# Section 12 – Preconstruction Assessment and Damage Mitigation Procedures

I. Chief Engineer's Introduction - In past years, HRSD received complaints from private property owners, the public, and locality staff regarding the condition of roads, sidewalks, drainage ditches, private property, damage to buildings, etc. within and along pipeline construction corridors and in close proximity to pumping station construction projects. For many of these construction projects, the captured preconstruction photography and/or video coverage was inadequate to resolve claims or complaints. This section provides evaluation processes and expectations for varying levels of preconstruction surveys and active impact monitoring during construction related to the potential construction noise, vibration, ground settlement, building damage, water ponding, and restoration complaints. Numerous publications have been authored on the matter of construction-related noise and vibration and on impacts to individuals and structures. Included in this section are excerpts from some of these publications to assist the FIRM in determining the appropriate level of preconstruction survey/assessment and active construction impacts monitoring to be performed for a planned construction project for the purpose of protecting all parties.

II. Purpose and Process – To deliver a project that focuses on minimizing risk and impacts to adjacent infrastructure and the community and also protects HRSD's reputation. The report produced will document the efforts to accomplish this. It should include a summary of all items discussed below, as well as any others evaluated or considered by the FIRM. The above will be accomplished through the following:

a. Evaluate the impacts and identify risks due to the construction of the project.

b. Provide recommendations and modifications to the design to avoid the identified risks and impacts and consider mitigation or avoidance measures.

c. Utilize the reports produced and recommendations provided by the FIRM. The FIRM and HRSD team will determine appropriate mitigation efforts for the project through collaborative workshops.

d. This report shall be considered a living document and should be reviewed and updated throughout the design and construction phases of the project as new risks are identified and conditions change (e.g., design changes, change of field conditions, or Contractors' means and methods).

e. Modify the Bid Documents to reflect all design changes and the recommendations resulting from this evaluation.

III. Deliverables and Timing – This section is divided into three Stages. Each stage corresponds to evaluations and decision points related to types of construction-

related impacts. Figure III-1 is a decision flow chart that is included to assist the FIRM in navigating these stages and actions. The FIRM shall produce a Stage 1 report for every project. If warranted, Stage 2 and 3 efforts will be authorized by the HRSD Project Manager and funded through the additional services budget.

The FIRM shall submit the detailed Stage 1 and Stage 2 reports within the Enterprise Project Management (Unifier) system under Transmittal-Deliverable-Turnover BP Logs, Professional Services Deliverables, and an electronic copy to the HRSD Real Estate/Engineering Compliance Managers. The Stage 3 deliverable shall not be submitted through Unifier, but the delivery method and format shall be coordinated with the HRSD Real Estate/Engineering Compliance Managers, with a copy to the HRSD Project Manager. An example of a Stage 1 and 2 report in included in Attachment H.

The FIRM shall use the template Cover Sheet provided in Attachment K and the Sample Table of Contents provided in Attachment L during the development of the report.

Workshops shall be facilitated by the FIRM corresponding to each Stage as indicated in Figure III-1. The FIRM shall then modify the report and obtain HRSD acceptance before moving on to the next Stage. As these reports are deemed a living document, additional workshops may be necessary throughout the project's life. Attendees at these workshops will include the HRSD Project Manager, Real Estate/Engineering Compliance Managers, Director of Design and Construction, and other key HRSD stakeholders (e.g., Communications, Operations staff), as needed.

Below are the deliverable timings:

- Stage 1 – Shall be submitted at the same time as the 50% Design, as a separate deliverable
- Stage 2 – Shall be submitted and accepted by HRSD before the 90% Design
- Stage 3 – Shall be completed before construction

Waiver Requests - On rare occasions, a project may not require the application of all parts of this section of the standards. An example of such a project might be one located on an existing HRSD property, such as on a treatment plant or in an isolated area, that does not present a perceived or material risk of damage to any or all of the following: HRSD existing facilities or structures, any private property, roadways or the motoring public. In most cases, however, a Stage 1 analysis will be required to justify a waiver. Approval of any waiver request must be obtained, in writing, from the HRSD Real Estate/Engineering Compliance Managers, the responsible Director of Design and Construction, and with the Chief Engineer's acknowledgment. A template waiver request is provided in Attachment J.

