Specifications

Department of Public Works
Official Notice # 45

Century City Redevelopment Project, Area – A /Zone # 1 – North End Improvements
3945 North 31st Street, Milwaukee, Wisconsin

Technical Specifications and Drawings

SECTION 00 01 17

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SECTION 01 10 00
SUMMARY OF WORK

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. All of the Contract Documents including General Specifications, General Requirements, Drawings and Attachments apply to the Work in this Section and are hereby made part of this Section.

1.02 DESCRIPTION OF WORK

A. Supply material, labor and equipment to complete the Work indicated on the Drawings . The Work is to be completed in strict accordance with the Contract Documents and applicable regulations. The Work is summarized (though not completely) below:

1. Site clearing.
2. Complete removal and disposal, at designated location on site, of concrete pavement materials, sidewalks, retaining wall and curb and gutter indicated for removal on the Drawings.
3. Excavation, spreading, compacting, and grading soil and gravel material and site grading.
4. Removal of the chain link fence adjacent to the northern boundary of the Project Site.
5. Soil erosion and dust control.
6. Construction of concrete pavement, sidewalks, curbs and gutters.
6. Site restoration.
7. Construction of the reinforced concrete support structure for a monument sign.
   a. The monument sign will be supplied and installed by others.
8. Construction of a storm water bio-filtration facility.

B. Work shown on the Drawings or included in the Specifications, except for Work specifically indicated as “not in contract” or “Work by Others”

C. All temporary facilities and utilities required to execute the Work, including, but not limited to temporary power, temporary water and temporary sanitary facilities for Contractor’s workers use.

D. All necessary coordination and cooperation with utility companies, City agencies, regulatory agencies and other Owner’s contractors working within the Project Limits or who are impacted by or will impact the Work within the Project Limits.

E. Restoration to its original condition of any facilities of items, not included in the Work, that are damaged as a result of activities related to the Work.

1.03 WORK BY OTHERS

A. Fabrication and installation of the monument sign will be performed by others. The

Contractor will however be required to coordinate and cooperate with the sign contractor to minimize conflicts.

B. Installation of electrical work related to the monument sign.

C. All work noted as “by Others” in the Drawings or Specifications.

1.04 WORK NOT INCLUDED IN CONTRACT

A. Work mentioned in the Drawings and Technical Specifications as not being a part of this contract.

1.05 WORK SEQUENCE

A. Contractor shall construct the Work in a sequence that efficiently accommodates all of the Work requirements of the Contract Documents. The Contractor shall be wholly responsible for sequencing the work and shall submit a work sequence plan to the Owner for approval, prior to commencement of the Work.

B. Contractor shall sequence the Work to coordinate with work being done by Others.

1.06 COORDINATION WITH OTHER OWNER’S CONTRACTORS ONSITE

A. The Contractor shall coordinate, as provided in the Contract Documents and as directed by the Owner, with other Owner’s contractors operating on the project site.

1.07 CONTRACTOR’S USE OF THE PREMISES

A. The Contractor shall submit, for Owner approval, documents indicating the proposed location of storage, staging, site office and other operations.

B. The Contractor's use of the site, including the areas approved by the Owner for Contractor’s use, is limited by:

1. The Owner's right to perform work, employ separate contractors to perform work, and to provide access to the Owner’s visitors at Owner’s convenience.
2. Regulatory requirements for use of public thoroughfares adjoining the Work site.

1.08 SITE CLEANING

A. Contractor shall keep the site clean of rubbish, in accordance with the General Conditions and applicable regulations, throughout the duration of the project.

B. Maintain the site in a manner to comply with codes, ordinances, regulations, and anti-

pollution laws.

1. Provide approved on-site containers for the collection of waste materials, debris, and rubbish.

C. Remove waste materials, debris, and rubbish from the site at the end of the Work and dispose in a legal manner away from the site.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION (Not Used)

END OF SECTION

SECTION 01 29 73
SCHEDULE OF VALUES

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. All of the Contract Documents, including General Specifications and Drawings, apply to the work of this Section.

B. This Section contains general information that applies to all work performed under the Contract and is inherently made a part of each specification section.

1.02 SCOPE OF WORK

A. The work of this Section consists of the procedural requirements for the submission of the following documents and items:

1. Schedule of Values allocated to the various portions of the Work.
2. Schedules of Values shall be submitted to the City when requested.

1.03 COORDINATION

A. The Contractor is to coordinate preparation of Schedule of Values with preparation of construction schedule.

B. Line items in Schedule of Values shall be correlated with other required administrative schedule and forms, including the following:

1. Contractor's construction schedule.
2. Application for payment form.
3. List of Subcontractors.
4. Schedule of Allowances.
5. List of products.
6. List of principal suppliers and fabricators.
7. Schedule of submittals.
8. List of Approved Change Orders.

1.04 FORM, CONTENT AND APPROVAL

A. Prepare Schedule of Values on AIA Document G702 and G703, latest editions, or as directed by City.

B. Include the following Project identification on Schedule of Values.

1. Project name and location.
2. Name of City.
3. City's Project number.
4. Contractor's name and address

5. Contractor's Project number.
6. Contract date.
7. Date of submittal.
8. Payment Application Number.

C. List the unit price and total installed value of the component parts of the work in sufficient detail to serve as a basis for computing values for progress payments during construction.

1. The Schedule of Values shall conform to the following:
   a. Include a directly proportional amount of the Contractor's overhead, profit, taxes, and other related costs in each item. Temporary facilities and other major cost items that are not direct cost of actual work-in-place shall be distributed as overhead expense.
   b. For items on which progress payments will be requested for stored materials, break down value into the following and assign the value to the appropriate cost code:
      1) The cost of the materials, delivered and unloaded, with taxes paid.
      2) The total installed value, less the cost of materials.
   c. The sum of all values listed in the schedule shall equal the total Contract Sum. Round all values to the nearest dollar.
   d. For unit cost Allowances, show line item value of unit cost Allowance as the product of unit cost times measured quantity as estimated from best indication in Contract Documents.
   e. Indicate the percentage complete, previous payment request, current payment request, and amount remaining for each item.
   f. The City or its Agent and City reserve the right to request further breakdown of costs or to add additional categories for payment as the Work progresses.

2. Update and resubmit Schedule of Values when Change Orders or Construction Change Directives result in a change in Contract Sum.

