

17.0 CONSTRUCTION IMPACTS

The environmental impacts of the proposed project and suggested mitigation measures are discussed within each of the environmental resource analysis chapters in this document. The purpose of this chapter is to summarize the discussion of construction impacts and mitigation measures for the Preferred Alternative. All construction related impacts of the No-Build and TSM Alternatives are covered in other environmental documents prepared by the sponsors of those projects.

17.1 Overview of Construction Activities

A preliminary schedule for the light rail system and facilities indicates that the construction period will take approximately 24 - 36 months. The construction will occur in sequential phases that will vary on a segment-by-segment basis depending on whether the work is being done within the existing street roadbed, on new aerial structure, or within the existing Norfolk Southern railroad right-of-way.

Generally the initial phase of construction will be to relocate and protect the existing utilities where required. It is expected that the most significant impacts related to utility relocation will be in the downtown streets, specifically along the rail alignment in York Street, Bute Street, Charlotte Street, Brambleton Avenue, Monticello Avenue, Plume Street, Main Street, and Park Avenue. Construction in the existing roadbeds will reduce street parking and involve a temporary decrease in roadway capacity, which may lead to traffic delays, congestion, and detours.

Typically following the utility relocation the trackway, station platforms, catenary pole foundations, and trackwork are installed. Construction of the at-grade trackway will cause the greatest impact because it requires the largest amount of in-street construction. Maintenance of pedestrian and vehicular traffic will be a significant issue during this phase, especially in those streets previously mentioned above.

The elevated guideway include bridges over Smith, Moseley, and Broad Creeks and the aerial structures over Norfolk Southern Lambert Point, Brambleton Avenue and Sewell Point railroad tracks. By and large the location and nature of the proposed elevated guideway minimizes the construction impacts to the roadway network. During construction of the structure over Brambleton Avenue, some lane closures and traffic disruption may occur. Total closure of Brambleton Avenue may be required when setting the girders for the structure. This activity will be planned to occur at night to minimize the disruption. Special arrangements will be made with Norfolk Southern railroad for setting girders over both the Lambert Point and Sewell Point branches to ensure minimal interference with existing freight rail service. HRT will coordinate with Virginia Power to identify special construction measures to avoid impacting the Virginia Power transmission lines.

Construction in the existing Norfolk Southern railroad right-of-way will have minimal impacts to pedestrian and vehicular movements. Some interruption to vehicular traffic may occur during construction of the at-grade crossings. Maintenance of existing railroad freight traffic on Lamberts and Sewells Point NSRR lines will be required during construction. The extent and type of measures to be considered will be developed during the final design phase and coordinated with Norfolk Southern Railroad.

Once completed, the on-street guideway would become a mostly exclusive right-of-way for light rail

transit only and should only be accessed by follow-on contractors installing LRT facilities such as catenary wire, signal systems, and other wayside equipment. This requires that all new traffic patterns and traffic signal modifications for the local roadways are in-place and functioning at that time. Final construction elements will include the construction of the park and ride lots and installation of station platform amenities such as canopies, fare vending equipment and signage.

17.2 Construction Impacts and Mitigation

Impacts upon the natural and built environments resulting from the construction of the Preferred Alternative would neither be permanent nor severe. Adherence to applicable construction regulations would be enforced for all areas of potential impacts.

17.2.1 Land Use

A. Impacts

The Preferred Alternative will require that some of the existing vacant or otherwise undeveloped parcels in the LRT corridor be used as construction staging sites. These parcels will be returned to their initial condition once construction is completed. No permanent impacts to the various land uses within the study area are expected.

B. Mitigation

To the maximum extent feasible, construction staging areas will be sited to minimize inconveniencing adjacent land uses. Construction staging sites will be identified during Final Design.

17.2.2 Transportation, Traffic and Parking

A. Impacts

Existing traffic patterns will be affected during the construction phase of the Preferred Alternative. A portion of the project will be constructed on or adjacent to existing travel ways, temporarily impacting surface parking and traffic patterns along the LRT alignment in downtown Norfolk. Traffic detours, temporary access modifications, and temporary elimination of on- and off-street parking may be required.