The following pages and attachments provide a more detailed understanding of

the required research, information, and breakdown of efforts within each Stage to be included in the FIRM's report and workshops.

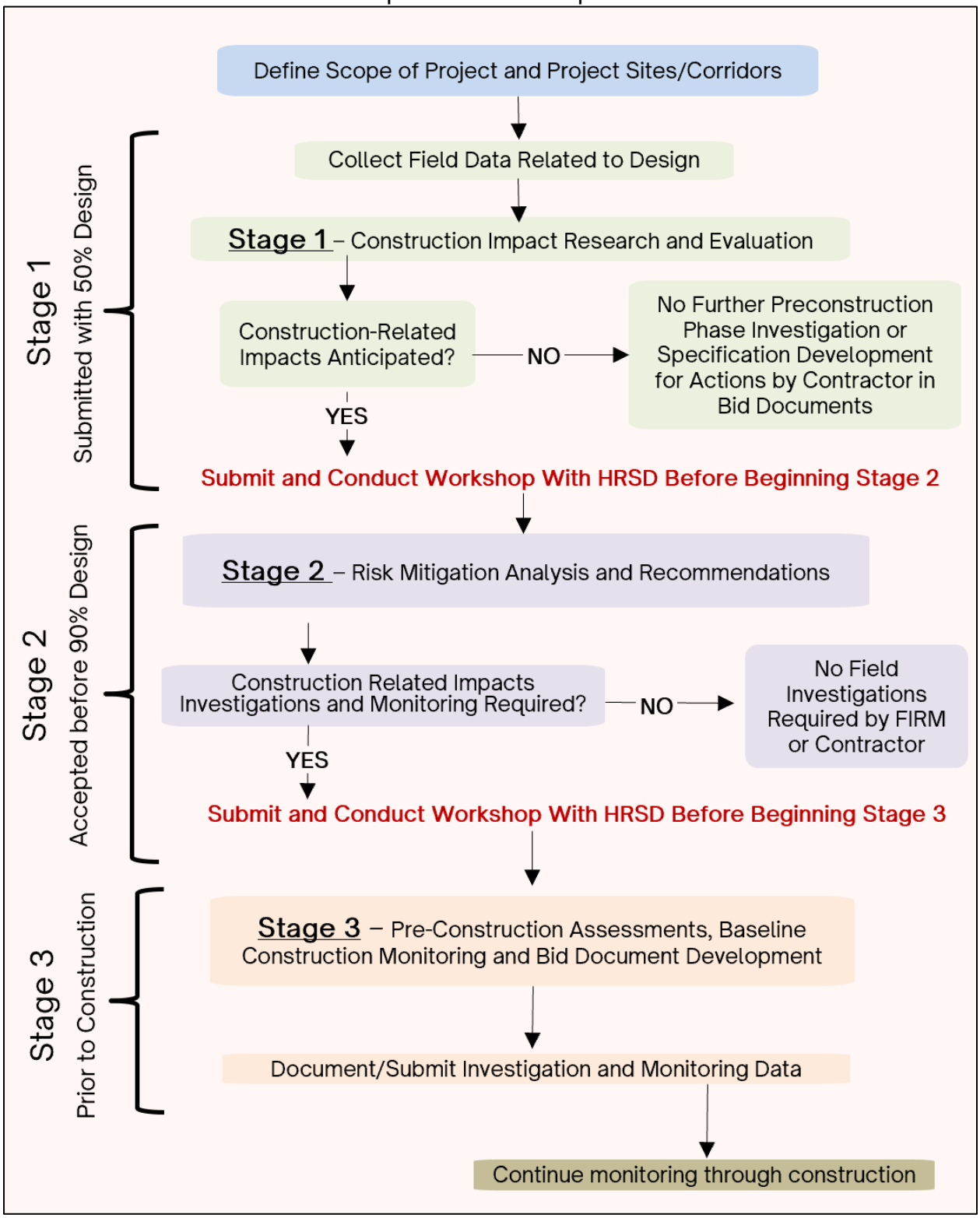


Figure III-1: Flow Chart for Preconstruction Assessment Decisions and Actions

IV. Stage 1 – Construction Impact Research and Evaluation

1. The FIRM shall perform, at a minimum, the following research and investigations (developing graphs and tables for each) to determine the possible construction-related impacts of the designed project:

   a) Determination of the various zones of influence throughout the entire project area

   b) Presence of historically significant buildings, structures, monuments, and/or sites. Resource: NPS National Register of Historic Places

   c) Determination of the types of buildings/structures (residential, business, religious, educational, daycare, etc.)