3. Contractor shall revise the Schedule of Values as requested by the City or its Agent.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION (Not Used)

END OF SECTION

SECTION 01 31 19
PROJECT MEETINGS

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. All of the Contract Documents including the General Specifications and General Requirements apply to the work in this Section.

1.02 SCOPE OF WORK

A. The City will conduct project meetings in which the Contractor is required to participate and make available the appropriate personnel. These meetings include, but are not limited to the following:

1. Pre-construction Project Meeting.
2. Project Progress Meetings.
3. Other Project Meetings.

1.03 PRE-CONSTRUCTION PROJECT MEETINGS

A. The City will schedule a pre-construction meeting within 5 days of issuance of the Notice to Proceed, to be attended by all project managers, Contractor's field superintendent other representatives of the Contractor and their major subcontractors. Prior to this time, Contractor shall make specified pre-construction submittals including the following:

1. Typed list of Contractor's sub-contractors, consultants and personnel, with names, titles, addresses, email addresses, and telephone numbers. Indicate at least two personnel who shall be the emergency contacts for the Project. Provide landline and mobile telephone information for the emergency contacts.
2. Contractor’s site specific health and safety plan.
3. Typed list of the submittals required for the work as indicated in the individual Specification Sections, including a schedule for the submittals.
4. Certificates of insurance.
5. Schedule of Values.
6. Permits.
7. Specified bonds.
8. Erosion control implementation plan.
9. Dust control plan

B. The pre-construction meeting agenda shall include the following:

1. Communication lines between all parties including written, electronic and verbal means.
2. Processing applications for payment, including the format, schedule of

values, frequency of applications, retainage, and other administrative requirements.

3. Processing and distribution of submittals.
4. Maintenance of as-built and record documents.
5. Procedure for field changes, change estimates, change orders, etc.
6. Site security.
7. Meeting schedule.

1.04. PROJECT PROGRESS MEETINGS

A. The City will conduct progress meetings at the Project site at regularly scheduled intervals to address matters related to the Work including but not limited to, safety, schedule, cost, changes and issues. The Contractor shall at least have its project manager present at these meetings.

1.05. OTHER PROJECT MEETINGS

A. The City will conduct other project meetings, at any time, as required, in its judgment, to achieve the project objectives. These meetings could include, but are not limited to: coordination meetings, issue meetings, project payment meetings and substantial completion and completion meetings.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION (Not Used)

END OF SECTION

SECTION 01 33 00
SUBMITTALS AND REQUESTS FOR INFORMATION

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. All of the Contract Documents, including General Specifications, Specifications, Appendices, Attachments and Drawings.
   1. This Section contains general information that applies to all work performed under the Contract and is inherently made a part of each specification section.

1.02 SUMMARY OF WORK

A. The Scope of Work in this section includes, but is not limited to, the following:
   1. Product Data and Samples.
   2. Project schedule.
   3. Work logistics and plans.
   4. Manufacturer's certificates.
   5. Construction photographs.
   6. Contractor's Request for Information (RFI).
   7. Any information needed to complete the Work.
   8. Worker certifications
   9. Contaminated/hazardous material disposal manifests
   10. Soil compaction test results
   11. Erosion Control Plan
   12. Dust Control Plan
   13. As-built drawings.

1.03 PRODUCT DATA AND SAMPLES

A. Required Submittals: Submit shop drawings, product data, initial selection samples, verification samples, calculations, coordination drawings, schedules, and all other submittals as specified for each part of the work.
   1. Substitutions: Where a submittal proposes a material or product different than specified, clearly note substitution on the submittal for each item. Contractor's submittal and City's acceptance of submittals is not a valid request for, nor an approval of, a substitution, unless the Contractor presents this information when first submitted as a formal "Request for Substitution".

B. Submittal Schedule: Within 10 days after award of contract and before first application for payment, prepare list of submittals in chronological sequence showing all submittals and proposed date first due at City or its Agent's office and proposed date due to be returned to Contractor. Use Submittal Reference Numbers on submittal schedule as

indicated below. Allow proper time for reviewing each submission and time for resubmission, if needed. Make first submission of a submittal no more than 7 days after notice of Award of Contract.

C. Contractor's Preparation of Submittals: Modify and customize all submittals to show interface and coordination with adjacent work and actual field conditions. Identify each submittal with name of project, date of origination, Contractor's name, subcontractor's name, manufacturer's name, fabricator's name, submittal name and description, and individual Submittal Reference. Use the Submittal Reference Number exclusively in communications about submittals. Clearly note and fully describe all qualifications and all deviations from the requirements of the Contract Documents. Stamp, date, and sign each submittal to show the Contractor's review and approval of each submittal before delivery to City or its Agent's office. Unstamped, undated or unsigned submittals will be returned without action by the City or its Agent. Leave minimum 4" x 6" open space for City or its Agent's stamp and notations.

D. Product Data: Provide manufacturer's printed literature including, without limitation, manufacturer's standard printed description of product, materials and construction, recommendations for application and use, certification of compliance with standards, instructions for installation, and special coordination requirements. Collect data into one submittal for each unit of work or system; clearly mark each copy with ink to show which choices and options are applicable to project.
    1. Product Data Submittal Quantities: Submit at least five copies. City or its Agent will return two copies to the Contractor if not rejected; if rejected, only one copy will be returned. Provide, reproduce, and distribute additional copies as needed.
    2. Installer Copy: Verify that the Installer has a current copy of the relevant product data, including installation instructions, before permitting installation to begin.

E. Samples: Provide at least two sample units for each sample submission. Sample units shall be identical to final materials and products installed in the work and shall clearly show the complete and full range of finish, color, texture and appearance variations expected. Work in the field which falls outside the accepted range shown by the samples shall be rejected. Where indicated, prepare samples to match City or its Agent's sample. Label each sample with description, source, varietal name or manufacturer's name and model number. City or its Agent will review samples for confirmation of visual design intent, color, pattern, texture and type only; City or its Agent will not test samples for compliance with other Contract requirements that shall remain the exclusive responsibility of the Contractor.
    1. Initial Selection Samples Submittal Quantities: For initial selection purposes, submit one set of samples showing the complete range of colors and finishes available.
    2. Verification Samples Submittal Quantities: For verification of an initial selection, submit two sets of samples; one set will be returned to Contractor to be maintained at project site for quality control comparisons. Discard rejected

samples; do not store at the site.