B. Mitigation

The intent of the following construction mitigation measures is not to relieve any pre-existing traffic congestion but provide safe movement on affected roadways during the construction of the light rail transit system and facilities. During final design, construction related traffic impacts will be further studied and mitigated through the development and implementation of a detailed Maintenance of Traffic Plan. Other measures to be considered include, but are not limited to the following:

- Off-peak hour construction to minimize disruption to access driveways and business entrances;
- Simultaneous utility relocations with construction of the LRT trackway where prudent to avoid additional disruption due to construction;
- Coordinated construction activities with other proposed utility and/or roadway improvements in the immediate area;
- Placement of mitigation measures in construction contract specifications and plans to encourage responsible construction practices by contractors;
- Full, yet controlled pedestrian access to business; and
- Limit open excavation and trackway construction and coordinate construction phasing to minimize impediments to traffic and pedestrian movements.

Several broad mitigation measures will be implemented. Motorists will be advised in advance of the nature, extent and duration of any planned street closing, and if routing outside of the construction corridor is advisable. Detour signing will be situated in advance of major decision points to advise motorists of suitable route alternatives. Bus routing modifications may be necessary and public announcements will be made to minimize inconveniences to transit users.

17.2.3 Displacements and Relocation of Existing Uses

A. Impacts

The construction of the Preferred Alternative will require the acquisition of seven residential properties, three businesses, and one vacant previously industrial property. Refer to Section 3.3.2 for a detailed description of the properties to be acquired. In areas where the project right-of-way is constrained, construction easements may be required from adjacent property owners to allow for movement of construction equipment and access to the project right-of-way.

B. Mitigation

A Relocation Plan will be developed upon completion of Preliminary Engineering that further identifies the specific properties and affected parties of the proposed action. In acquiring the necessary private property, HRT would adhere to the requirements pertaining to land acquisition for projects funded by the Federal Transit Administration (FTA) as prescribed in Volume 49 Code of Federal Regulations (CFR) Part 24, Uniform Relocation Assistance and Real Property Acquisition for Federal and Federally Assisted Programs (1970).

Construction easements are temporary in nature. Construction easements would be used only in instances where no other alternative is available, and construction staging areas would be sited to minimize

disruption to adjacent properties to the extent feasible. When easements are required, property owners would be fairly compensated for the temporary use of their property and affected properties would be returned to their previous condition.

17.2.4 Community Facilities

A. Impacts

The majority of construction activity associated with the Preferred Alternative will occur within the existing Norfolk Southern right-of-way. Nevertheless, construction activities in downtown Norfolk will temporarily disrupt existing pedestrian and motor vehicle traffic routes into and out of community facilities.

B. Mitigation

Construction management and traffic control plans will be implemented to ensure a smooth flow of traffic, as well as to allow emergency vehicles priority access to neighborhoods during construction. Special emphasis will be placed on maintaining pedestrian access to all community facilities throughout the construction period.

17.2.5 Soils

A. Impacts

During implementation of various project elements associated with the Preferred Alternative, soils will be temporarily disturbed due to grading activities.

B. Mitigation

Soil disturbances from grading activities will be in the form of erosion and airborne dust. The Virginia Erosion and Sediment Control Law and Regulations (1996) detail applicable rules. These rules are, in turn, enforced by local jurisdictions. The Zoning Ordinances of Norfolk require the submission of Soil Erosion and Sediment Control Plans as part of the site plan review process.

Airborne dust emissions associated with construction will be minimized by adherence to standard construction techniques, such as:

- Watering areas of exposed soil to control fugitive dust;
- Covering open body trucks which transport materials to and from construction sites;
- Removing soil and other materials from paved streets;
- Repaving and/or revegetating exposed areas as soon as practical after completion of construction.

17.2.6 Visual and Aesthetic Conditions

A. Impacts

The construction activities related to the Preferred Alternative will have only a temporary impact on the visual environment. The activities and impacts will vary based upon the type of construction required. In general, the construction impacts will include the movement of construction equipment, construction of temporary roads and access ways, and temporary construction fences and screens.

B. Mitigation

HRT will work with adjacent communities to develop appropriate measures to mitigate impacts, including fencing of construction areas where appropriate.