   d) Determination of age, materials of construction, presence of basements for buildings/structures and properties with pools

   e) Identify potentially sensitive structures that may exist in the area, including but not limited to, schools, crosswalks, bus stops or routes (public and private), churches, historical buildings or monuments

   f) Distance from the closest point of construction to each building, structure, and/or site

   g) Determination of other projects in the general vicinity that may be under construction at the same time, have recently been completed, or will be commencing soon

   h) Determination of soil conditions, types, and strata from soil borings

   i) Determination of groundwater levels and seasonal variations within the construction site and/or corridor

   j) Determination of topography and known or likely stormwater drainage issues

   k) Determination of dust, odor, and other emissions

   l) Additional items as identified by the FIRM

2. The FIRM shall determine and include in the report the likely construction means and methods for the designed project.

3. The FIRM shall consider the findings from the research and evaluations from

Section 12.IV-1, in combination with the likely construction means from Section 12.IV-2 above. The FIRM shall then determine the possible construction-related impacts to the surrounding areas as noted below.

a) Ranges of depth of construction (e.g., bottom of pipe trench, pump station wet well, vault, etc.).

b) Noise generation and impacts.

c) Vibration generation and impacts.

d) Anticipated heavy construction equipment for specific areas (noise and vibration impacts).

e) Construction methods and materials for trench or excavation pit stabilization and foundation support (e.g., driven temporary or permanent sheet piling, auger foundation piles, driven foundation piles).

f) Dewatering methods and likely impacts on ground settlement and/or structural impacts within the cone of depression zone, including but not limited to pools and other subsurface structures.

g) Pavement type and thickness where construction equipment will travel, or equipment/materials will be staged.

h) Determination of day versus night construction noise requirements.

i) Determination of prevailing winds in areas of construction and fugitive emissions from the construction zone.

j) Construction impacts on existing topography, hydrology, and construction travel routes and traffic counts (e.g., neighborhoods/businesses, detours, parking, buses).

k) Dust, odor, and other emissions in and beyond the construction zone.

l) Determination of Locality limitations, requirements, or Ordinances.

m) Any additional category of findings by the FIRM.

4. Construction Zone of Influence (ZOI) - The FIRM shall identify and document each potential construction-related impact, including both perceived impacts and those with the potential to cause damage. Provide a table and diagram of each impacted site within each ZOI detailing distances from the source of the impact. The FIRM shall tailor each ZOI determination to the specific construction activities proposed in that area (e.g., dewatering, vibration, and noise impacts) and by phase, if different (e.g., site clearing, demolition,

excavation). Note that a 5-foot deep open-cut pipeline excavation would be vastly different than a 40-foot-deep excavation for a pump station; thus, this effort will likely generate multiple graphics and tables. Samples of ZOI analyses can be found as Attachments A-C.

5. Additional Impact Considerations – As Stage 1 evaluations are performed, the FIRM will also consider the items below for each potential construction-related impact.

   a. Noise Generation and Impacts. Noise influences from construction activities may vary depending on the duration, equipment used, sound frequencies, environmental conditions, among other factors that need to be evaluated and possibly abated depending upon the anticipated impact of noise.

      The following diagram provides a visual relationship between common indoor and outdoor sound generators and their accompanying decibel levels. This type of graphic can be used to compare expected construction-related noise levels to more commonly experienced sounds.

