 72	Light Truck, 1.5 Ton	Diesel	450	1	100%	40%

Notes:

*Daily Usage Percentage = Percentage of time that the equipment is in use during a typical 8-hour workday. Example: 75% daily use equals 75% of an 8-hour workday or 6 hours.

**Average Use Percentage = Percentage of time that the equipment is in use during the duration of the task. Example: For a task that lasts 4 quarters, 50% average use means that the equipment is in use half the time during the 4-quarter construction period, or 2 quarters.

Table 4-3

Viaduct Alternative: Construction Staff-Hours and Staff-Years Generated

Description	Construction Staff-Hours					Demolition Staff-Hours					Total
	1	2A	2B	3	Total	1	2A	2B	3	Total	
Carpenters	-	54,860	33,174	159,658	247,692	-	5,529	3,492	16,819	25,840	273,532
Concrete Finishers / Masons	-	9,982	5,989	28,241	44,212	-	-	-	-	-	44,212
Common Building Laborers	1,632	34,223	19,832	86,505	142,192	-	35,579	21,590	100,200	157,369	299,561
Equipment Operators, Crane or Shovel	1,004	7,801	4,088	19,356	32,249	-	2,120	1,205	6,055	9,380	41,629
Equipment Operators, Light Equipment	1,257	995	483	155	2,890	-	-	-	-	-	2,890
Equipment Operators, Medium Equipment	-	5,827	1,988	8,487	16,302	-	16,772	10,160	46,992	73,924	90,226
Equipment Operators, Oilers	-	4,074	2,319	10,196	16,589	-	844	483	2,342	3,669	20,258
Helpers Average (5 trades)	-	3,376	1,284	9,081	13,741	-	3,376	1,932	9,368	14,676	28,417
Pile Drivers	-	10,984	6,378	25,253	42,615	-	-	-	-	-	42,615
Rodmen (Reinforcing), Foreman	-	8,761	5,332	24,460	38,553	-	-	-	-	-	38,553
Rodmen (Reinforcing)	-	33,577	18,879	93,501	145,957	-	-	-	-	-	145,957
Rodmen (Reinforcing), Apprentice	-	8,761	5,332	24,460	38,553	-	-	-	-	-	38,553
Skilled Workers Average (35 trades)	-	399	180	146	725	-	16,266	9,881	45,387	71,534	72,259
Structural Steel Workers	-	5,063	1,925	13,621	20,609	-	5,063	2,898	14,053	22,014	42,623
Welders, Structural Steel	-	105	40	284	429	-	105	60	293	458	887
Truck Drivers, Heavy	31,121	21,421	3,774	14,944	71,260	-	4,114	2,500	11,482	18,096	89,356
Total Staff-Hours	35,014	210,209	110,997	518,348	874,568	-	89,768	54,201	252,991	396,960	1,271,528
Total Staff-Years	16.8	101.1	53.36	249.2	420.5		43.2	26.0	121.6	190.8	611.3

Assuming a standard work year of 2,080 hours (40 hours per week for 50 weeks), the overall staff-hour total related to on-site workers performing heavy civil and structural construction activities for the entire Project translates to an equivalent of more than 611 staff-years of employment.

CONSTRUCTION-RELATED PUBLIC OUTREACH

The Contractor would be required to prepare an approved communication and outreach plan for implementation throughout the six-year construction period. Since it would be the Contractor's responsibility to develop and implement the plan that would need to be approved by NYSDOT, the specifics cannot be predicted at this time. However, typical elements that could be expected to be included in the plan for later implementation include:

- Establishment of at least one full-time person at an on-site project office that is easily accessible to the public (including environmental justice communities) and can accommodate drop-in visitors from the public with any questions, comments, or concerns that they may have about ongoing and upcoming construction activities.

- Establishment of a special telephone number that can be used to call and ask any questions about ongoing and upcoming construction activities, to submit a comment, or discuss a concern. This number could be operated either as a full-time staffed telephone line, a part-time staffed telephone line, and/or an answering machine where callers can leave a message and knowledgeable staff would return their calls.
- Development and maintenance of a website to advise stakeholders and the general public of upcoming and current street closures, detours, nighttime construction activities, locations and times of particularly noisy construction activities, identification of specific locations where construction is currently being implemented or will be implemented, any changes to the project schedule, identification of temporary staging locations, and identification of on-site mitigation measures that are currently being or will be employed.
- Development of a specific communication schedule and procedures for providing construction status updates and planned coordination meetings with major stakeholders in the area including, but not necessarily limited to, city/municipal engineering, city/municipal planning, city/municipal clerk, city/municipal mayor, other city/municipal offices as appropriate, police stations, fire departments, ambulance services, hospitals, universities, schools, libraries, houses of worship, large employers, transit providers, and trucking and freight services.
- Development of a specific communication schedule and procedures for providing construction status updates and other construction-related information to environmental justice communities and housing projects. Typical procedures that may be utilized in this regard include distribution of flyers at facilities that are within environmental justice communities and/or regularly frequented by environmental justice populations (e.g., houses of worship, entranceways to apartments/community homes, certain local businesses), as well as public notices in local papers. The flyers and public notices would be printed in both English and Spanish, as appropriate.
- Development of a specific communication schedule and procedures for coordinating with media (e.g., local radio stations, local television stations, local newspapers) to disseminate construction-related information, such as upcoming and current street closures, detours, and nighttime construction activities to the general public. These procedures should also include opportunities for implementing social media alerts via Facebook, twitter, or other appropriate social networking services. These various media outlets would include both English- and Spanish-speaking audiences, as appropriate.

4.4 COMMUNITY GRID ALTERNATIVE

CONSTRUCTION PHASING AND SCHEDULE

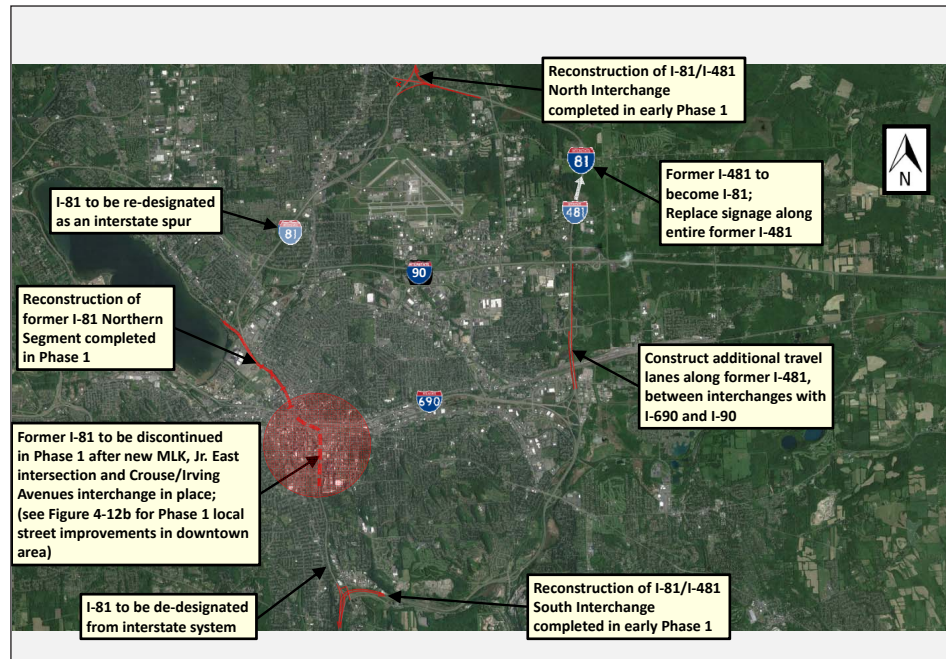
The construction evaluation of the Community Grid Alternative is based on a five-year schedule. During this period, construction of the various elements associated with this alternative would progress via three separate phases, designated as Phases 1, 2A, and 2B. Details of each of these phases are provided below and are shown for the Downtown area in **Figure 4-11**. Although details of utility relocations, drainage improvements, building

demolition activities, and intelligent transportation systems (ITS) are not discussed in the following phasing discussions, it should be noted that such activities would be initiated early in Phase 1 and would likely continue into Phase 2B.