17.2.7 Air Quality

A. Impacts

Fugitive dust, emissions from construction equipment, and emissions from additional traffic and detouring due to construction activities will result from implementation of the Preferred Alternative.

The proposed project will require the disturbance of soil during construction. This activity will produce fugitive dust and/or particulate pollution. Construction related activities may cause soil material to become airborne in a variety of ways including the following:

- Digging and dumping of soil and discarded construction materials (asphalt, concrete, etc.)
- Material hauling;
- Wind erosion over exposed construction sites;
- Re-entrainment of construction dirt deposited on local streets by vehicular traffic on the streets.

The amount of airborne dust generated and the airborne concentration of particulate matter that people will be exposed to will be dependent on a variety of factors and will vary from day-to-day depending on site and climate conditions. Factors influencing fugitive dust emissions include:

- Soil type
- Area of exposed soil
- Location of construction activities relative to receivers
- Volume of dirt/material to be moved
- Wind speed
- Wind direction
- Soil moisture

The length of time that any particular receiver will be exposed to construction related dust will be relatively short, lasting only the duration of construction. Construction will likely proceed in a linear fashion with site excavation, bed preparation, and track installation beginning at one or more locations and working along the project alignment.

B. Mitigation

Fugitive dust emissions associated with construction will be minimized by adherence to standard construction techniques, such as:

- Watering areas of exposed soil to control fugitive dust;
- Covering open body trucks which transport materials to and from construction sites;
- Removing soil and other materials from paved streets;
- Repaving and/or revegetating exposed areas after completion of construction.

Construction vehicles and equipment will generate the same exhaust emissions, as do motor vehicles on area roadways. The emissions contribution of these vehicles will be short-term and minor when compared to usual emission levels from day-to-day traffic in the study area. Additionally, construction equipment will generally be diesel-powered, emitting relatively low levels of carbon monoxide.

17.2.8 Noise

A. Impacts

The construction process for the Preferred Alternative will involve the use of equipment and vehicle operations that typically result in high noise levels adjacent to the construction sites. Table 17-1 shows typical construction equipment noise emission levels at 50 feet. The use of especially noisy equipment, such as a rail saw, jack hammer, scrapers, and pneumatic tools, would be common throughout the alignment. Pile drivers, the noisiest type of equipment for LRT projects, will be used in areas where bridges will be constructed.

**Table 17-1
Typical Construction Equipment Noise Emission Levels at 50 Feet**

Equipment Type	Typical Noise Levels at 50 ft. from Source
Pile Drivers (Impact)	101
Rail Saw	90
Scraper	89
Truck	88
Jack Hammer	88
Mobile Crane	88
Grader	85
Dozer	85
Tie Inserter	85
Pneumatic Tool	85
Impact Wrench	85

Source: Transit Noise & Vibration Impact Assessment, Federal Transit Administration, April 1995.

Table 17-2, identifies the acceptable noise levels from construction activities for associated land uses. In order to identify whether or not construction activity is likely to impact nearby sensitive receiver areas, the two loudest pieces of equipment, the pile driver and the rail saw, were added together (using decibel addition). These two pieces of equipment, used simultaneously at the same location, will result in the

emission of 101 decibels of noise at 50 feet from construction. In areas where pile drivers will not be used, the next loudest pieces of equipment (rail saw and jack hammer), if used together simultaneously at the same location, will emit 92 decibels of sound at 50 feet from construction. It is likely that noise impacts will occur in residential areas within 50 feet of the proposed LRT alignment as a result of the construction of the LRT. These impacts will be intermittent and temporary.

Noise impact to commercial or industrial areas within 50 feet of the proposed may occur from construction activities in areas where pile driving activity takes place. Based on existing design, pile driving activities will be located at all bridges and elevated structures. One residential property, located at Clairborne Avenue near Park Avenue, is located within 50 feet of the pile driving locations and will, as a result, be impacted. However, this area has been designated by NSU as part of the RISE redevelopment site, and may be displaced as part of that project.

**Table 17-2
Acceptable Construction Noise Levels**

Land Use	One hour Leq ¹ (dBA) ²	
	Day	Night
Residential	90	80
Commercial	100	100
Industrial	100	100

Source: Transit Noise & Vibration Impact Assessment, Federal Transit Administration, April 1995.