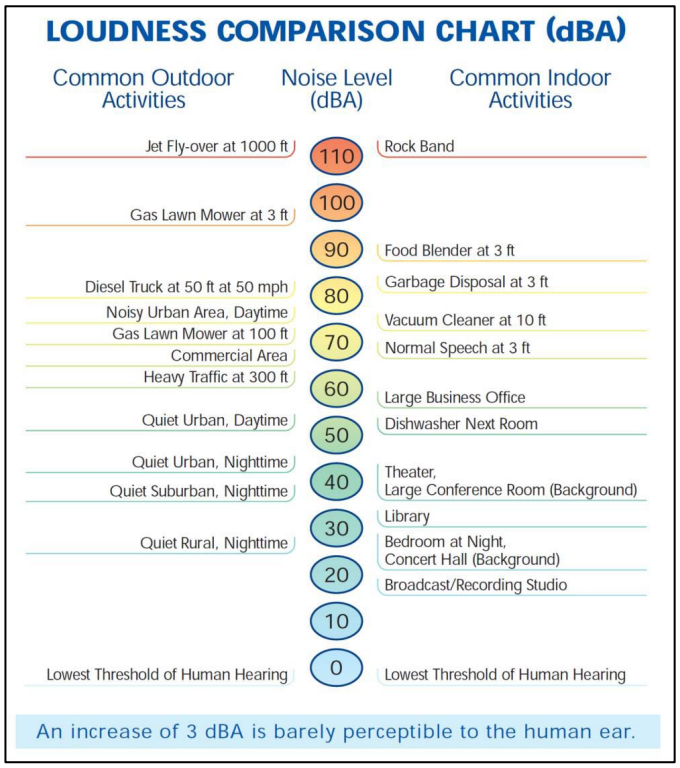


Figure IV-1: Decibel Levels for Common Sound Sources

   b. Vibration Impacts. Ground vibration impacts from construction activities may vary depending on the duration, equipment used, soil types, groundwater level, vibration frequencies, construction methods among

other factors that need to be evaluated and monitored depending on the anticipated impact of vibration.

The following diagram provides a relationship between vibration sources and likely impacts from the vibrations they generate.