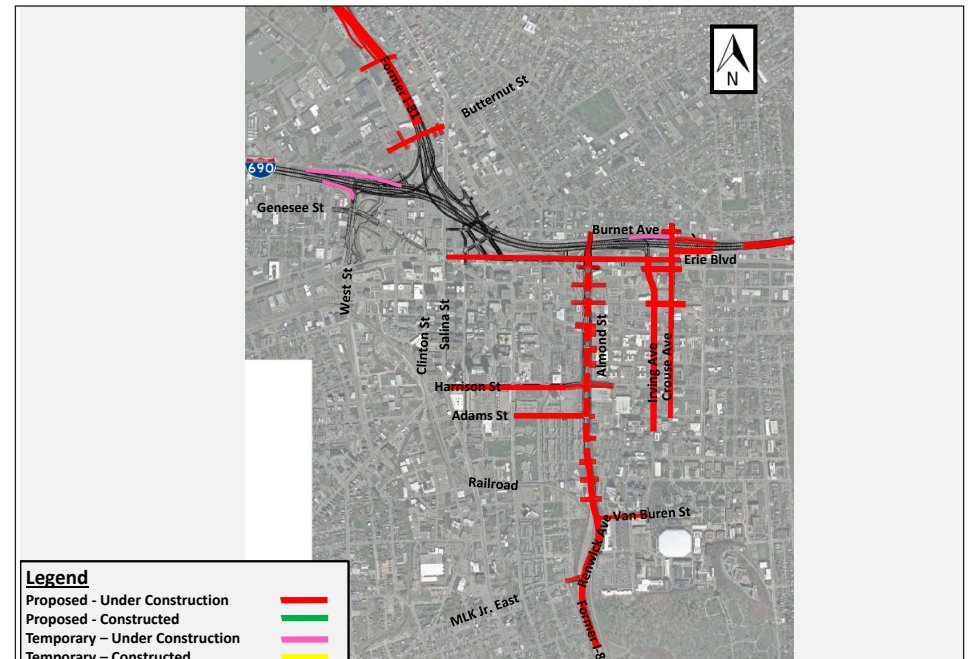
Phase 1—Preparatory Phase

Phase 1 is proposed to take approximately two years and focuses on: 1) the conversion of I-481 to serve as the new I-81; and 2) the initiation/construction of specific local street improvements within the Downtown area. Once the various elements of the I-481 conversion and other miscellaneous Phase 1 improvements are completed and opened to traffic, phased demolition of the viaduct can begin. This phase includes construction of various new facilities such as interchanges and ramps, demolition of existing facilities, and construction of temporary facilities to accommodate movement of vehicles during construction. **Figure 4-12** shows the project-wide improvements and the Downtown area improvements, respectively, for the Community Grid Alternative during Phase 1. Specific improvements to be undertaken during Phase 1 include:

- **I-81/I-481 North Interchange (Interchange 29):** Interchange and widening improvements to I-481 are required to accommodate the redesignation of I-481 as I-81. This interchange would be reconstructed to connect the realigned former I-81 with the newly re-designated I-81, and to carry a minimum of four travel lanes (two in each direction) of through traffic and meet 70 mph design standards. The ramps that currently connect existing northbound I-481 to existing northbound I-81 and existing southbound I-81 to existing southbound I-481 would be demolished, and these movements would be made on the mainline of existing I-481 (newly re-designated I-81). This work needs to be in place before existing I-81 is shut down, and must be completed by the end of Phase 1.
- **I-81/I-481 South Interchange (Interchange 16):** Reconstruction of this interchange would involve re-routing existing I-81 to connect with existing I-481, which would serve as the new I-81. The existing ramps that connect northbound I-81 to northbound I-481 and southbound I-481 to southbound I-81 would become interstate mainlines, and be reconstructed to meet 70 mph design standards. The remaining existing I-81 section connecting to Downtown from just north of this interchange would be de-designated from the interstate system. A new signalized intersection would be installed to the proposed ramp from northbound I-81 to this newly de-designated road to provide additional local access through another newly proposed local road connecting to East Brighton Avenue. The East Brighton Avenue bridge over the interchange, between the intersections of Rock Cut Road and the newly proposed local road, would also be reconstructed. This work all needs to be in place before I-81 is shut down for viaduct removal, and must be completed by the end of Phase 1.
- **I-481 Corridor:** In addition to the proposed improvements at the northern and southern interchanges with I-81, other improvements along I-481 between those interchanges would be required. These improvements include: 1) addition of a third (auxiliary) lane in each direction between Kirkville Road (Interchange 5) and I-690 (Interchange 4); 2) addition of a third northbound (auxiliary) lane between Kirkville Road (Interchange 5) and I-90 (Interchange 6); and 3) replacement of existing I-481 signage with new I-81



Community Grid Alternative –
Phase 1 Project-Wide Improvements



Community Grid Alternative –
Phase 1 Community Grid Improvements
for Downtown Area

signage and renumbering I-481 interchanges. This work all needs to be in place before I-81 is shut down for viaduct removal, and must be completed by the end of Phase 1.

- **I-690/Crouse and Irving Avenues Interchange:** A new exit ramp from westbound I-690 to Crouse Avenue and a new entrance ramp from Crouse and Irving Avenues to eastbound I-690 would be constructed. A temporary on-ramp from Crouse and Irving Avenues to westbound I-690 would also be put in place for use at a later stage. These improvements would result in three of the four new ramps that would ultimately comprise this interchange. These ramps would be open to traffic at the end of Phase 1 to redirect traffic destined for University Hill that would normally have used the Harrison Street ramps, which are proposed to be demolished toward the end of this phase.
- **New Intersection at MLK, Jr. East:** Between East Kennedy Street and MLK, Jr. East, the high-speed section of I-81 north of Brighton Avenue would transition to an arterial street with its first intersection at MLK, Jr. East. Once this connection has been completed during this phase, viaduct traffic traveling from points to the south would utilize this improvement to access Almond Street and the local street system. This transition area ultimately would become a permanent part of Almond Street. Construction of this new intersection at MLK, Jr. East is expected to occur throughout this phase. Construction work in this segment includes: reconstruction of the highway between the Colvin Street on-ramp and MLK, Jr. East; construction of the proposed Almond Street extension between MLK, Jr. East and Van Buren Street; replacement of the New York, Susquehanna, and Western Railroad Bridge; and relocation of the railroad tracks. The northbound side of the extended Almond Street would be constructed first. In addition, construction of the new railroad bridge adjacent to the existing bridge would begin. Once the northbound traffic on former I-81 can be redirected onto the new highway section and I-481 has been redesignated as I-81, demolition of the northbound section of the viaduct can begin. Then, once northbound traffic is diverted, construction to connect the southbound segment of the Almond Street extension to former I-81 can begin, which would allow completion of the remaining work on the southern portion of the Almond Street extension to former I-81 at its western edge.
- **Remove Existing I-81 Viaduct:** The entire existing viaduct between the New York, Susquehanna and Western Railway bridge at Renwick Street at the south end and the I-690 connector ramps at the north end would be closed down and demolished in several sub-stages toward the end of this phase, although it is not anticipated that demolition would be entirely completed until a subsequent phase of construction. As stated earlier, conversion of I-481 to I-81 must be completed and transitional access from the viaduct to Almond Street at MLK, Jr. East would need to be in place prior to actually initiating demolition of the viaduct.
- **Initiate Almond Street Construction:** Reconstruction of Almond Street would begin during this phase, and improvements would be initiated along its length in various sub-stages. The new intersection at MLK, Jr. East, which would be completed during this phase, would begin functioning as reconstructed Almond Street between MLK, Jr. East and Van Buren Street before this phase is completed. Although all or most of Almond Street would continue to be operational to traffic, certain traffic movements would be

restricted. Actual construction activity along Almond Street would not be completed during this phase, but would continue into future phases.

- **I-81 Northern Segment (Between West Street/Franklin Street at Interchange 20 and Route 370 West to Liverpool at Interchange 24):** Improvements to I-81 between Interchanges 20 and 24 are proposed to occur during this first phase of construction. This phase would include reconstruction, realignment, and/or other improvements of the four overpasses crossing the northern segment of I-81 (i.e., Butternut Street, Spencer Street, Court Street, and Bear Street) and any off-line construction work, including grading, widening, ramp realignments, and retaining walls that can be completed while maintaining the existing I-81 mainline and connector ramp capacity. The existing ramps connecting I-81 to Butternut/State, Franklin, Clinton, and Salina Streets would remain in place with minor modifications until the end of Phase 2B to facilitate traffic mitigation in Phases 2A and 2B.
- **Butternut Street Overpass:** Improvements and realignment of the Butternut Street overpass would be initiated and completed in Phase 1 to allow for future realignment of northbound I-81 in future phases.
- **I-690 Interchange 11 (West Street):** Although the majority of the I-690/West Street interchange, including various associated ramps, would be reconstructed in subsequent phases (2A and 2B) while I-690 is shut down, preparation activities required for those improvements are proposed during this first phase. Reconstruction of West Street to convert the existing overpass at Genesee Street to an at-grade intersection would be initiated. Temporary improvements proposed during this first phase to maintain interstate connectivity to and from local roadways include 1) construction of a temporary bypass to the north of the interchange along Evans Street to accommodate westbound I-690 traffic during subsequent phases; 2) construction of a temporary off-ramp from westbound I-690 to Bear Street; and 3) temporary widening to two lanes of the existing off-ramp from eastbound I-690 to Genesee Street.
- **Local Street Improvements:** A variety of temporary improvements and/or mitigation measures to local streets would be completed during this phase. Temporary improvements and/or mitigation measures to local streets would be completed during Phase 1 to handle diverted traffic during construction in subsequent phases. The temporary improvements include reconfigured travel lanes, added turn bays, temporary signals, street parking removals, and temporary ramp improvements between I-81 and local streets, and are summarized in **Table 4-4**. These improvements are also presented in **Figure 4-12**.