3. Additional Samples: The City and City or its Agent reserve the right to require additional samples or samples not listed in the Contract Documents. Provide these samples as indicated for specified samples.
4. If samples are rejected, Contractor shall provide, at no additional cost, additional samples until accepted by the City or its Agent.

F. Timing of Submittals: Submit submittals in a timely fashion to allow at least 5 business days for the City or its Agent's review and handling. For submittals which have to be reviewed by the City or its Agent and his/ her project team sub-consultants add five more business days for each consultant.
   1. Testing: Submit samples and materials for testing sufficiently in advance of need for use on Project. Allow adequate time for testing and, if necessary, re-testing.
   2. Allow sufficient time for review and acceptance of mock-ups/ sample panels before performing work.

G. City or its Agent's Action on Submittals: City or its Agent will review submittals, stamp with "action stamp", mark action, and return to Contractor. City or its Agent will review submittals only for conformance with the design concept of the project. The Contractor is responsible for confirming compliance with other Contract requirements, including without limitation, performance requirements, field dimensions, fabrication methods, means, methods, techniques, sequences and procedures of construction, and coordination with other work. The City or its Agent's review and approval of submittals shall be held to the limitations stated in the General Conditions of the Contract for Construction. In no case shall approval or acceptance by the City or its Agent be interpreted as a release of Contractor of his responsibilities to fulfill all of the requirements of the Contract Documents. City or its Agent's action will be one of the following:

   1. Reviewed: When so marked, City or its Agent and his/ her sub-consultants are indicating that they have reviewed the submittal but do not assume responsibility for the use of that submittal.
   2. Accepted: When so marked, the work covered by the submittal may proceed provided it complies with the requirements of the Contract Documents. Acceptance of the work will be based on that compliance.
   3. Accepted Subject to Condition as Noted: When so marked, the work covered by the submittal may proceed provided it complies with the requirements of the Contract Documents and the City or its Agent's notes and comments. Acceptance of the work shall be based on that compliance.
   4. Resubmission Required: Do not permit submittals with this action marking to be used at the project site or elsewhere where work is in progress.
      a. Submit Additional Item as Noted: When so marked, resubmit the item[s] noted.
      b. Revise Submission as Noted and Resubmit: When so marked, make corrections or changes to original submittal or prepare a new submittal and resubmit to City or its Agent for additional review.

5. Disapproved: When so marked, prepare a new submittal and resubmit to City or its Agent for review. Do not permit submittals with this action marking to be used at the project site or elsewhere where work is in progress.
6. Incomplete, illegible, erroneous or other faulty submittals shall be returned to Contractor without any submittal designation. The Contractor shall correct the submittal and return it for additional review.
7. Distribution of submittals: When submittal is noted "accepted" or "accepted subject to conditions as noted", make prints or copies and distribute to City, Subcontractors involved, and to all other parties requiring information from the submittal for performance or coordination of related work within 10 calendar days after date of City or its Agent's action. Provide and pay for all copies of submittals as reasonably necessary for proper completion of the Work. Print shop drawings for distribution only from the final approved reproducible drawing. Maintain one complete set of submittals at the project site in a neat, organized file.

1.04 MANUFACTURER'S CERTIFICATES AND TEST RESULTS

A. Submit manufacturer's certificates required by individual Sections.

B. Indicate that the product complies with or exceeds specified requirements. Submit supporting reference data, affidavits and/or certifications as appropriate.

C. Certificates that are not current must be acceptable to the City or its Agent.

1.05 WORKERS' CERTIFICATION

A. Contractor is to submit to the City or its Agent, documentation that proves all workers involved in asbestos abatement or any hazardous material handling work have the required certifications.

B. Contractor is to submit to the City or its Agent, documentation that proves all workers involved in soil remediation or any hazardous material handling work have the required 40-hour HAZWOPER training, and annual refresher training, if required.

C. Contractor is to submit to the City or its Agent, documentation that proves that all workers are certified as to discipline or trade as required in permits issued to complete the work

1.06 REQUESTS FOR INFORMATION

A. When the Contractor encounters any question concerning the Work or when he/ she requires additional information to perform the Work, the Contractor shall submit a written Request for Information (RFI), on a City approved form, to the City or its Agent. The RFI shall contain the project name, names and addresses of the Contractor, City and

City or its Agent, RFI number, related drawings and specification numbers, nature of the question, space for a reply, and due date for the response.

B. The Contractor shall number the RFI's sequentially and shall keep a record of all RFI s and their responses.

C. Each RFI shall pertain to one topic only. Topics shall not be mixed on RFIs.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION (Not Used)

END OF SECTION

SECTION 01 35 00
SPECIAL PROCEDURES

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. All of the Contract Documents including the General Specifications and General Requirements apply to the work in this Section.

B. Wisconsin Administrative Code Chapter NR 447.02.

C. City of Milwaukee and State of Wisconsin Construction Asbestos Abatement permits.

D. All applicable parts of the United States Department of Labor, Occupation Safety & Health Administration (OSHA) standards in 29 CFR Part 1910 Occupational Safety and Health Standards and Part 1926 Safety and Health Regulations for Construction

E. U. S. Environmental Protection Agency (USEPA) standards in 40 CFR Part 763, Asbestos, Asbestos Hazard Emergency Response Act (AHERA),

F. USEPA standards in 40 CFR Part 61 Subpart M, National Emission Standards for Hazardous Air Pollution (NESHAP) for Asbestos,

G. Wisconsin State Statutes Chapter 254, Environmental Health, WAC ch. DHS 159, Certification and Training Course Requirements for Asbestos Activities, and WAC ch. NR 447 Control of Asbestos Emissions.

H. The current, City of Milwaukee Code of Ordinances, Chapter 66, "Asbestos Hazard Control" regulations.

I. The current, City of Milwaukee Asbestos Inspection and Sampling Protocol for Buildings to be Demolished or Renovated, dated February 1998, Updated August 2000 (copy attached),

J. Wisconsin Department of Natural Resources, Pre-Demolition Environmental Checklist, DNR Publication WA-651-07, Revised 2007 (copy attached).

1.02 SUMMARY OF WORK

A. This Section consists of the special procedural requirements for work involving asbestos containing materials (ACM).

B. Any asbestos abatement performed under this Contract shall be completed to properly remove and dispose of regulated asbestos-containing material including friable and non-friable asbestos-containing materials that is currently crumbling, cracked, or peeling, or

could be crumbled, pulverized or reduced to powder during the Work.