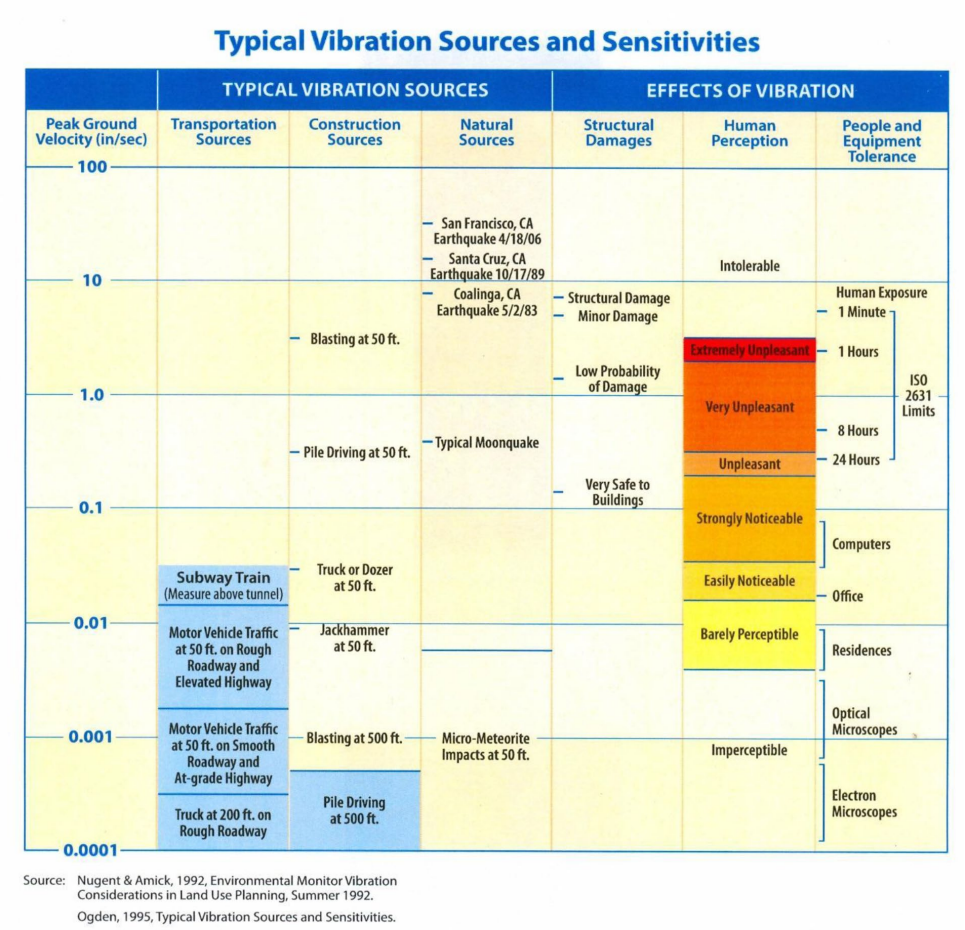


Figure IV-2: Typical Vibration Sources and Sensitivities

c. Dewatering Impacts on Ground and Structures Settlement. Dewatering deep construction trenches and excavation pits is a common practice for HRSD construction projects. The cone of depression for groundwater removal with well point dewatering systems needs to be evaluated for possible settling impacts on paved surfaces, buried utilities, buildings, and other structures near the construction zone. Common occurrences with groundwater dewatering are compaction of soils as water is removed, resulting in soil movement and removal of fine soil particles along with the groundwater, resulting in voids in the soil. The FIRM is to evaluate settlement abatement methods and materials, create action plans, and identify the zone of influence specific to each project. The following figure shows the results of groundwater modeling for a calculated withdrawal rate.