Table 4-4

Community Grid Alternative: Phase 1 Local Street Temporary Mitigation Measures and/or Improvements

Location	Temporary Mitigation Measures/Improvements
Northbound I-81 on-ramp from Pearl Street	Add second lane starting from the intersection of Pearl and Hickory Streets, continue both lanes
Intersection of Pearl and Hickory Streets	Install temporary signal
Intersection of Pearl and Hickory Streets	Restripe northbound approach to serve: 1) left turns; and 2) left turns, through traffic and right turns
Intersection of southbound I-81 off-ramp and Salina Street	Install temporary signal
Westbound Genesee Street between Franklin and Wallace Streets	Remove parking lane, provide two westbound travel lanes
Genesee and Wallace Streets	Restripe westbound approach to serve: 1) left turns and through traffic; and 2) through traffic and right turns
Genesee and Franklin Streets westbound approach	Remove parking (approx. 75') to create an auxiliary through lane
Genesee and Franklin Streets westbound approach	Restripe westbound approach to serve: 1) left turns and through traffic; and 2) through traffic and right turns
Erie Boulevard and State Street	Create a right-turn bay and restripe westbound approach to serve as: 1) left turn lane; 2) through traffic lane; and 3) dual right turn lanes
Erie Boulevard and Crouse Avenue	Restripe eastbound approach to serve: 1) dual left turns; and 2) through traffic and right turns
Crouse Avenue between Water Street and Erie Boulevard	Create a third northbound travel lane for a total width of five lanes in this section
Erie Boulevard and Crouse Avenue	Stripe northbound approach to serve: 1) left turns and through traffic; 2) through traffic; and 3) through traffic and right turns
Crouse Avenue and Water Street	Create a third northbound lane starting approx. 100 feet south of the northbound stop bar
Erie Boulevard and Crouse Avenue	Stripe northbound approach to serve: 1) left turns and through traffic; 2) through traffic; and 3) through traffic and right turns
Crouse Avenue between Erie Boulevard and eastbound on-ramp to I-690	Create a third northbound travel lane for a total width of lanes in this section
Crouse Avenue and eastbound on-ramp to I-690	Prohibit southbound left turns
Crouse Avenue and eastbound on-ramp to I-690	Restripe northbound approach to serve: 1) through traffic; 2) through traffic and right turns; and 3) right turns
Crouse Avenue and eastbound on-ramp to I-690	Provide two lanes from intersection continuing onto the interstate

Phase 2A—Eastbound I-690 Shutdown and Construction

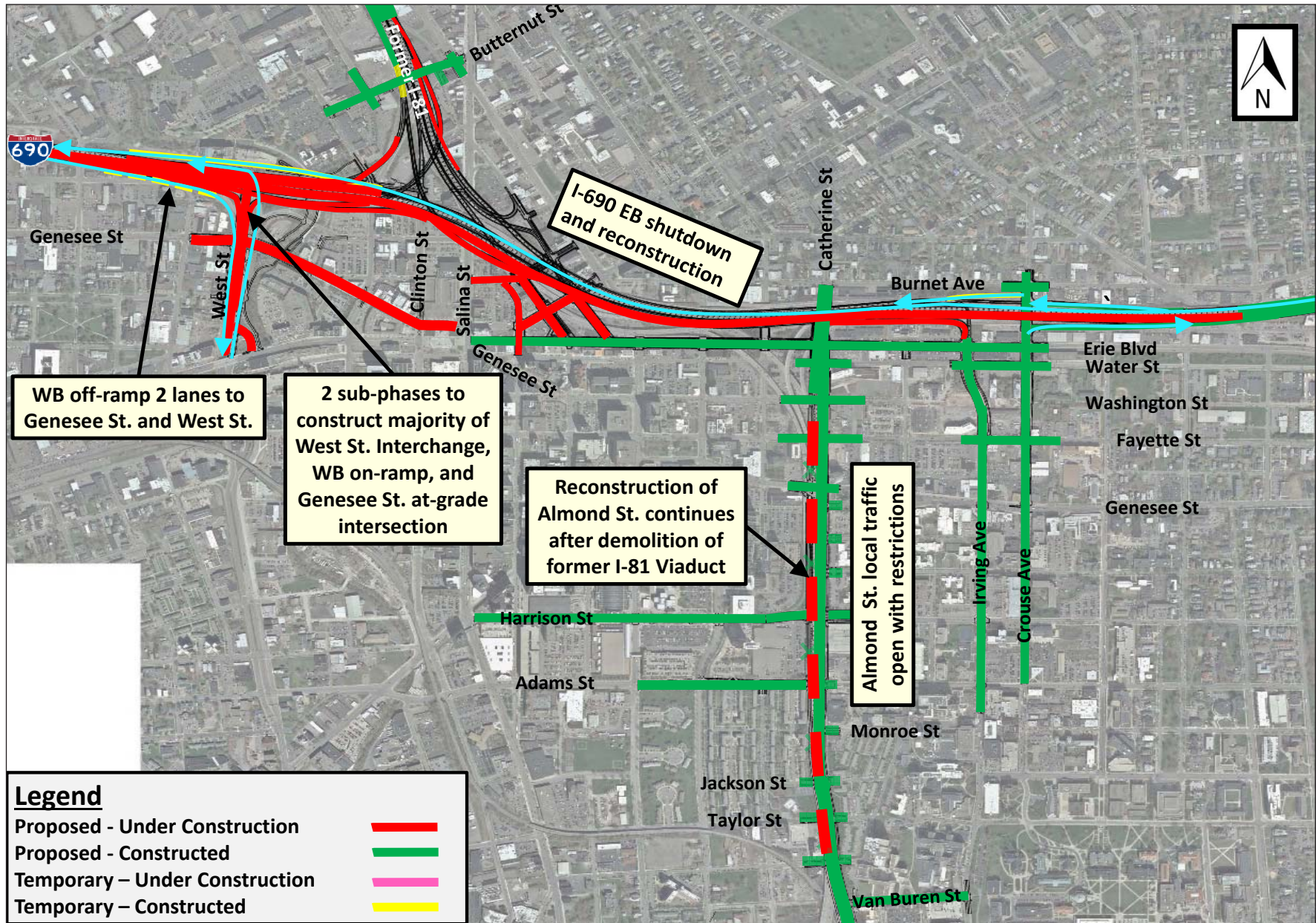
Phase 2A of the Community Grid Alternative would be essentially the same as Phase 2A for the Viaduct Alternative, in that it is proposed to take approximately 1½ years to complete, and focuses on reconstruction and realignment of eastbound I-690, improvements to interchange ramps, and various other improvements along eastbound I-690 between

Leavenworth Avenue (west of the West Street Interchange) and Beech Street (which is a slightly different eastern end point from the Viaduct Alternative). The I-690 improvements encompass a distance of approximately two miles. To facilitate these improvements, eastbound I-690 between West Street and Beech Street would be closed to traffic during this entire phase. All I-690 traffic from the west would need to exit at West Street and traffic heading east could re-enter I-690 at the new Crouse Avenue on-ramp. Westbound traffic would generally continue to use existing westbound I-690, while eastbound traffic would utilize local roadways during this phase. Specific improvements to be undertaken during Phase 2A are described below and are shown in **Figure 4-13**.

- **I-690 Interchange 11 (West Street) and Removal of the West Street Overpass:** The intent of the work to be performed at this location during Phase 2A is to fully construct eastbound I-690 and a portion of westbound I-690 in the vicinity of this interchange, as well as to partially construct the West Street/I-690 ramps that would ultimately be completed in Phase 2B. The work included in this phase includes 1) construction of eastbound I-690 in its entirety; 2) construction of westbound I-690 within the limits of the temporary bypass constructed during Phase 1; 3) construction of the proposed eastbound I-690 ramps to and from West Street/Genesee Street in their entirety; 4) partial construction of the proposed westbound I-690 ramps to and from West Street/Genesee Street; and 5) construction of the West Street/Genesee Street intersection in its entirety except for the future parking area on the west side.
- **Continue Almond Street Construction:** Construction along Almond Street would likely continue with somewhat restricted traffic access during Phase 2A.
- **I-81 Northern Segment (Between Clinton Street/Salina Street at Interchange 19 and Route 370 West to Liverpool at Interchange 24):** The intent of the work in this phase is to complete any off-line construction, including grading, widening, ramp realignments, and retaining walls that can be completed while maintaining the existing I-81 mainline and connector ramp capacity, and to begin reconstruction and realignment of the mainline. Reconstruction of the mainline would be phased by shifting traffic onto widened sections constructed in Phase 1. During construction, a minimum of three lanes of traffic in both directions would be maintained and all existing ramps would be maintained throughout the duration of this phase.