C. The work under this Section shall be performed in conformance with all of the applicable "Related Documents".

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION

1.01 ASBESTOS ABATEMENT

A. The Contractor shall immediately notify the City of any suspect asbestos containing materials discovered during the Work so arrangements can be made to properly assess and manage the materials.
   1. Additional suspect materials may include buried pipe insulation, other buried materials or materials not previously identified in the Contract Documents as suspect asbestos-containing materials.

B. After completion of the asbestos abatement work, the ground surfaces shall be cleaned, using appropriate methods for asbestos abatement, to meet visual and clearance criteria.

C. Liquid and/or solid debris generated during the final cleaning shall be properly characterized and disposed of in an approved manner and in accordance with all local, state, and federal regulations.

D. The asbestos abatement activities shall be conducted by asbestos workers and supervisors currently certified by the Asbestos and Lead Section of the Wisconsin Department of Health Services.

E. The Contractor shall not dispose of any asbestos-contaminated waste, debris, or refuse in any location or manner other than at a pre-established landfill, licensed by the Wisconsin Department of Natural Resources to accept asbestos containing material, using methods specified herein, and in accordance with Federal, State, and local regulations.

F. Storage of ACM bags shall only be inside an approved and properly prepared container, which shall be locked at all times when it not being loaded by the Contractor.

G. The Contractor shall transport asbestos-containing materials to the licensed landfill in labeled and covered containers in accordance with all Federal, State, and local regulations.

H. At the end of the project the Contractor shall notify the City in writing that it has complied with all requirements stated herein and with those set forth by Federal, State, or local

agencies as required herein. This notice shall be included in the final Project Log Book.

END OF SECTION

SECTION 01 40 00
QUALITY REQUIREMENTS

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. All of the Contract Documents, including General Specifications, Specifications and Drawings.

B. This Section contains general information that applies to all work performed under the Contract and is inherently made a part of each specification section.

1.02 SUMMARY OF WORK

A. The Contractor shall implement procedures, including testing as required, to ensure that all Work complies with the quality requirements of the Contract Documents.
   1. The City may arrange for a qualified Testing Laboratory or other inspection or measurement services, to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.
   2. Specified tests, inspections, and related actions do not limit Contractor's quality-control procedures that facilitate compliance with the Contract Document requirements.
   3. Requirements for Contractor to provide quality-control services required by City or its Agent, or authorities having jurisdiction are not limited by provisions of this Section.

B. See the respective sections of the Technical Specifications for specific test and inspection requirements.

C. Contractor shall provide, quality-control services to verify conformance of the Work with the requirements of the Specifications.

1.03 DEFINITIONS

A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and ensure that proposed construction complies with requirements.

B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that completed construction comply with requirements. Services do not include contract enforcement activities performed by City or its Agent.

C. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing

laboratory shall mean the same as testing agency.

1.04 SUBMITTALS

A. Qualification Data: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.

B. Reports: When required by the Contract Documents or when requested by the City, prepare and submit certified written reports that include the following:
   1. Date of issue.
   2. Project title and number.
   3. Name, address, and telephone number of testing agency.
   4. Dates and locations of samples and tests or inspections.
   5. Names of individuals making tests and inspections.
   6. Description of the Work and test and inspection method.
   7. Identification of product and Specification Section.
   8. Complete test or inspection data.
   9. Test and inspection results and an interpretation of test results.
   10. Ambient conditions at time of sample taking and testing and inspecting.
   11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
   12. Name and signature of laboratory inspector.
   13. Recommendations on retesting and re-inspecting.

C. Permits, Licenses, and Certificates: For City's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

1.05 QUALITY ASSURANCE

A. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

B. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

C. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.

D. Manufacturer Qualifications. A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance.

E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or products that are similar to those indicated for this Project in material, design, and extent.

F. Testing Agency Qualifications: An agency with the experience and capability to conduct testing and inspecting indicated, as documented by ASTM E 548, and that specializes in types of tests and inspections to be performed.

1.06 QUALITY CONTROL

A. City Responsibilities: Where quality-control services are indicated as City's responsibility, City will engage a qualified testing agency to perform these services.
   1. City will furnish Contractor with names addresses, and telephone numbers of testing agencies engaged and a description of the types of testing and inspecting they are engaged to perform.
   2. Costs for retesting and re-inspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor.

B. Contractor Responsibilities: Unless otherwise indicated, provide quality-control services specified and required by authorities having jurisdiction.
   1. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services. Contractor shall not employ the same entity engaged by City, unless agreed to in writing by City.
   2. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspecting will be performed.
   3. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
   4. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
   5. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.

C. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing.

D. Retesting/Re-inspecting: Regardless of whether original tests or inspections were

Contractor's responsibility, provide quality-control services, including retesting and re-inspecting, for construction that revised or replaced Work that failed to comply with requirements established by the Contract Documents.

E. Testing Agency Responsibilities:
   1. Cooperate with the City or its Agent, and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.
   2. Notify City or its Agent and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
   3. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
   4. Submit a certified written report, in duplicate of each test, inspection, and similar quality-control service through Contractor.
   5. The testing agency shall not release, revoke, alter, or increase requirements of the Contract Documents or approve or accept any portion of the Work.
   6. The testing agency shall not perform any duties of Contractor.

F. Associated Services: Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:
   1. Access to the Work.
   2. Incidental labor and facilities necessary to facilitate tests and inspections.
   3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
   4. Facilities for storage and field-curing of test samples.
   5. Preliminary design mix proposed for use for material mixes that require control by testing agency.

G. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and quality-control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION

1.01 REPAIR AND PROTECTION

A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.

B. Protect construction exposed by or for quality-control service activities.

C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION

SECTION 01 57 00
ENVIRONMENTAL PROTECTION

PART 1 - GENERAL

1.01 SUMMARY

A. Contractor, in executing Work, shall maintain Work areas on- and off-site free from environmental pollution that would be in violation of federal, state or local regulations.

B. Payment:
   1. Work specified in this section is incidental to the Work and should be included as part of appropriate lump sum or unit prices specified in Bid Form.

1.02 RELATED SECTIONS

A. All sections of these Specifications are related to this section.

1.03 REFERENCES

A. City of Milwaukee Code of Ordinances Vol. 2, Chapter 290 – Erosion Control

B. Wisconsin Department of Transportation Standard Specification for Highway and Structure Construction

C. WPDES Permit.

1.04 PROTECTION OF SEWERS

A. Prevent construction material, pavement, concrete, earth or other debris from entering existing culverts or sewer structures.