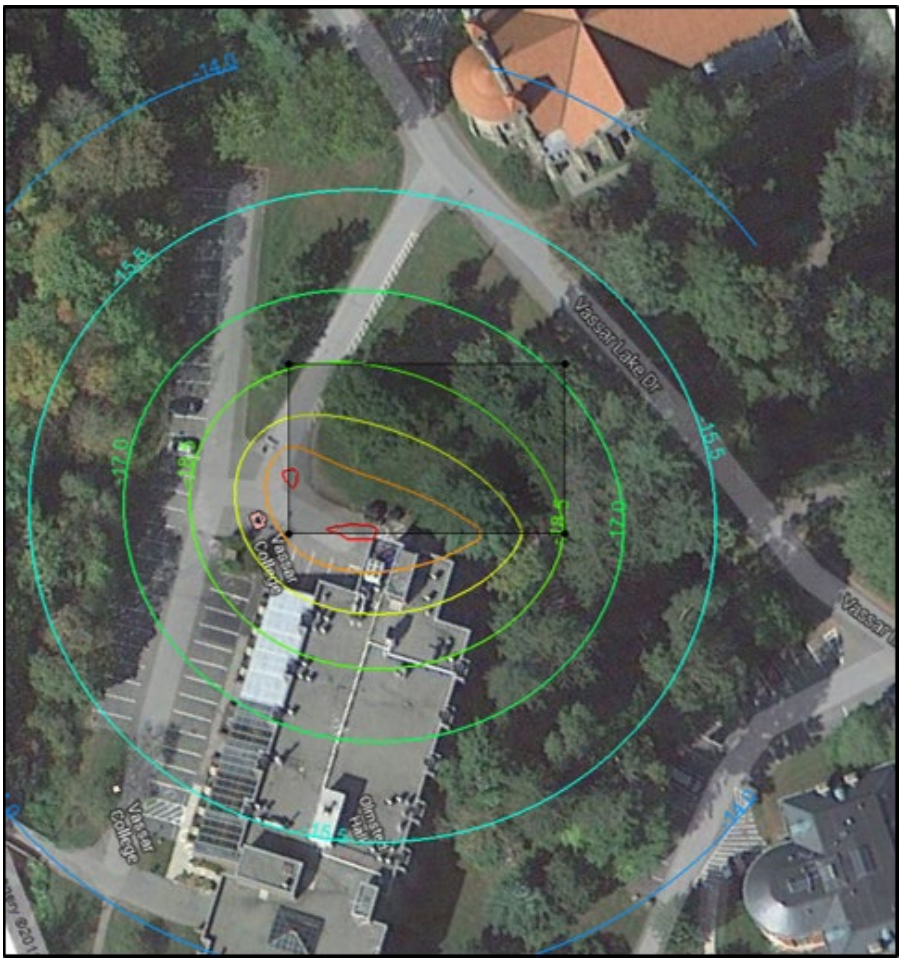


Figure IV-3: Example of Impact Zone and Groundwater Elevations During Withdrawal

d. Construction Impacts on Existing Topography, Hard Surfaces, Hydrology, and Construction Travel Routes. The FIRM will document existing conditions and evaluate likely impacts on stormwater drainage, unpaved surfaces, paved surfaces, concrete driveways/sidewalks, vegetation/plantings from construction equipment and material storage within the construction zones. Consideration to be given to preventative and protective measures as practical to be incorporated into the construction Bid Documents. The FIRM will consider how the Contractor(s) will deliver materials to the construction area and storage sites and movement of construction equipment across paved and unpaved surfaces. The FIRM shall create action plans and identify the zone of influence specific to each project.

e. Dust, Odor, and Other Emissions beyond Construction Zone**.** Construction projects have the potential to generate numerous types and quantities of

fugitive emissions. Some examples of emission generating activities include site clearing; excavation and earthwork; stockpiles and storage mounds; demolition activities; spray painting; power washing; operating equipment exhausts; and site vehicular entrances and exits. The FIRM is to consider the types of construction equipment and activities within the construction zone and the potential for fugitive emissions from these sources and nuisance of these emissions. Determination of prevailing wind direction and proximity of buildings and/or sensitive receptors are to be made by the FIRM as part of this evaluation. Upon completion of these evaluations, if nuisance emissions are determined to likely extend beyond the construction zone, then further investigations and abatement efforts are warranted. The FIRM shall create action plans and identify the zone of influence specific to each project.

f. Excerpts from the *Federal Transit Administration Office of Planning and Environment Transit Noise and Vibration Impact Assessment May 2018* should be reviewed by the FIRM. The FIRM shall use the most recent version of this Manual for their assessment and provide acknowledgement within the submitted report which version was used and the date on which it was verified by the FIRM. The excerpts are included as Attachments M and N within this Section.

g. The referenced information and procedures provided in this Section are not all inclusive, and therefore, the FIRM shall also apply its own experience and evaluation to supplement the information in this Section to minimize risks related to construction impacts.

**STOP HERE - SUBMIT YOUR REPORT**
**AND SCHEDULE A REVIEW WORKSHOP**

## V. Stage 2 – Risk Mitigation Analysis and Recommendations

When managing risk, HRSD uses three primary strategies: Avoidance, Mitigation, and Monitoring.

During this Stage, the FIRM shall develop mitigation and avoidance strategies for the risks and impacts identified during Stage 1. This may require the specification of Contractor activities (e.g., installation of hay bales to reduce noise; work hour restrictions) or means and methods (e.g., use of Silent Piler or trenchless technologies), or the modification of the design of the project (e.g., realignment of the pipeline; selection of a different pump station site). If the risks and impacts cannot be mitigated or avoided, then Stage 3 assessment and monitoring will be required to manage risks that cannot be mitigated or avoided.

Once the Stage 2 recommendations are accepted by HRSD, the Stage 1 report will be

updated, as appropriate. For example, if the pipeline alignment was modified as a result of the Stage 2 recommendation, then the associated risks may have been avoided. An electronic copy of the revised Stage 1 report and the Stage 2 report will be submitted in Unifier and provided to the HRSD Real Estate/Engineering Compliance Managers. Stage 2 activities shall be completed before submission of the 90% design package so that Contractor-specific requirements can be included in the Bid Documents.

Stage 2 mitigation and recommendations will address, at a minimum, the following:

- Noise Impacts
- Vibration Impacts
- Dewatering, Topography, and Hydrology Impacts
- Dust, Odor, and Fugitive Emissions Controls
- Proposed Pre-Construction Surveys and Assessments
- Any other findings by the FIRM

The FIRM shall also consider the construction impacts on existing drainage, trees/vegetation, and locality and/or private roads. The FIRM will take appropriate steps to mitigate these potential impacts and incorporate appropriate requirements for the Contractor within the Bid Documents. The FIRM will collaborate with HRSD to identify and determine the appropriate level of preconstruction surveys.