Phase 2B—Westbound I-690 Shutdown and Construction

As the third and final phase of construction, Phase 2B of the Community Grid Alternative is essentially the same as Phase 2B for the Viaduct Alternative, in that it is proposed to take approximately 1½ years to complete, and focuses on reconstruction and realignment of westbound I-690, improvements to interchange ramps, and various other improvements along westbound I-690 between Leavenworth Avenue (west of the West Street Interchange) and Beech Street (which is a slightly different eastern end point from the Viaduct Alternative). The I-690 improvements encompass a distance of approximately two miles. In order to facilitate these improvements, westbound I-690 would be closed to traffic during this entire phase. This phase and its associated shutdown of westbound I-690 would not occur until Phase 2A is completed and the newly reconstructed eastbound I-690 lanes became operational and temporarily available for use by westbound traffic only. Eastbound



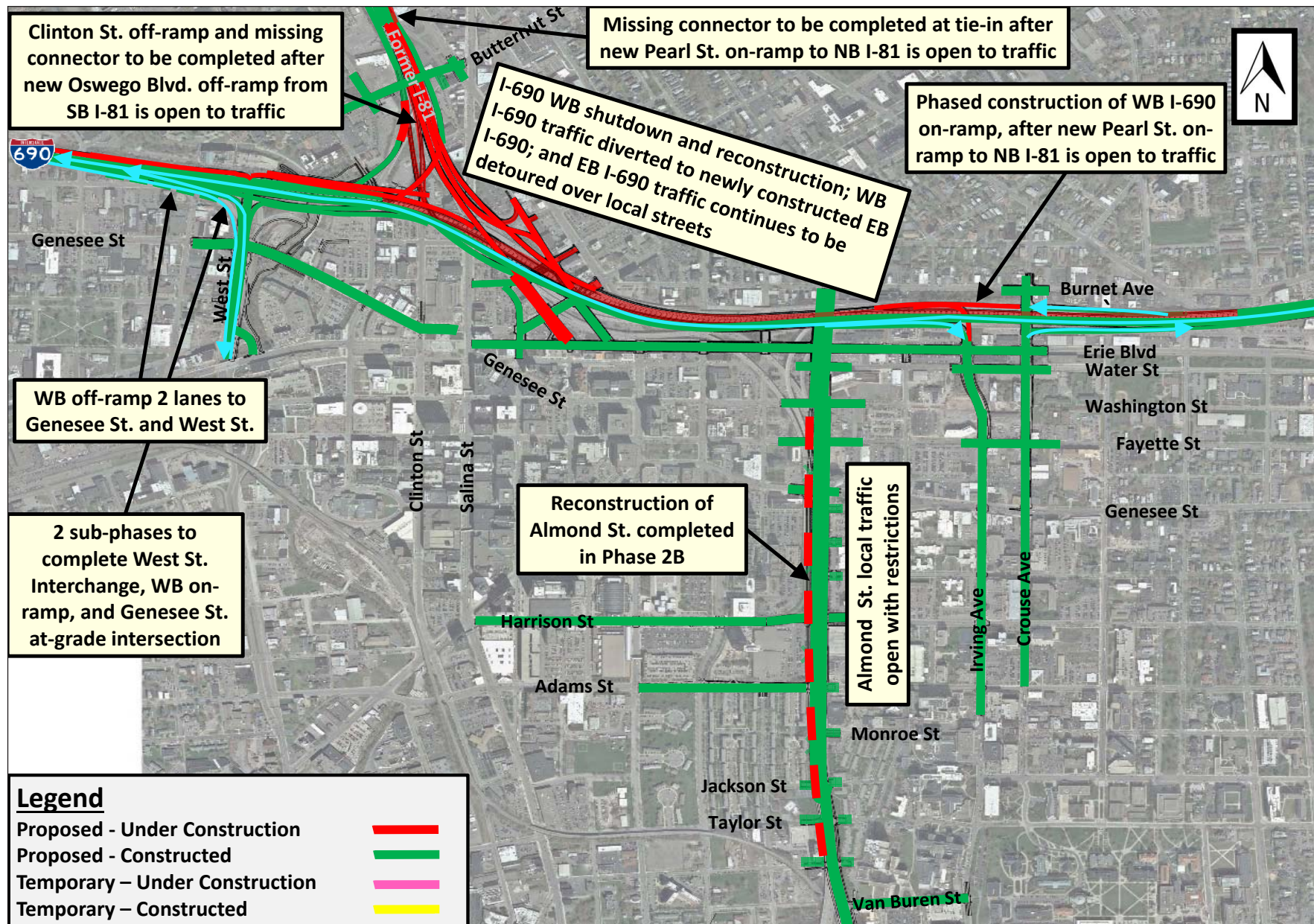
Community Grid Alternative –
Phase 2A Closure and Construction of I-690 Eastbound
Figure 4-13

traffic would continue to utilize local roadways during this phase. Specific improvements to be undertaken during Phase 2B are described below and are shown in **Figure 4-14**.

- **I-690 Interchange 11 (West Street) and Removal of the West Street Overpass:** The intent of the work at this location during Phase 2B is to complete and fully open the West Street interchange. Construction of the remaining portions of the I-690/West Street interchange, including proposed ramp improvements associated with westbound I-690, would be completed during this phase. Once westbound traffic can be placed on the new westbound section near the end of this phase, then any remaining work on the median edge of eastbound I-690 would be completed to the permanent condition. West Street reconstruction would also be completed during this phase once the new West Street to westbound I-690 on-ramp is opened. The realigned Evans Street and bridge would also be constructed while completing westbound I-690 near the West Street interchange area.
- **New Pearl Street On-Ramp:** Early in this phase, the new northbound I-81 Pearl Street on-ramp and the Pearl Street improvements between E. Willow Street and the ramp intersection would be constructed. The existing Pearl Street ramp must remain open until traffic can be placed onto the new ramp, so construction would need to be staged, with lane shifting as necessary. As soon as existing westbound I-690 is closed to traffic, the remaining portion of the Pearl Street extension to Erie Boulevard would be constructed.
- **New Oswego Boulevard Off-Ramp:** As soon as existing westbound I-690 is shut down and demolished, the new southbound I-81 to Oswego Boulevard off-ramp between westbound I-690 and Erie Boulevard would be constructed. Until traffic can utilize the new Oswego Boulevard off-ramp, the Clinton Street exit and temporary ramp to Salina Street must remain open. As soon as the new Oswego Boulevard off-ramp can be opened to traffic, the temporary Salina Street ramp can be closed. Using staged construction and lane shifting as necessary, the Clinton Street off-ramp can be constructed to its final configuration. Once all work is completed on both the Clinton Street off-ramp and the Oswego Boulevard off-ramp, the existing southbound I-81 exit to Butternut Street can be removed.
- **Complete I-81 Northern Segment (I-690 to West Street/Franklin Street at Interchange 20):** The remaining reconstruction of the northern segment of former I-81 would be completed during this phase. After the new Pearl Street and Oswego Boulevard ramps are in place and open to traffic, existing ramps at Franklin Street and Butternut Street/State Street would be removed, which would allow the two proposed missing connectors to and from I-81 and I-690 to be completed at their connections with the I-81 Northern Segment.
- **Complete Almond Street Construction:** Construction along Almond Street would continue during this phase to completion and full operation.

MAINTENANCE AND PROTECTION OF TRAFFIC (MPT)

MPT during construction is closely linked to the project phasing described above. Whereas the above subsection presents the physical improvements proposed to be undertaken during



Community Grid Alternative –
Phase 2B Closure and Construction of I-690 Westbound
Figure 4-14

each of the three construction phases for the Community Grid Alternative, this subsection presents information regarding the movement of traffic during construction. It should be noted that traffic demand management (TDM) techniques can potentially be used to aid in managing the movement of traffic during construction, but these techniques are not specifically discussed in the phased MPT discussions that follow. A variety of TDM techniques that could be used during construction would be evaluated during final design and are discussed further in **Chapter 5, Transportation and Engineering Considerations**.