Notes: ¹Leq: the cumulative noise exposure over a one-hour period.

² dBA, A-weighted decibel; the basic noise unit for transit noise

At this early stage of project development, the extent of the short-term construction impacts is indeterminable as construction plans which will identify the specific equipment to be used and the locations where the equipment will be used, will not be completed until the final design stage of the project.

B. Mitigation

During the final design stage of the project, a detailed construction noise assessment will be completed. This detailed assessment will provide property specific detail which will then be used to develop mitigation plans to keep the noise levels at or below acceptable levels.

Construction activities will be conducted in accordance with applicable state and local requirements including the Norfolk Code, Chapter 26, "Noise", Section 26-3(d), which allows operation of any piece of mobile power equipment between 7:00 a.m. and 9:00 p.m.; noise due to general construction work is not restricted. Noise will be monitored on a regular basis during construction near potentially affected sensitive receptors.

Several means are available for the control of noise impacts during construction. Employing the following techniques will reduce noise levels 5 to 10 dBA and bring noise levels below 90 dBA residential threshold and the 100 dBA commercial/industrial threshold for the majority of construction activity. These include:

- Design considerations and project layout, such as: noise barriers, minimize distance of truck routing

and route trucks away from residential streets, or relocating noise-generating equipment as far away from the sensitive noise areas as possible.

- Operations sequence, such as: avoiding nighttime construction in residential areas.
- Alternative methods, such as: using drilled pile instead of impact pile driving, specifying quieted equipment in construction specifications, and alternative demolition or pavement breaking techniques.

17.2.9 Vibration

A. Impacts

Construction vibration impacts will result from the use of construction equipment such as a pile driver, a bulldozer, or a jackhammer. This vibration is generally intermittent and temporary, and therefore, will not result in a significant impact to receivers along the proposed alignment, except during night time hours and for properties in close proximity to construction activities. Table 17-3 identifies the vibration source levels for construction equipment at 25 feet.

The following formula was used to estimate the propagation of vibration to nearby receivers:

$$PPV_{\text{equip}} = PPV_{\text{ref}} \times (25/D)^{1.5}$$

where: PPV (equip) is the peak particle velocity in in/sec of the equipment adjusted for distance
 PPV (ref) is the reference vibration level in in/sec at 25 feet
 D is the distance from the equipment to the receiver.

Table 17-3
Vibration Source Levels for Construction Equipment
(From Measured Data)

Equipment	PPV ¹ at 25ft (in/sec)	Approximate VdB ² at 25 ft
Pile Driver (impact)	1.518	112
Large bulldozer	0.089	87
Caisson drilling	0.089	87
Loaded trucks	0.076	86
Jackhammer	0.035	79
Small bulldozer	0.003	58

Source: *Transit Noise & Vibration Impact Assessment, Federal Transit Administration, April 1995.*

Notes: ¹PPV: Peak Particle Velocity

²VdB: Vibration Decibels

Using this formula, propagation distances were computed based on a vibration damage threshold criterion of 0.20 in/sec (approximately 100 VdB) for fragile buildings, or 0.12 in/sec (approximately 95 VdB) for extremely fragile historic buildings. The calculated propagation distances for a pile driver, which produces the most vibration, are 27 feet for fragile buildings and 28 feet for extremely fragile historic

buildings. These distances indicate that any fragile, or extremely fragile historic buildings, would have a probable impact from resulting vibration emitted during construction activities. The historic buildings identified in Chapter 12.0, the Wells Theater on Monticello Avenue, Monticello Arcade and the Old City Hall Building are not located within 28 feet of proposed pile driving activities and therefore, are not likely to sustain impact or building damage from construction activities.

B. Mitigation

A detailed vibration analysis will be conducted during Final Design to identify properties that may be affected by construction and operation of the LRT project. The monitoring of vibration levels will be required at each phase of project implementation to ensure that no damage is caused to surrounding buildings or utilities. Procedures that will be employed to minimize vibration impacts include:

- Establishing vibration limits during the construction period for nearby buildings;
- Vibration monitoring at nearby buildings throughout the excavation and construction phases;
- Monitoring foundation conditions at nearby buildings; and,
- Phasing of demolition, earth-moving, and other ground impacting operations so they do not occur in the same time period.