As a resource, excerpts from the *Federal Transit Administration Office of Planning and Environment Transit Noise and Vibration Impact Mitigation May 2018* publication should be reviewed by the FIRM to mitigate vibration and noise influences and action plans as recommended. The FIRM shall use the most recent version of this Manual for their assessment and provide acknowledgement within the submitted report which version was used and the date on which the FIRM verified it. The FIRM is to collaborate with HRSD to identify and determine the level of preconstruction surveys/monitoring efforts of properties, buildings, and structures with the potential to be impacted by construction vibrations. The excerpts are included as Attachments O and P within this Section.

The referenced information above and these procedures are not all inclusive, and therefore, the FIRM shall also apply its own experience and evaluation to supplement the information in this Section to minimize risks related to construction impacts.

**STOP HERE - SUBMIT YOUR REPORT**
**AND SCHEDULE A REVIEW WORKSHOP**

VI. Stage 3 –Pre-Construction Assessments, Construction Monitoring, Determination of Responsible Parties and Bid Document Development

A. General Discussion – The following paragraphs discuss pre-construction condition assessments for HRSD, public and private property, and facilities, as well as construction activity monitoring in areas where a level of damage or nuisance is possible, as determined by the Stage 2 assessment. These activities are intended to follow best practices for protecting all parties from damage and nuisance-related claims.

In this Stage, the responsibility for these assessments and monitoring (i.e., the FIRM and/or the Contractor) will be determined collaboratively by the FIRM and HRSD as each project is unique. Collaborative delivery projects will also require discussions with the Builder or Construction Manager. If determined to be the responsibility of the Contractor/Builder/Construction Manager, the FIRM will incorporate the items below into the technical requirements of the Bid Documents.

B. The following activities will be performed during the Pre-Construction Phase of the project:

1. A pre-construction condition assessment after award of the construction contract but before the start of any construction activities. The purpose of this assessment is to determine vibration and noise baselines and document the existing conditions of infrastructure and structures that may be impacted by the work, as contemplated in Stages 1 and 2 above and coordinated through the HRSD Real Estate/Engineering Compliance Managers. The FIRM shall document the exterior and interior (if possible) of residences, commercial, and industrial properties after obtaining the signed approval of the property owner (or their authorized agent). Documentation should include detailed and identifiable videos, images, and surveys to capture **ALL** existing conditions, with an emphasis on detailing damages or deficiencies (e.g., cracks and settlement). The documentation shall also provide detailed comments to describe the documented area or item (e.g., 1st floor, living room) and any observations (e.g., right wall, step crack 4mm wide and 36 inches long, no other deficiencies found, or unable to visualize left wall due to furniture blocking). These assessments shall be completed and submitted to the HRSD Real Estate/Engineering Compliance Managers at least 30 days before Contractor mobilization. Once approved by HRSD, the FIRM will forward a copy to the Contractor for their use. An example report is included in Attachment I.

2. A post-rain event field reconnaissance immediately following a rain event. At a minimum, take photographs at each roadway

intersection, all driveways, and a minimum of two pictures at the front of each property. Photograph all standing water areas within the construction limits. Digital photographs are to be labeled with the time and date taken, project stationing, cardinal direction, street address, or other identifying features. Capture video recordings along the construction limits, including roadway intersections, all driveways, and each property and structure. Recorded audio on the video recordings shall describe observations and identify the property address and construction stationing. Provide digital images and videos to the HRSD Real Estate/Engineering Compliance Managers for review and approval at least 30 days before Contractor mobilization.

C. The following are procedures associated with the pre-construction condition assessment of private property buildings and facilities described above. Note that all documentation sent out to the public must be approved by HRSD's Communications Division before distribution or use. Coordinate this effort with the HRSD Public Information Specialist and the HRSD Real Estate/Engineering Compliance Managers.

1. Maintain the HRSD Communications and Contact Tracking Log (Attachment D) to document each verified property owner and renter/lessee, their address, method of contact, and dates of contact attempts to gain access permission. At a minimum, three (3) certified return receipt attempts for each property are required.

2. Use the HRSD Assessment Request Letter Template (Attachment E) to gain permission to enter the property for this assessment

3. Use the HRSD Right to Access Property Form (Attachment F) and have the property owner (or authorized agent) sign. Provide a copy to the property owner (or authorized agent) for their records before entering private property.