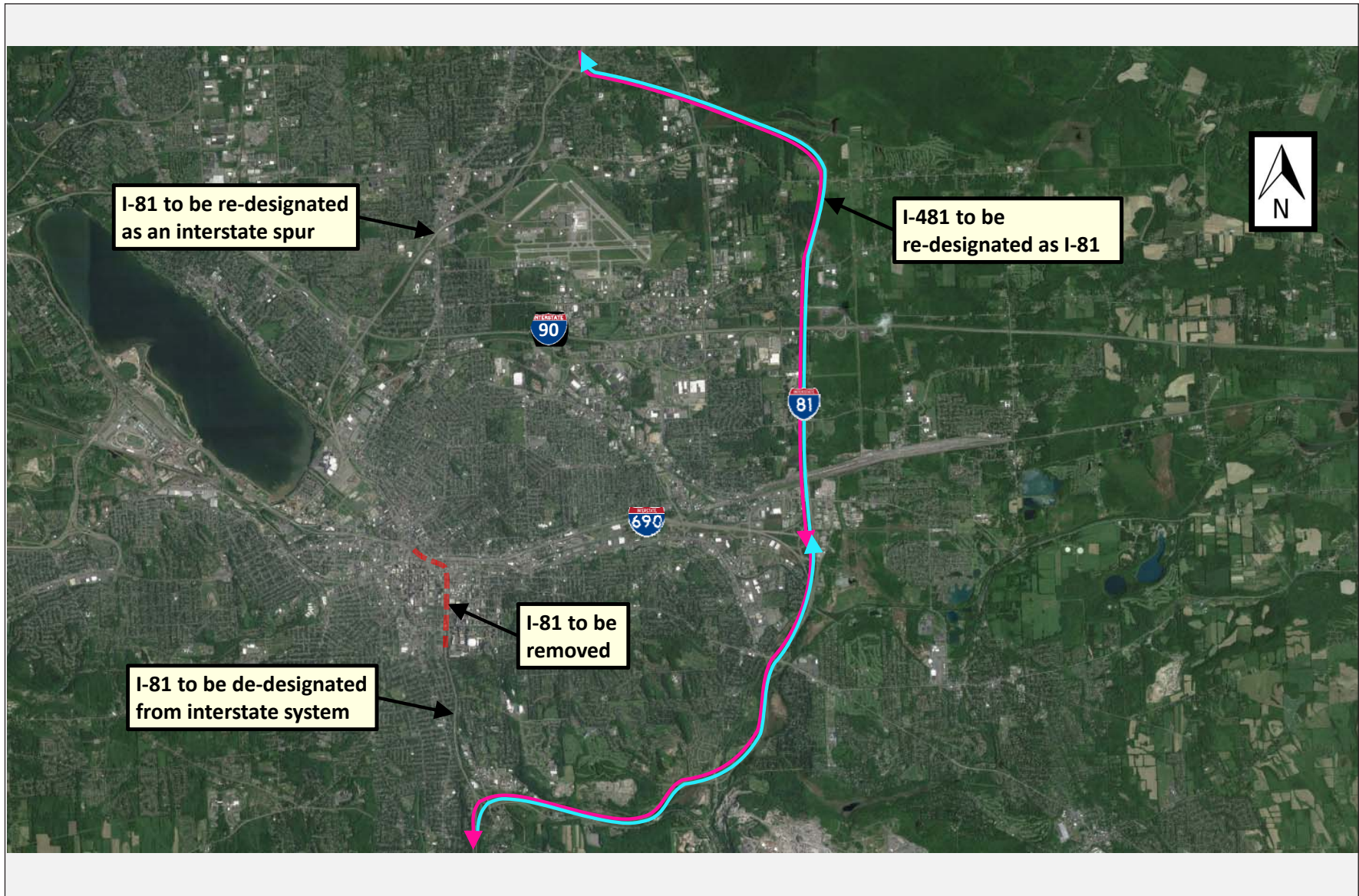
Phase 1—Preparatory Phase

Figure 4-15 presents the proposed new Phase 1 traffic pattern with the Community Grid Alternative that would be created for existing I-81 through traffic in the long term and that could begin once the de-designation of existing I-81 and the re-designation of I-481 to the new I-81 are completed in Phase 1. The shift of north-south through traffic from the existing I-81 route through the city to the newly redesignated I-81 route around the city would also help to reduce the amount of traffic movements through the city during future phases when the viaduct carrying former I-81 is being demolished.

Figure 4-16 presents the specific traffic detours and/or shifts anticipated in the Downtown area as part of the Community Grid Alternative.

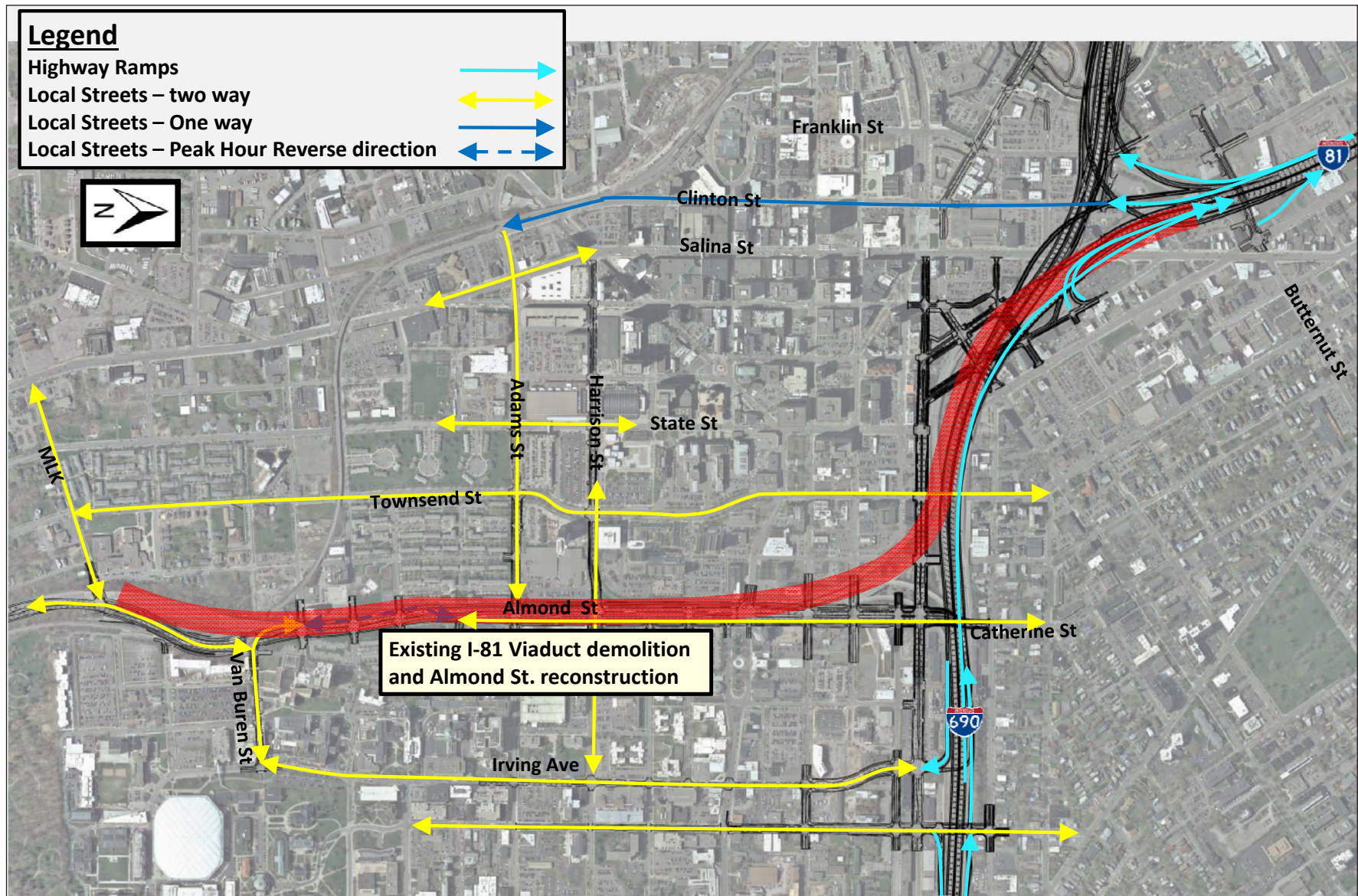
Specific improvements to be undertaken during Phase 1 include the following:

- **I-81/I-481 North Interchange (Interchange 29):** These improvements would consist of a complete reconstruction and reconfiguration of this interchange. During construction, a minimum of two lanes of traffic in each direction would be maintained and all ramp connections would remain open through the use of phased construction and temporary widening. Demolition of northbound I-481 to existing northbound I-81 and existing southbound I-81 to existing southbound I-481 ramps would be completed utilizing shoulder closures.
- **I-81/I-481 South Interchange (Interchange 16):** These improvements would consist of a complete reconstruction and reconfiguration of this interchange. During construction, a minimum of two lanes of traffic in each direction would be maintained and all ramp connections would remain open through the use of phased construction and temporary widening. The East Brighton Road Bridge would be replaced using staged construction. Demolition of northbound I-481 to existing northbound I-81 and existing southbound I-81 to existing southbound I-481 ramps would be completed utilizing shoulder closures.
- **I-481 Corridor:** These improvements would involve the addition of a third (auxiliary) lane to the existing I-481 corridor at two locations: 1) in each direction between I-690 (Interchange 4) and Kirkville Road (Interchange 5); and 2) in the northbound direction between Kirkville Road (Interchange 5) and I-90 (Interchange 6). The majority of work would likely be carried out utilizing shoulder closures with occasional lane closures during off-peak hours to facilitate delivery of materials and equipment.