17.2.10 Ecological Resources

A. Impacts

Correspondence with the Center for Conservation Biology and the Virginia Game and Inland Fisheries (VGIF) indicate Virginia State Listed bird species utilizing the construction areas are very habituated to human activity and that construction activity near their nesting areas poses no harm, even during the breeding season (Appendix A).

17.2.11 Water Resources

A. Impacts

Construction activities could impact water resources in a variety of ways. Impacts to floodplains, groundwater, surface waters, and wetlands are described below.

Floodplains

Construction activities will have minimal impacts on floodplains because any impact to channel geometry will be slight. Little impact is anticipated due to construction of new bridges and culverts. Construction in downtown Norfolk will require new structures below the floodplain. Floodplain impacts and stormwater runoff plans must be approved by the City of Norfolk.

Aquifers / Groundwater

The groundwater table is below the anticipated depth of construction throughout the project area; therefore, impacts during construction are not anticipated.

Surface Waters

Techniques for stormwater management and contaminants containment during construction of the Preferred Alternative will be developed by HRT in consultation with appropriate local, state and regional agencies, in accordance with applicable local, state and federal regulations. This coordination will ensure that project construction activities will not create significant adverse water quality impacts. Applicable regulations include the Clean Water Act, the National Pollution Elimination Discharge System requirements, and the Virginia Stormwater Management Law and Regulations. Floodplain impacts and stormwater runoff plans must be approved by the City of Norfolk. The construction of bridges and structures over navigable waterways is regulated by the Army Corps of Engineers (ACOE) under section 10 of the Rivers and Harbors Act of 1899 (33 U.S.C 403). A Virginia Pollutant Discharge Elimination System (VPDES) permit is required for construction disturbing more than five acres of land.

Wetlands

Most surface waters along the LRT corridor are considered wetlands. Construction activities that may impact wetlands include temporary removal of vegetation, increased stormwater runoff, and increased sedimentation in wetland areas. For the most part, the measures discussed above with respect to surface waters apply to wetlands.

Under Section 404 of the Clean Water Act, the Army Corps of Engineers regulates all wetlands that are adjacent or connected to navigable waters. According to the Virginia Wetlands Act, local governments have jurisdiction of non-tidal wetlands (including isolated wetlands) and portions of tidal wetlands, from low tide inland to a point 1.5 times the mean tide range. The Virginia Marine Resources Commission (VMRC) regulates the portion of tidal wetland below the mean low tide elevation.

B. Mitigation

Floodplains

Construction activities will not be conducted within floodplain areas during flood events. No additional mitigation for construction related activities is necessary or proposed. Mitigation of the effects of construction of the Preferred Alternative on floodplains, if any should occur, will be conducted in accordance with the Virginia Department of Environmental Quality Regulations and other applicable local requirements. Stream Encroachment Permits will be acquired, if necessary.

Bridge and culvert crossings will be designed to minimize backwater conditions and rail/road profiles will minimize overtopping. Where practical, all construction shall meet local zoning requirements, which require new structures to have at least one foot of freeboard above the 100-year flood elevation. Prior to construction, HRT will coordinate with the City of Norfolk environmental staffs to conduct site specific floodway studies and water quality impact assessments.

Aquifers / Groundwater

The groundwater table is below the anticipated depth of construction throughout the project area; therefore, no mitigation measures will be required.

Surface Waters

At individual construction sites, impacts to surface waters will be minimized through measures such as installation of hay bales and/or fabric filters at the construction area periphery to filter out sediments from stormwater runoff prior to discharge into storm sewer inlets and surface waters.

Wetlands

As with surface waters, impacts to wetlands due to construction activities will be minimized by installing Best Management Practices prior to construction including filtering storm water runoff prior to discharge into storm sewer inlets and wetland areas. Specific measures will be identified in the erosion control plan, and will include traditional best management practices. Fabric filters will be installed along the periphery of the wetland (or construction zone) to minimize traffic related activity. Revegetation within temporary construction areas will use native plantings and will be installed in a timely fashion. Details of the vegetation specifications will be provided in landscape plans. HRT will coordinate with responsible agencies to ensure that project construction activities will not create significant adverse water quality impacts.