4. Provide video and still photographs, and details as noted above in sub-section C.1. HRSD has the sole right to determine the acceptability of these items for its and the project's use. Provide a sample to the HRSD Real Estate/Engineering Compliance Managers for review and approval.

    a. Photographs shall be a minimum 24-megapixel and videos shall be a minimum 1080p (Full HD), 60 frames per second that capture details effectively, with focus and stability, and clear audio. Images and videos shall be in "Exchangeable Image File Format" (EXIF). A date and time stamp shall be present in all files.

b. A ruler or other measurement device should be included in the photograph and video, for scale, next to the observed crack or defect.

5. Log the conditions using the HRSD Pre-Existing Condition Assessment Reporting Form (Attachment G). Upon completion, have the property owner (or authorized agent) sign this form.

6. Provide a sketch of each room inspected, documenting the location of each identified existing defect.

7. Prepare an overall summary report of these assessments. All items described above will be submitted in a single report, organized by each property or structure. This report will be submitted to the HRSD Real Estate/Engineering Compliance Managers for review and approval at least 30 days before the start of construction.

D. The following procedures are associated with a vibration monitoring program to be performed during the construction phase of the project. An example vibration monitoring plan from the Minnesota Department of Transportation is included as Attachment Q to provide insight for establishing various responsibilities and accountabilities for a construction-related vibration program. The FIRM is to collaborate with HRSD to establish a vibration control and monitoring program specific to the construction project's needs.

1. Duration of the monitoring, including:

   i. A minimum of 15 days of pre-construction, baseline vibration monitoring.

   ii. During the entire extent of the construction activities.

2. Specific locations throughout the project extents for vibration monitors, including the use of vibration monitors in tandem, placed a designated distance apart, for properties to be monitored. Stationary and rolling vibrations monitor placements should be considered.

3. Peak particle velocity (PPV) thresholds.

4. The amount of memory needed for each vibration monitor to capture data in the monitoring log for the date ranges required.

5. The calibration requirements for vibration monitors.

6. The minimum experience and qualification requirements for the technician and the company performing the vibration monitoring program.

7. The FIRM will verify that vibration monitors are properly installed at the correct locations.

8. Develop and implement a monitoring program for any pre-existing cracks identified during the pre-construction assessments, to allow quantification of changes to these cracks during construction.

E. The FIRM, when requested, will produce a document intended for educational use with the public detailing the zone of influence, distance attenuation of ground vibrations and how it was determined, the levels of vibration (maximum peak velocity) recorded during the project, and examples of what those levels equate to for the public. This document will be submitted to the HRSD Real Estate/Engineering Compliance Managers upon request and updated as necessary to include the most recent property-specific vibration data. The FIRM may be required to join HRSD in a meeting with the public/property owner to relay technical information. A sample of this document can be found in Attachment R.

## Attachments

A. Sample – Noise and Vibration Generation and Impacts (combined diagram and impact table)

B. Sample – Noise and Vibration Generation and Impacts by Phase (diagram and impact table)

C. Sample – Dewatering Impacts

D. Pre-Construction Conditions Assessment Communications and Contact Tracking Log

E. Assessment of Pre-Existing Conditions - Right to Access Property Form

F. Letter to Property Owner Template for Pre-Existing Conditions Assessment

G. Pre-Existing Condition Assessment – Reporting Form – Template

H. Sample – Precondition Assessment and Damage Mitigation Report

I. Sample – Precondition Assessment Field Survey Report (excerpts)

J. Template - Waiver Request

K. Precondition Assessment and Damage Mitigation Report – Cover sheet

L. Precondition Assessment and Damage Mitigation Report – Table of Contents

M. Excerpt Federal Transit Administration Vibration Impact Assessment 2018

N. Excerpt Federal Transit Administration Noise Impact Assessment 2018

O. Excerpt Federal Transit Administration Vibration Mitigation 2018

P. Excerpt Federal Transit Administration Noise Mitigation 2018

Q. Sample - Vibration Monitoring Program

R. Sample – Summary Assessment Memo for Public Use

**End of Section**