Community Grid Alternative – MPT Phase 1 Existing I-81 Through Traffic Shifts to Newly Re-Designated I-81 (Existing I-481)

Figure 4-15



Community Grid Alternative – MPT Phase 1 Downtown Traffic Detours

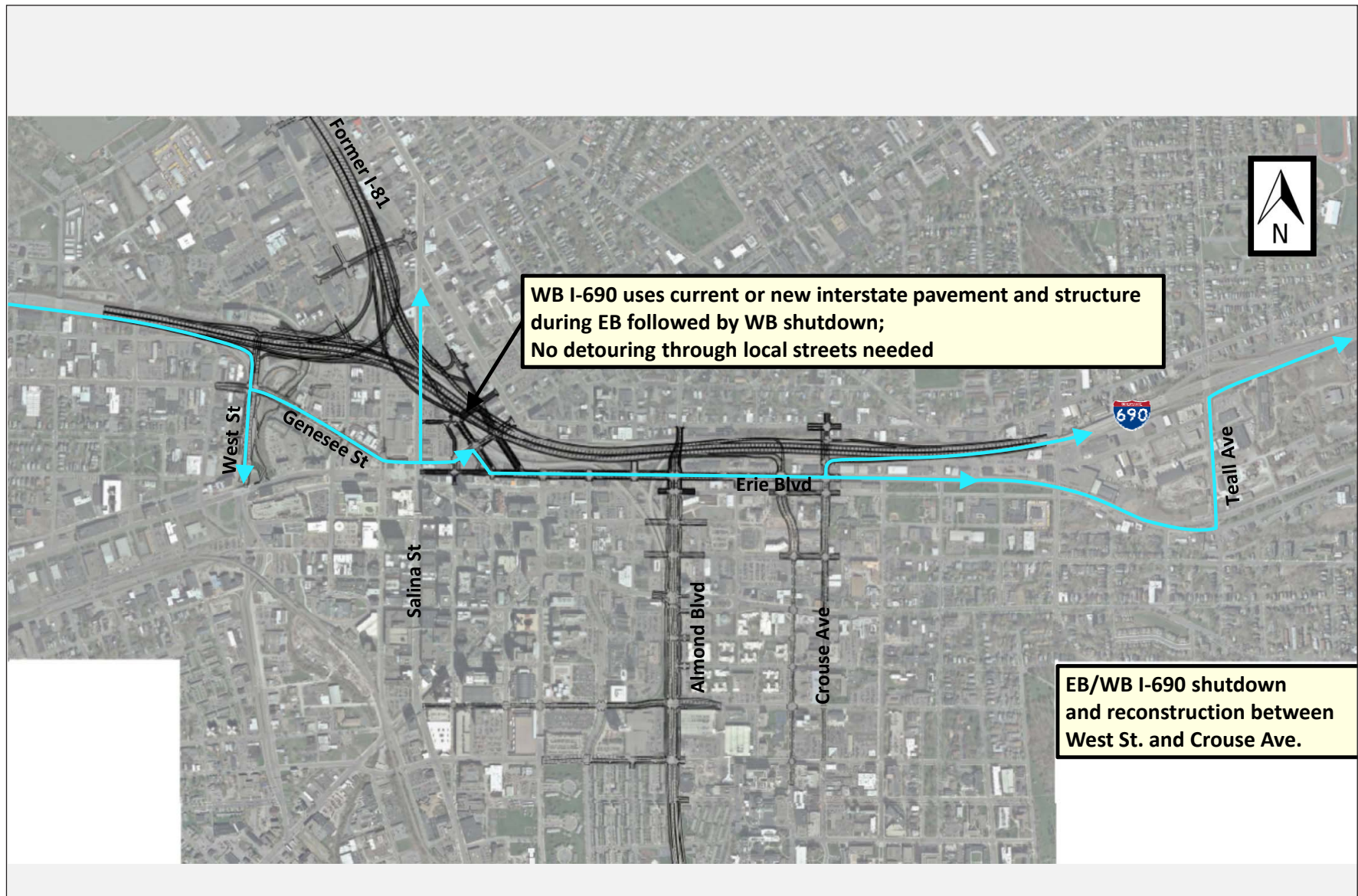
- **Construct I-690/Crouse and Irving Avenues Interchange:** During this phase, three of the four new ramps at this new interchange would be constructed. The ramps to and from the east on I-690 would be permanent construction while a temporary westbound on-ramp from Crouse Avenue would also be constructed. During ramp construction, travel lane shifting and shoulder closures on I-690 would be used. Also during this phase, Crouse Avenue and Irving Avenue would be converted to two-way streets using phased construction. The new extension of Irving Avenue between Fayette Street and Erie Boulevard would be completed by the end of Phase 1. Local traffic maintenance at the vicinity of this new interchange and along Crouse and Irving Avenues is planned as follows: 1) one-way northbound traffic would be maintained on Crouse Avenue between Adams and Canal Streets; 2) one-way southbound traffic would be maintained on Irving Avenue at various sections with sequenced sub-phases; 3) restricted traffic movements and travel lane shifting are expected during construction along Crouse and Irving Avenues, as well as the cross streets and intersections within the vicinity; and 4) existing parking spaces along Crouse and Irving Avenues would be used for travel lane shifting during construction.
- **New Intersection at MLK, Jr. East:** Construction of this new intersection is expected to occur throughout this phase. The intersection includes reconstruction of the highway between the Colvin Street on-ramp and MLK, Jr. East; construction of the proposed Almond Street extension between MLK, Jr. East and Van Buren Street; and replacement of the railroad bridge and relocation of the railroad tracks. During this phase, Renwick Avenue and the portion of Fineview Place between Renwick Avenue and East Raynor Avenue would be permanently closed. The elementary school driveway access on MLK, Jr. East would be maintained throughout construction. As work progresses along this section, existing I-81 traffic through Downtown Syracuse is expected to be gradually transitioned to the new Almond Street extension. For the majority of Phase 1, I-81 traffic would not be impacted, except for minor lane shifting in the northbound direction between Colvin Street and MLK, Jr. East, to allow for partial construction of the Almond Street extension tie-in. Once I-481 has been converted to I-81, then the northbound traffic on former I-81 could be redirected onto the new Almond Street extension. Once this northbound traffic is redirected, demolition of the northbound section of the viaduct can begin. This would also allow construction to proceed with connecting the southbound segment of the Almond Street extension to former I-81. After the southbound section of the Almond Street extension is opened to traffic, demolition of the southbound portion of the viaduct carrying former I-81 could begin.
- **Remove I-81 Viaduct:** Demolition of the viaduct carrying former I-81 is sequenced with construction of the new MLK, Jr. East intersection and the Almond Street southern extension along Renwick Avenue. As work progresses along the Almond Street southern extension, I-81 traffic through Downtown Syracuse is expected to be gradually transitioned to this newly established arterial route. Motorists traveling in the northbound and southbound directions could use the newly opened and constructed Almond Street to access the local streets while demolition takes place. Northbound I-81 and its associated ramps would be replaced and demolished first, followed by southbound I-81 and its associated ramps. The final portions of the southbound I-81

viaduct, the connector ramp from westbound I-690 to southbound I-81, and the Harrison Street off-ramp would be demolished in the last sub-stage of Phase 1.

- **Initiate Almond Street Construction:** The eastern side of Almond Street between Genesee Street and Burnet Street can be initiated.
- **Butternut Street Overpass:** Butternut Street bridge would be completed during this phase. Genant Drive south of West Division Street would become a dead-end street, open to local traffic only. The portion of Genant Drive between North Clinton Street and the sharp curve to the east of North Clinton Street would be permanently closed. The portion of Genant Drive between Franklin Street and North Clinton Street and the southern portion of North Clinton Street would be restricted to local traffic only during construction, while access to the business adjacent to the Genant Drive/North Clinton Street intersection would remain open at all times. At the east end of the new Butternut Street bridge, the existing northbound entrance ramp to I-81 must remain open so that the work in the vicinity of Butternut Street, Salt Street, Salina Street, and State Street could be phased by shifting traffic and local detours.
- **I-81 Northern Segment (Between West Street/Franklin Street at Interchange 20 and Route 370 West to Liverpool at Interchange 24):** East-west traffic across I-81 would be maintained at all times, either through the use of staged construction of individual bridges or by keeping at least two of the four bridges open to traffic at any one time. During specific bridge closures, traffic would need to use local streets such as Clinton Street, Sunset Avenue, State Street, Genant Drive, and Salina Street. The need to remove and replace the existing retaining wall along I-81 near State Street would not affect the ability to maintain east-west movement of traffic across I-81 at any time.
- **Local Street Improvements:** In addition to the improvements at Crouse and Irving Avenues, improvements to other local and cross streets would take place during this phase as well. Traffic movement restrictions and travel lane shifting, as well as sequenced construction, are expected through the end of this phase in order to upgrade the local grid as soon as possible to support future phases of construction. Major local streets to be reconstructed to various extents during this phase include Erie Boulevard, Harrison Street, Almond Street, Canal Street, and Van Buren Street, among others. Construction of many local streets are not expected to achieve their final conditions until the end of this Project, as multiple temporary traffic mitigation procedures would be implemented during construction (see details in **Table 4-4**).

Phase 2A—Eastbound I-690 Shutdown and Construction

During this phase, eastbound I-690 would be closed between West Street and Crouse Avenue, and all eastbound traffic would be diverted to local roads that would have been improved during Phase 1. Major local street routes anticipated to handle diverted traffic in direct response to the eastbound I-690 shutdown include West Street, Genesee Street, and Erie Boulevard to North Crouse Avenue or Teall Avenue. Westbound I-690 traffic, however, would generally continue to use I-690 during this phase. Specific MPT elements that would be put in place during this phase are shown in **Figure 4-17**.