1.05 EROSION AND SEDIMENT CONTROL

A. Comply with provisions of City of Milwaukee Code of Ordinances Vol. 2, Chapter 290 – Erosion Control

B. Apply appropriate soil conservation measures to protect project area and adjacent lands. These measures may include, but not be limited to, mulching, rapid growth vegetation, fabric mat, hay bales, filter barriers, sediment traps, and basins.

C. Select methods of erosion and sediment control for specific job site.
   1. Contractor shall develop an erosion control plan and shall submit the plan to the City for review and approval.
   2. Adjust sediment control measures in field to meet conditions encountered.

D. Install erosion control measures before commencing work on project site.
   1. Maintain erosion control measure during course of construction.
   2. Remove erosion control measures upon establishment of permanent, surface stabilization.

E. All products used must be listed on the Wisconsin Department of Transportation's erosion control acceptability list.

F. All erosion control devices shall be installed as indicated in accordance with section 628 of the State of Wisconsin, Department of Transportation, Standard Specifications for Highway and Structure Construction, Current Edition.

G. Maintenance of the erosion control devices shall be performed in accordance with all applicable standards and permits, including the Wisconsin Pollution Discharge Elimination System (WPDES) permit

1.06 DISPOSAL OF EXCESS EXCAVATED AND OTHER WASTE MATERIALS

A. Excess excavated material not required or unsuitable for backfill, and other waste material shall be disposed of in accordance with state and local solid and hazardous waste regulatory requirements.

B. Provide watertight conveyance for liquid, semi-liquid or saturated solids which tend to bleed during transport. Liquid loss from transported materials is not permitted, whether being delivered to construction site or hauled away for disposal. Fluid materials hauled for disposal must be specifically acceptable at selected disposal site.

1.07 PROTECTION OF AIR QUALITY

A. Minimize air pollution by use of properly operating combustion emission control devices on construction vehicles and equipment and encourage shutdown of motorized equipment not in use.

B. Do not burn trash on construction site.

C. If temporary heating devices are necessary for protection of Work, they shall not cause air pollution.

1.08 THAWING OF FROZEN GROUND

A. Obtain permit from appropriate local authority before building fire to thaw frozen ground, and comply with conditions of permit.

B. Use fuel which does not create air pollution or inconvenience public.

C. Engineer reserves right to prohibit fires for thawing whenever deemed undesirable.

1.09 USE OF CHEMICALS

A. Chemicals used during project construction or furnished for project operation, whether herbicide, pesticide, disinfectant, polymer, reactant or of other classification, shall be approved by U.S. EPA or U.S. Department of Agriculture or any other applicable regulatory agency.

B. Use and disposal of chemicals and residues shall comply with manufacturer's instructions.

1.10 NOISE CONTROL

A. Conduct operations to cause least annoyance to residents in vicinity of Work, and comply with applicable local ordinances.

B. Equip compressors, hoists, and other apparatus with mechanical devices necessary to minimize noise and dust. Equip compressors with silencers on intake lines.

C. Equip gasoline or oil-operated equipment with silencers or mufflers on intake and exhaust lines.

D. Line storage bins and hoppers with material that will deaden sounds.

E. Conduct operation of dumping rock and of carrying rock away in trucks so as to cause minimum of noise and dust.

F. Route vehicles carrying rock, concrete or other material over such streets as will cause least annoyance to public and do not operate on public streets between hours of 6:00 p.m. and 7:00 a.m., or on Saturdays, Sundays or legal holidays unless approved by City.

1.11 DUST CONTROL

A. Contractor shall develop and implement a dust control plan that ensures conformance with the dust control standards of the Wisconsin DNR, the City of Milwaukee Code of Ordinances and other applicable federal, state and local standards, at all times during the Work.

B. If dust emissions are problematic, the Contractor will identify the source of emissions and take corrective action, at no additional cost to the City.

C. Contractor shall submit for review, to the City or its Agent, a dust control plan that outlines the methodology and materials that will be employed in the dust control during the Work.

D. Any anti-freeze that is added to the water for dust control on the project site shall be approved by the Wisconsin Department of Natural Resources prior to its use on the site.

1.12 FUELS AND LUBRICANTS

A. Project site is within well recharge area.

B. Minimize use of potentially hazardous materials including fuels and lubricants.

C. Keep motorized equipment in good working order with no fuel or lubricant leakage. Protect ground surface from leakage using tarps or other material methods.

D. If grease, oil, solvent, or other residue from Contractor operations occurs, Contractor shall conduct remedial investigation and remediate as required by City.

E. Do not change oil on equipment or store or dispose of fuels, solvents, lubricants, or other potentially hazardous materials on Site.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION (Not Used)

END OF SECTION

SECTION 01 70 00
CONTRACT CLOSEOUT REQUIREMENTS

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. All of the Contract Documents, including General Specifications and other requirements of the Specifications apply to the work of this Section and are hereby made a part of this Section.

1.02 SCOPE OF WORK

A. This Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:
   1. Inspection and acceptance procedures.
   2. Project Record Documents.
   3. As-Built Documents.
   4. Punch List.
   5. Operation and maintenance manuals.
   6. Warranties.
   7. Instruction of City's personnel.
   8. Final cleaning.

B. See Technical Specifications for specific closeout and special cleaning requirements for products of those Sections.

1.03 SUBSTANTIAL COMPLETION

A. Preliminary Procedures: Before requesting inspection for determining date of Substantial Completion, complete the following. List items below that are incomplete in request.
   1. Prepare a list of items to be completed and corrected (punch list), the value of items on the list, and reasons why the Work is not complete.
   2. Advise City of pending insurance changeover requirements.
   3. Submit specific warranties, workmanship bonds, maintenance service agreements, final certifications, waste disposal manifests (contaminated soil, sewer sediment, and asbestos), and similar documents.
   4. Obtain and submit releases permitting City unrestricted use of the Work and access to services and utilities.
   5. Prepare and submit Project Record and As-Built Documents, operation and maintenance manuals, Final Completion construction photographs, damage or settlement surveys, property surveys, and similar final record information.
   6. Deliver tools, spare parts, extra materials, and similar items to location designated by City. Label with manufacturer's name and model number where applicable. Legally dispose of materials not returned or retained by the City.
   7. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.