17.2.12 Historic and Archaeological Resources

A. Impacts

During the construction phase, noise, vibration and fugitive dust may have the potential to result in temporary effects on historic and archaeological resources.

B. Mitigation

The effects of construction on historic resources will be kept to a minimum by applying the following techniques to improve air quality, noise and vibration, and visual impacts:

- Fugitive emissions associated with construction will be minimized by adherence to special construction techniques such as watering areas of exposed soil to control fugitive dust, covering open body trucks that transport materials to and from construction sites, and removing soil and other materials from paved streets.
- Every effort to prevent unnecessary noise and vibration during construction will be made and will be conducted in accordance with applicable state and local ordinances. Restricted hours of construction and the use of sound dampened equipment meeting the standards of the US Environmental Protection Agency could be implemented.
- The monitoring of vibration levels will be required at each phase of project implementation to ensure that no damage is caused to surrounding buildings or utilities. Procedures which will be employed to minimize vibration impacts include:
 - Establishing vibration limits during the construction period for nearby buildings;
 - Vibration monitoring at nearby buildings throughout the excavation and construction phases;
 - Monitoring foundation conditions at nearby buildings; and,
 - Phasing of demolition, earth-moving, and other ground impacting operations so they do not occur in the same time period.

- Measures will be taken at the conclusion of construction activities to restore any site to at least its pre-construction condition.

17.2.13 Parklands

A. Impacts

Construction activities associated with the Preferred Alternative would occur near MacArthur Memorial Park. The MacArthur Memorial Park site is physically separated from the LRT corridor, therefore it would not be directly affected by construction activities. However, noise levels from construction equipment could temporarily impact this park. In addition, the Elizabeth River Trail, which is proposed to be developed adjacent to the LRT along York Street and near Harbor Park may be affected by construction activities associated with the Preferred Alternative. No other park properties will be affected by construction activities.

B. Mitigation

HRT will coordinate with the City of Norfolk to ensure that the potential for disruption to the MacArthur Memorial Park and to the Elizabeth River Trail is kept to a minimum. Where appropriate, fencing will be used to further isolate this resource from construction activities.

17.2.14 Contamination

A. Impacts

The presence of potential contaminants has been identified within the project study area. *Chapter 15.0, Contamination* identifies 6 potentially impacted waste sites and underground storage tanks along the corridor. These sites are listed in Table 17-4.

**Table 17-4
Impacted Hazardous Waste Sites**

NAME	DATABASE REFERENCE			
	ADDRESS	ERNS ¹	LST ²	RST ³
ERNS Site # 1	300 Monticello Ave.	X		
ERNS Site # 2	Brambleton Ave. Between I-264 and RR Tracks, near NSU	X		
Police Dept. 1 st Patrol Division	811 E. City Hall		X	
City of Norfolk, Public Safety Bldg.	811 E. City Hall		X	
Newtown Imports Used Auto Sales	129 Kempsville Road		X	X
Maritime Tower	234 Monticello Ave.		X	X

Source: URS Corp., September 2003

Notes: ¹ ERNS: Emergency Response Notification System (ERNS)

² LST: Leaking Storage Tanks

³ RST: Registered Storage Tanks

The study area has a high potential for contaminated sites because downtown Norfolk has been heavily developed since the turn of the century. Much of the proposed alignment is in roadway and railroad rights-of-way, which reduces the potential for impact from industrial and commercial sources of contamination.

B. Mitigation

Prior to construction and right-of-way acquisition for the Preferred Alternative, soil sampling will be performed to determine the nature and extent of contamination. The results of this sampling will be incorporated into a health and safety plan that will be implemented during construction to minimize the potential exposure of workers to contaminants and hazards. Soil and water management plans will be developed to minimize runoff and impacts to uncontaminated soils. The following will also be performed during construction:

- Field monitoring during excavation and dewatering to identify changes in conditions;
- Stockpiling of excavated soils on heavy, waterproof plastic.

17.2.15 Safety and Security

Pedestrian safety in the vicinity of construction activities will be provided through the use of temporary construction fencing and barricades around all construction sites. Access into the construction sites will be controlled.