Community Grid Alternative – MPT Phase 2A/2B Detours of I-690 Eastbound Traffic

Figure 4-17

- **I-690 Interchange 11 (West Street) and Removal of the West Street Overpass:** Westbound I-690 traffic would shift to the two-lane temporary bypass along Evans Street to allow construction of the new eastbound structure through this area. Other ramps would be closed or modified, including the following:
 - West Street Entrance Ramp to Eastbound I-690: This ramp would be closed starting early in Phase 2A, together with the spur to Herald Place. Motorists would generally use the same detour routes described in the above introductory discussion of eastbound I-690 shutdown and construction traffic.
 - Westbound I-690 Exit Ramp to West Street: This ramp would be closed as soon as westbound I-690 traffic switches to the temporary bypass. Vehicles traveling from the east would either use the previous exit to Crouse Avenue or the next exit to the temporary Bear Street off-ramp, then follow the local street system to various Downtown destinations.
 - Eastbound I-690 Exit Ramp to West Street: This ramp would serve as the last access point for Downtown traffic during the I-690 shutdown and therefore would need to stay open throughout Phases 2A and 2B. Two lanes of traffic would be maintained with modified configuration and phased construction using the existing spur to Genesee Street that would be temporarily widened in the previous phase, until the new ramp could be opened during Phase 2B.
 - West Street Entrance Ramp to Westbound I-690: This ramp would serve as the first interstate access point for motorists traveling westerly from Downtown and the University Hill area during I-690 shutdown and, therefore, would need to stay open with two-lane capacity throughout Phases 2A and 2B. Modified configuration and phased construction are proposed in this area. In this regard, the on-ramp would maintain its existing route during the early part of this phase, with widening to the inside core area proceeding in order to give sufficient room to accommodate the westbound bypass, and then switching the new eastbound I-690 traffic to the West Street off-ramp as a temporary access route once this new ramp and associated eastbound I-690 are in place. This switch clears out the last stream of live traffic going through the middle of the West Street interchange area, and allows completion of the flipped interchange configuration.
 - West Street: West Street would remain open in both directions during the I-690 shutdown using phased construction. However, traffic lane modifications and restrictions would occur during reconstruction, first to the southbound lanes followed by the northbound lanes, in order to remove the bridges and embankments. The existing auxiliary road pavement of West Street from Genesee Street to Tracy Street would be used to accommodate West Street southbound traffic during Phase 2A.
- **Continue Almond Street Construction:** Some of the remaining unimproved portions of Almond Street would continue to be constructed in Phase 2A. Traffic along Almond Street may be redirected during this phase to the local street system, especially those

local streets improved during Phase 1, and/or shifted to the other side of Almond Street where construction is not ongoing at the time.

- **I-81 Northern Segment (Between Clinton Street/Salina Street at Interchange 19 and Route 370 West to Liverpool at Interchange 24):** I-81 northern segment widening and realignment would be initiated during this phase. Sequenced construction and lane shifting would be utilized to maintain a minimum of three through lanes of traffic in each direction in this area throughout this phase. The existing access ramps from Butternut Street to northbound I-81 and from southbound I-81 to Franklin, Clinton and Salina Streets would be maintained and open to traffic with minor modifications until the section of I-81 through Downtown Syracuse is reconstructed and open to traffic.

Phase 2B—Westbound I-690 Shutdown and Construction

During this phase, westbound I-690 traffic would be placed on the newly constructed eastbound I-690 lanes while westbound I-690 is closed for construction during this phase. Eastbound I-690 traffic would continue to use the detour route that would be in place during the previous phase (see **Figure 4-17**). Specific MPT elements that would be put in place during this phase are presented below.

- **I-81 Northern Segment (Between I-690 and West Street/Franklin Street at Interchange 20):** The remaining reconstruction work along the northern segment of former I-81 would be completed during this phase. A minimum of three travel lanes in each direction would be maintained throughout construction using sequenced construction and lane shifting. The remaining ramp consolidation work would be completed after traffic is able to use the new Pearl Street and Oswego Boulevard ramps constructed during this phase. Minor travel lane shifting and shoulder closures on former I-81 could be expected within this area of construction.
- **I-690 Interchange 11 (West Street) and Removal of the West Street Overpass:** Once westbound traffic can be placed on the new westbound section near the end of this phase, then any remaining work on the median edge of eastbound I-690 would be completed to the permanent condition. West Street reconstruction would also be completed during this phase once the new West Street to westbound I-690 on-ramp is opened. The realigned Evans Street and bridge could also be constructed while completing westbound I-690 near the West Street interchange area.
- **New Pearl Street On-Ramp:** During construction, the existing Pearl Street ramp would remain open, with two-lane capacity, at all times until the functionality can be replaced by the new ramp. The existing Butternut Street/State Street on-ramp to northbound I-81 must remain in place until the new Pearl Street on-ramp can be opened to traffic.
- **New Oswego Boulevard Off-Ramp:** During construction of the new Oswego Boulevard off-ramp in this phase, traffic from former I-81 southbound would continue to use the existing off-ramps with modifications: 1) temporarily realigned Salina Street off-ramp; 2) temporary connection from the newly widened former southbound I-81 to the existing Franklin/Butternut Street off-ramp; and 3) temporarily widened Clinton

Street off-ramp to a two-lane width to access the Downtown area until the new ramp can be opened to traffic.

- **Complete Almond Street Construction:** The remaining portions of Almond Street would be completed. Traffic along Almond Street could be redirected during this phase to the local street system, especially those local streets improved during Phase 1, and/or shifted to the other side of Almond Street where construction is not ongoing at the time.

CONSTRUCTION MEANS AND METHODS

This section describes the primary means and methods to construct the Community Grid Alternative. As stated in **Section 4.1**, the development of specific construction means and methods generally depends on the Contractor. Therefore, the construction means and methods related to staging areas; office/administrative and support space; disposal and borrow sites; concrete batch plants; existing bridge demolition; new bridge substructure construction; and new bridge superstructure construction discussed below identify some of the factors that the Contractor may consider.

Most of the construction means and methods related to the Community Grid Alternative are identical or similar to those presented for the Viaduct Alternative. Therefore, the various means and methods discussions presented below primarily refer back to the Viaduct Alternative discussion, although any differences are specifically identified.

Construction Staging Areas

The discussion of construction staging areas presented for the Viaduct Alternative is also applicable to the Community Grid Alternative.

Office/Administrative and Support Space

The discussion of office/administrative support space presented for the Viaduct Alternative is also applicable to the Community Grid Alternative.

Disposal and Borrow Sites

The discussion of disposal and borrow sites presented for the Viaduct Alternative is also applicable to the Community Grid Alternative.

Concrete Batch Plant

The discussion of concrete batch plant presented for the Viaduct Alternative is also applicable to the Community Grid Alternative.

Bridge and Buildings Demolition

The discussion of bridge and buildings demolition related to the I-81 viaduct and the I-690 mainline and associated interchange ramps presented for the Viaduct Alternative is also generally applicable to the Community Grid Alternative, with two differences. One difference is the construction sequencing related to demolition of the I-81 viaduct south of Erie Boulevard, which would be more simplified for the Community Grid Alternative since a new replacement viaduct would not need to be constructed. This would provide more flexibility in terms of the siting of staging areas and the duration of construction.

The second difference is that fewer existing buildings would be required for right-of-way acquisition and demolition for the Community Grid Alternative than for the Viaduct Alternative. At present, it is anticipated that five buildings would be acquired and demolished for this alternative.

New Bridge Substructure Construction

The discussion of new bridge substructure construction presented for the Viaduct Alternative is also generally applicable to the Community Grid Alternative. However, the discussion of new bridge substructure construction for this alternative is only applicable to the I-690 portion of the Project, since this alternative does not require reconstruction of the I-81 viaduct once it has been demolished. In contrast, the Viaduct Alternative requires new bridge substructure construction for both the reconstruction of the I-81 viaduct and I-690 and its associated ramps.

New Bridge Superstructure Construction

The discussion of new bridge superstructure construction presented for the Viaduct Alternative is also generally applicable to the Community Grid Alternative. However, the discussion of new bridge superstructure construction for this alternative is only applicable to the I-690 portion of the Project, since this alternative does not require reconstruction of the I-81 viaduct once it has been demolished. In contrast, the Viaduct Alternative requires new bridge superstructure construction for both the reconstruction of the I-81 viaduct and I-690 and its associated ramps.

CONSTRUCTION EQUIPMENT AND EMPLOYMENT

Table 4-5 provides a breakdown of the major types of equipment that could be used on-site to construct the Community Grid Alternative. The equipment listed primarily relates to the heavy civil and structural activities associated with the Project (e.g., demolition, superstructure construction and earthworks), and which could have the greatest effect in terms of air emissions, particulates, and/or noise generation.