8 Advise City of changeover for all utilities.
9. Submit changeover information related to City's occupancy, use, operation, and maintenance.
10. Complete final cleaning requirements.
11. Touch up and otherwise repair and restore pavements, fences and other features that were damaged by the Work.

B. Inspection: Submit a written request for inspection for Substantial Completion. On receipt of request, City or its Agent will either proceed with inspection or notify Contractor of unfulfilled requirements. City or its Agent will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by City or its Agent, that must be completed or corrected before certificate will be issued.
   1. Re-inspection: Request re-inspection when the Work identified in previous inspections (the Punch List) as incomplete is completed or corrected.
   2. Results of completed inspection will form the basis of requirements for Final Completion.

1.04 FINAL COMPLETION

A. Preliminary Procedures: Before requesting final inspection for determining date of Final Completion, complete the following:
   1. Submit a final Application for Payment according to the General Conditions and the Specifications
   2. Submit certified copy of City or its Agent's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by City or its Agent. The certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
   3. Submit evidence of final, continuing insurance coverage complying with insurance requirements.

B. Inspection: Submit a written request for final inspection for Final Acceptance. On receipt of request, City or its Agent will either proceed with inspection or notify Contractor of unfulfilled requirements. City or its Agent will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.
   1. Re-inspection: Request re-inspection when the Work identified in previous inspections as incomplete is completed or corrected.

C. The City or its Agent shall establish the date of Final Acceptance and submit written notice of that date. The warranty and maintenance periods will not commence until the City or its Agent has made a Final Acceptance of the Project.

1.05 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

A. Preparation: Submit three copies of Punch List. Include name and identification of each

space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.

1.06 PROJECT RECORD AND AS-BUILT DOCUMENTS

A. General: Do not use Project Record Documents for construction purposes. Protect Project Record Documents from deterioration and loss. Provide access to Project Record Documents for City or its Agent's reference during normal working hours.

B. Maintain field record documents neatly and accurately, and carefully record information regularly as the work progresses. Include in record documents all field changes made to the original Contract Documents, all change order modifications, all construction change directives, all field directions and instructions from the City or its Agent, all relevant dimensions, and all relevant details of the work. Information and locations of work that is readily obvious does not need to be recorded in record documents. Keep record documents up to date at all times.
    1. Progress Payments: Maintaining record documents accurately and up to-date shall be a prerequisite for approval of Contractor's application for progress payments.
    2. Record Documents Required: The following record documents are required:
        a. Record and As-Built drawings.
        b. Record specifications.
        c. Waste disposal manifests.

C. Record progress "As Built" Drawings: During the course of the Work, Contractor shall have maintained one print of all of the Contract Drawings, commencing with the original Contract issue and including all revisions thereto, as the "working record" of the Drawings from which the Project is constructed.
    1. Contractor shall show on the copy of Contract Drawings by notation thereon, or red marked revisions thereto, any deviations between the work as originally shown for design and the work as actually installed. These noted deviations shall include changes that were required to be made because of field conditions or conflicts between the work of two or more trades.
    2. Comply also with requirements of specification sections of Division 1 through 16 for Record Documents of specific items or systems referenced therein.

D. At the close of the Project, the Contractor shall prepare from the "working record", final "As-Built" Drawings showing all changes made to horizontal and vertical alignment of the site.
    1. Note Construction Change Directive numbers, Change Order numbers, alternate numbers, and similar identification where applicable.
    2. Identify and date each Record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location. Organize into manageable sets; bind each set with durable paper cover sheets. Include identification on cover sheets.

E. Record Submittals: Shop Drawings, Product Data, and other data shall be assembled in sequential order of the specification format and provided to the City.

F. Record Specifications: Submit two copies of the Project's Specifications, including addenda and contract modifications. Mark copy to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.
   1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
   2. Mark copy with the proprietary name and model number of products, materials, and equipment finished, including substitutions and product options selected.
   3. Note related Change Orders and Record Drawings, where applicable.

G. Miscellaneous Record Submittals: Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.
   1. Provide written concise chart of all materials, systems and products used on the Project. Indicate name, model number, manufacturer, supplier and contact information.

1.07 MAINTENANCE

A. Submittal Time: Submit written maintenance agreements on request of City or its Agent for designated portions of the Work where commencement of maintenance other than date of Final Completion is indicated.

B. Refer to individual trade sections for specific maintenance requirements. Maintenance that is required under the Contract is in addition to and not in lieu of any remedy or warranty to which the City is entitled under law. Maintenance agreements shall not be interpreted as a waiver of any of the City's rights.
   1. Maintenance Effective Starting Date: All maintenance shall begin upon Substantial Completion of the project and shall run for the period indicated. If no specific maintenance period is indicated, the maintenance shall be for at least one year from Date of Substantial Completion of the Project.
   2. Contractor's Responsibilities for Maintenance: The Contractor shall implement and invoke all maintenance by subcontractors and material suppliers longer than one year duration when required under various sections of these specifications, and use his best efforts to facilitate and aid the City in any claims the City may have.

1.08 FINAL CLEANING

A. General: Just prior to Final Acceptance provide final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.

B. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a portion of Project:
   1. Clean Project site, yard, and grounds in areas disturbed by construction activities, including landscape development areas, of debris, rubbish, waste material, litter, and other foreign substances.
   2. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
   3. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
   4. Remove tools, construction equipment, machinery, and surplus material from Project site.
   5. Leave Project site clean.

C. Comply with safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on City's property. Do not discharge volatile, harmful, or dangerous materials or any chemicals into drainage systems. Remove waste materials from Project site and dispose of lawfully.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION (Not Used)

END OF SECTION

SECTION 01 71 23
FIELD ENGINEERING

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. All of the Contract Documents, including General Specifications and Specifications, Appendices and Drawings, apply to the work of this Section and are hereby made a part of this Section.

1.02 SCOPE OF WORK

A. This Section specifies administrative and procedural requirements for field engineering services, including, but not necessarily limited to, the following:
   1. Land Survey Work.
   2. Establishment and maintenance of layout and elevation control points.
   3. Horizontal and vertical layout of all site improvements for review by the City or its Agent prior to and during construction.

1.03 SUBMITTALS

A. Project Record and As-Built Documents: Submit a record of work performed and record survey data as required under provisions of sections "Submittals" and "Contract Closeout".

B. When requested by the City or its Agent, provide supplemental horizontal and vertical data to aid in the design or construction of the Work. Provide supplementary data at no additional cost to the Project.