For each equipment type, **Table 4-5** lists engine type (diesel, gasoline or electric); engine size (horsepower); the number of each equipment type to be employed; the percentage of time during a typical eight-hour workday that each equipment type would likely be in use; and the percentage of time that each equipment type would likely be in use during the duration of each task.

As shown in **Table 4-5**, essentially all demolition, superstructure construction, and earthwork activities associated with the Community Grid Alternative would begin early in the construction period and continue throughout. The only exception to this is the use of a backhoe loader during earthworks, which only spans a seven-month period during Phase 2A.

Table 4-5
Community Grid Alternative: Construction Equipment

Work Task	Start Date	End Date	Equipment Type	Engine type	Size (hp)	Qty	Daily Use*	Average Use**
Demolition	Month 1	Month 60	Hyd. Excavator, 1 C.Y.	Diesel	150	2	85%	4%
Demolition	Month 1	Month 60	Backhoe Loader, 48 H.P.	Diesel	48	2	85%	1%
Demolition	Month 1	Month 60	Backhoe Loader, 80 H.P.	Diesel	80	6	85%	6%
Demolition	Month 1	Month 60	Vibrating Plate, Gas, 21"	Gasoline	5	1	50%	1%
Demolition	Month 1	Month 60	Lead, 90' high	N/A	-	1	85%	7%
Demolition	Month 1	Month 60	Conc. Hammer Attach.	N/A	-	4	85%	9%
Demolition	Month 1	Month 60	Dump Truck, 12 C.Y., 400 H.P.	Diesel	400	1	85%	9%
Demolition	Month 1	Month 60	Cutting Torch	N/A	-	4	80%	10%
Demolition	Month 1	Month 60	Welder, Gas Engine, 300 amp	Gasoline	300A	1	85%	2%
Demolition	Month 1	Month 60	Lattice Boom Crane, 150 Ton	Diesel	300	1	85%	4%
Demolition	Month 1	Month 60	Acetylene Torches, 5 ", 1/2" weld size	N/A	-	2	20%	4%
Superstructure	Month 1	Month 60	Concrete Bucket, 1 C.Y.	N/A	-	2	85%	7%
Superstructure	Month 1	Month 60	Concrete Pump (Small)	Diesel	400	2	100%	19%
Superstructure	Month 1	Month 60	Concrete Vibrator	Electric	20A	4	70%	36%
Superstructure	Month 1	Month 60	Lead, 90' high	N/A	-	5	85%	33%
Superstructure	Month 1	Month 60	Hammer, Diesel, 41k ft-lb	Diesel	220	2	90%	34%
Superstructure	Month 1	Month 60	Cutting Torch	N/A	-	7	80%	40%
Superstructure	Month 1	Month 60	Pickup Truck, 3/4 Ton	Diesel	300	12	100%	22%
Superstructure	Month 1	Month 60	Welder, Gas Engine, 300 amp	Gasoline	300A	7	85%	41%
Superstructure	Month 1	Month 60	Crawler Crane, 75 Ton	Diesel	250	4	100%	15%
Superstructure	Month 1	Month 60	Lattice Boom Crane, 150 Ton	Diesel	300	4	85%	12%
Superstructure	Month 1	Month 60	Hyd. Crane, 25 Ton	Diesel	250	2	85%	8%
Superstructure	Month 1	Month 60	Hyd. Crane, 55 Ton	Diesel	300	2	85%	7%
Superstructure	Month 1	Month 60	S.P. Crane, 4x4, 12 Ton	Diesel	200	1	35%	30%
Superstructure	Month 1	Month 60	Hand Tools	Electric	20A	30	85%	30%
Superstructure	Month 1	Month 60	Acetylene Torches, 5 ", 1/2" weld size	N/A	-	5	20%	20%
Earthworks	Month 1	Month 60	Hyd. Excavator, 1 C.Y.	Diesel	150	5	85%	4%
Earthworks	Month 1	Month 60	Hyd. Excavator, 3.5 C.Y.	Diesel	200	4	85%	8%
Earthworks	Month 13	Month 18	Backhoe Loader, 48 H.P.	Diesel	48	1	85%	33%
Earthworks	Month 1	Month 60	Vibrating Plate, Gas, 21"	Gasoline	5	1	50%	12%
Earthworks	Month 1	Month 60	Dozer, 300 H.P.	Diesel	300	1	85%	29%
Earthworks	Month 1	Month 60	Loader, Skid Steer, 30 H.P.	Diesel	30	1	85%	42%
Earthworks	Month 1	Month 60	Dump Truck, 12 C.Y., 400 H.P.	Diesel	400	20	85%	47%
Earthworks	Month 1	Month 60	Light Truck, 1.5 Ton	Diesel	450	1	100%	20%
Notes: *Daily Usage Percentage = Percentage of time that the equipment is in use during a typical 8-hour workday. Example: 75% daily use equals 75% of an 8-hour workday or 6 hours. **Average Use Percentage = Percentage of time that the equipment is in use during the duration of the task. Example: For a task that lasts 4 quarters, 50% average use means that the equipment is in use half the time during the 4-quarter construction period, or 2 quarters.								

One of the factors used to estimate the on-site construction equipment and their durations of use is the number of on-site staff-hours by category of worker involved in constructing the heavy civil and structural elements of the Project. Estimates were developed based on the expertise and experience of construction estimators and various factors typically used by such estimators, and were primarily used to develop the number of hours of heavy vehicle usage and construction activities that could have the greatest effect on air quality and noise.

The estimates only relate to the Contractor's on-site construction workers directly involved in the actual demolition and/or construction of the Project. Staff-hours associated with ancillary functions such as office/administrative work, material deliveries, construction inspection, construction management, landscaping, design engineering, safety oversight, and various vendor activities have not been estimated. In addition, the indirect and induced employment associated with manufacture of materials to be used on-site, shipping of materials, and local services to accommodate the construction workers have not been estimated.

The number of construction staff-hours anticipated to be generated by the Community Grid Alternative during the five-year construction period has been estimated and is presented in **Table 4-6**. The table presents staff-hours related to both on-site demolition and construction activities. As shown in the table, 877,982 staff-hours spread across the three construction phases and five years of total construction are estimated for this alternative. Of this total, 396,960 staff-hours would be involved in bridge demolition activities while 481,022 staff-hours would be involved in new construction activities. A further split of these numbers by individual construction phase is also presented in the table.

Assuming a standard work year of 2,080 hours (40 hours per week for 50 weeks per year), the overall staff-hour total related to on-site workers performing heavy civil and structural construction activities for the entire Project translates to an equivalent of more than 422 staff-years of employment.

CONSTRUCTION-RELATED PUBLIC OUTREACH

The Contractor would be required to prepare an approved communication and outreach plan for implementation throughout the construction period. The typical components that could be expected for the plan for the Community Grid Alternative would be essentially identical to those described previously for the Viaduct Alternative.

Table 4-6

Community Grid Alternative: Construction Staff-Hours and Staff-Years Generated

Description	Construction Staff-Hours				Demolition Staff-Hours				Total
	1	2A	2B	Total	1	2A	2B	Total	
Carpenters	12,665	54,802	53,976	121,443	10,336	7,752	7,752	25,840	147,283
Concrete Finishers / Masons	2,255	9,661	9,241	21,157	-	-	-	-	21,157
Common Building Laborers	9,637	35,005	32,426	77,068	62,948	47,211	47,211	157,369	234,437
Equipment Operators, Crane or Shovel	3,149	8,001	7,862	19,012	3,752	2,814	2,814	9,380	28,392
Equipment Operators, Light Equipment	517	1,585	978	3,080	-	-	-	-	3,080
Equipment Operators, Medium Equipment	962	4,455	3,593	9,010	29,570	22,177	22,177	73,924	82,934
Equipment Operators, Oilers	960	4,153	4,071	9,184	1,468	1,101	1,101	3,669	12,853
Helpers Average (5 trades)	571	2,734	3,605	6,910	5,870	4,403	4,403	14,676	21,586
Pile Drivers	2,761	12,181	11,439	26,381	-	-	-	-	26,381
Rodmen (Reinforcing), Foreman	1,987	8,962	8,571	19,520	-	-	-	-	19,520
Rodmen (Reinforcing)	6,093	30,521	30,211	66,825	-	-	-	-	66,825
Rodmen (Reinforcing), Apprentice	1,987	8,962	8,571	19,520	-	-	-	-	19,520
Skilled Workers Average (35 trades)	33	768	1,034	1,835	28,614	21,460	21,460	71,534	73,369
Structural Steel Workers	856	4,101	5,408	10,365	8,806	6,604	6,604	22,014	32,379
Welders, Structural Steel	18	85	113	216	183	137	137	458	674
Truck Drivers, Heavy	40,619	21,405	7,472	69,496	7,238	5,429	5,429	18,096	87,592
Total Staff-Hours	85,070	207,381	188,571	481,022	158,784	119,088	119,088	396,960	877,982
Total Staff-Years	40.9	99.7	90.7	231.3	76.4	57.2	57.2	190.8	422.1