1.04 QUALITY ASSURANCE

A. Surveyor: The Contractor shall engage a Registered Land Surveyor, registered in the state of Wisconsin to perform land/building surveying services required.

1.05 EXAMINATION

A. Verify layout information shown on the Drawings, in relation to the property survey and existing benchmarks before proceeding to lay out the work. Locate and protect existing benchmarks and control points. Preserve permanent reference points during construction.
   1. Establish existing control points in areas convenient to but outside of Work area, prior to the commencement of any Work. Confer with City's Agent prior to reestablishing control points.
   2. Do not change or relocate benchmarks or control points without prior written approval. Promptly report lost or destroyed reference points, or requirements to relocate reference points because of necessary changes in grades or locations. Base replacements on the original survey control points.

B. Establish and maintain a minimum of two permanent benchmarks on the site, referenced to data established by survey control points. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.

C. Existing utilities and equipment: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning site work, investigate and verify the existence and location of underground utilities and other construction.
   1. Prior to construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer and water service piping.

1.06 PERFORMANCE

A. Working from lines and levels established by the property survey, establish benchmarks and markers to set lines and levels at each area of work and elsewhere as needed to properly locate each element of the Project. Calculate and measure required dimensions within indicated or recognized tolerances. Do not scale Drawings to determine dimensions.
   1. Advise entities engaged in construction activities of marked lines and levels provided for their use.
   2. As construction proceeds, check every major element for line, level and plumb.

B. Surveyor's Log: Maintain a surveyor's log of control points, benchmarks, and other survey work. Make this log available for reference.

C. Record deviations from required lines and levels, and advise the City's Agent when deviations that exceed indicated or recognized tolerances are detected. On Project Record Drawings, record deviations that are accepted and not corrected.

D. Site Improvements: Locate and lay out site improvements horizontally and vertically, including but not limited to, pavements, bases, foundations, steps, walls, wood elements, stakes for grading, fill and topsoil placement, utilities, utility slopes and invert elevations, benches, lights, and planting by instrumentation and similar appropriate means.
   1. The City or its Agent shall review and accept the horizontal and vertical layout before construction begins. No Work shall be installed without the City or its Agent's acceptance of the layout.
   2. Work with City or its Agent to set up string line or other layout aides necessary to review horizontal and vertical alignment of site improvements.
   3. Provide horizontal and vertical layout information prior to beginning construction and as construction proceeds. City or its Agent shall have the right to request confirmation of all vertical and horizontal layouts of site improvements before, during and after construction.

E. Existing Utilities: If the Work impacts existing utilities that are to remain, furnish information necessary to adjust, move or relocate existing structures, utility poles, lines, services or other appurtenances located in, or affected by construction. Coordinate with local

authorities and public/ private utilities having jurisdiction.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION (Not Used)

END OF SECTION

SECTION 02 41 13

SITE DEMOLITION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Demolish and remove designated pavements.
2. Remove designated retaining wall system.
3. Remove designated fencing system.
4. Owner retained material.
5. Remove demolition materials from site.

B. Related Sections:
1. Applicable provisions of Section 31 02 00 – General Requirements for Sitework shall govern Work under this Section.
2. Section 31 05 13 – Soils for Earthwork: Subsoil backfill material.
3. Section 31 05 16 – Aggregates for Earthwork: Granular backfill material.
4. Section 31 10 00 - Site Clearing: Site clearing outside perimeter of existing structures.

1.2 SUBMITTALS

A. Section 31 02 00 – General Requirements for Sitework: Requirements for submittals.

B. Submit demolition schedule.

C. Submit project record documents under provisions of Section 31 02 00 – General Requirements for Sitework.
1. Record drawings should accurately identify location of active or abandoned utilities encountered, location of foundations or appurtenances abandoned and covered, or items remaining that would affect future work on site.

1.3 REGULATORY REQUIREMENTS

A. Comply with local, state, and federal codes, rules and regulations applicable to demolition work including but not limited to erosion control, air pollution, noise pollution, and waste disposal.

B. Contractor shall obtain and pay for permits required for demolition work.

1.4 PROJECT SITE CONDITIONS

A. Conduct demolition to minimize interference with adjacent structures.

B. Maintain protected egress and access at all times.

C. Provide, erect, and maintain temporary barriers and security devices.

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D. Conduct operations with minimum interference to public or private thoroughfares.

E. Do not close or obstruct roadways and sidewalks without permits.

1.5 SITE DEMOLITION REQUIREMENTS

A. Traffic Control Signs:
   1. Where pedestrian and driver safety is endangered in area of removal work, use traffic barricades with flashing lights.
   2. Anchor barricades in a manner to prevent displacement by wind.

B. Items to Remain in Place:
   1. Take necessary precautions to avoid damage to existing items scheduled to remain in place, to be reused, or to remain property of Owner.
   2. Repair or replace damaged items as approved by Owner's Representative.
   3. Construct and maintain shoring, bracing, and supports as required.
   4. Ensure that structural elements are not overloaded. Increase structural supports or add new supports as may be required as a result of any cutting, removal, or demolition work performed.
   5. Do not overload pavements to remain.
   6. Provide new supports and reinforcement for existing construction weakened by demolition or removal work.
   7. Repairs, reinforcement, or structural replacement require approval by Owner's Representative prior to performing such work.

C. Existing Conditions:
   1. Before beginning any demolition work, survey project site and examine drawings and specifications to determine extent of demolition work.
   2. Protect trees within project site which might be damaged during demolition, and which are indicated to be left in place.
   3. Replace any tree designated to remain that is damaged during the work under this contract with like and kind or as approved by Owner's Representative.
   4. Maintain existing utilities indicated to stay in service and protect against damage during demolition operations.
   5. Prior to start of work, utilities serving each area of alteration or removal will be shut off by Utility Owner and disconnected and sealed by Contractor.

1.6 HAZARDOUS MATERIALS

A. If Contractor encounters a hazardous material during demolition process, it shall cease operations immediately and notify Owner and Owner's Representative of its findings.

B. Owner will employ a Contractor, experienced and certified in removal and disposal of hazardous substances to perform removal and disposal work.

C. Contractor shall not reinstate demolition operations until areas have been cleared for continuation of demolition work.

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PART 2 - PRODUCTS – (Not Used)

PART 3 - EXECUTION

3.1 NOTIFICATION

A. Contractor, prior to any excavation work, shall notify (1) a designated locating service; (2) all utilities, governmental agencies, entities, known to, or which can reasonably be assumed to have above or below ground pipe, conduit cables, structures, or similar items within limits of project; to locate and mark location of such items.

B. In accordance with Wisconsin Statute 182.0175, "Damage to Transmission Facilities," Excavator, as defined in 182.0175(1)(bm), shall provide advance notice not less than three (3) working days before the start of nonemergency excavation to the one-call system, as defined in the statute, required to perform work contained in this Project, and further, Excavator shall comply with all other requirements of this Statute relative to Excavation.

3.2 PREPARATION

A. Prevent movement or settlement of adjacent structures scheduled to remain.

B. Provide bracing and shoring of adjacent structures scheduled to remain.

C. Protect existing landscaping materials, appurtenances and structures which are not to be demolished.

3.3 DEMOLITION AND REMOVAL

A. Except where specified in other sections, all materials and equipment removed, and not reused or salvaged shall become property of the Contractor.

B. Demolish designated pavements, fences, and appurtenances in accordance with removal procedure and schedule.

C. Cease operations and notify Owner’s Representative immediately if adjacent structures or landscape features appear to be endangered.

D. Do not resume operations until corrective measures have been taken.

E. Immediately remove demolished material from site unless approved demolition procedure and schedule submitted in accordance with this section provides otherwise.

F. Relics, antiques, and similar objects remain property of Owner.

G. Notify Owner’s Representative prior to removal and obtain acceptance regarding method of removal.

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H. Remove following material and equipment disposal off-site.
   1. Fencing.
   2. Retaining Wall.

I. Remove and promptly dispose of contaminated, vermin infested, or dangerous materials encountered.

J. Do not burn or bury materials on site.

K. Demolish and remove designated concrete pavement completely which includes:
   1. Sidewalks.
   2. Curb and Gutter.

L. Neatly saw cut pavement edges at right angle to surface to complete depth of pavement prior to shattering or mechanical removal.

M. Keep work sprinkled to minimize dust. Provide hoses and water main or hydrant connections for this purpose. Obtain permits and pay for water usage as required by Local Water Utility.

N. Backfill areas excavated, open pits, and holes caused as a result of demolition with Type S1 or S2 subsoil specified in Section 31 05 13 – Soils for Earthwork.

O. Rough grade and compact areas affected by building demolition to maintain and blend site grades and contours as indicated on Drawings.

END OF SECTION

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SECTION 03 31 00

STRUCTURAL CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Structural Concrete.
2. Admixtures.
3. Formwork, shoring, bracing, and anchorage.
4. Concrete reinforcement and accessories.

B. Work Installed But Furnished Under Other Sections:
1. Division 05 - Metals.

C. Related Sections:
1. Applicable provisions of Division 01 – General Requirements shall govern all work under this Section.
2. Division 31 – Earthwork.

1.2 REFERENCES

A. Incorporated Guides and References:
1. American Concrete Institute (ACI):
a. ACI 302.1R – Guide for Concrete Floor and Slab Construction.
b. ACI 304R – Guide for Measuring, Mixing, Transporting and Placing Concrete.
c. ACI 304.2R - Placing Concrete by Pumping Methods.
d. ACI 305R - Hot Weather Concreting.
e. ACI 309R – Guide for the Consolidation of Concrete.
f. ACI 347 – Guide to Formwork for Concrete.
g. ACI SP-66 – ACI Detailing Manual.

B. Specifications:
1. American Concrete Institute (ACI):
a. ACI 117 - Specifications for Tolerances for Concrete Construction and Materials.
b. ACI 301 - Specifications for Structural Concrete.
c. ACI 303.1 – Specification for Cast-In-Place Architectural Concrete.
d. ACI 306.1 – Specification for Cold Weather Concreting.
e. ACI 308.1 – Specification for Curing Concrete.
f. ACI 315 - Details and Detailing of Concrete Reinforcement.
g. ACI 318 - Building Code Requirements for Structural Concrete and Commentary.
2. ASTM International (ASTM):
a. ASTM A108 - Standard Specification for Steel Bar, Carbon and Alloy, Cold-Finished.

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b. ASTM A615 – Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.
c. ASTM A775 – Standard Specification for Epoxy-Coated Steel Reinforcing Bars.
d. ASTM A934 – Standard Specification for Epoxy-Coated Prefabricated Steel Reinforcing Bars.
e. ASTM A1044 – Standard Specification for Steel Stud Assemblies for Shear Reinforcement of Concrete.
f. ASTM C33 – Standard Specification for Concrete Aggregates.
g. ASTM C94 – Standard Specification for Ready-Mixed Concrete.
h. ASTM C150 – Standard Specification for Portland Cement.
i. ASTM C260 – Standard Specification for Air-Entraining Admixtures for Concrete.
j. ASTM C494 – Standard Specification for Chemical Admixtures for Concrete.
k. ASTM C618 – Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for use in Concrete.
l. ASTM C1602 – Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete.
m. ASTM D3963 – Standard Specification for Fabrication and Jobsite Handling of Epoxy-Coated Steel Reinforcing Bars.

1.3 SUBMITTALS

A. Submit proposed mix design of each class of concrete to Engineer not later than 10 days after Notice to Proceed or 15 days prior to the first concrete placement, whichever comes first.

B. Submit shop drawings of reinforcing steel under provisions of Division 01 – General Requirements.
1. Initial submittal of reinforcement shop drawings shall be complete. No partial submittals will be accepted.
2. Indicate reinforcement sizes, spacings, locations and quantities of reinforcing steel, bending and cutting schedules, splicing, supporting and spacing devices.
3. Reinforcement placement shop drawings for foundations and walls shall conform to ACI SP-66 providing full wall elevations.

C. Material Certificates: For each of the following, signed by the manufacturers:
1. Cementitious materials.
2. Admixtures.

D. Material Test Reports: For the following, from a qualified testing agency, indicating compliance with requirements:
1. Aggregates.

1.4 QUALITY ASSURANCE

A. Perform work in accordance with ACI 301, 305R, and 306.1.

B. Maintain copy of ACI 301 on site.

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C. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from one source, and obtain admixtures through one source from a single manufacturer.

1.5 REGULATORY REQUIREMENTS

A. Conform to requirements of local, state and federal rules and regulations applicable to Work and Project location.

1.6 ENVIRONMENTAL REQUIREMENTS

A. Cold Weather Concreting
   1. Placement and curing of concrete where (1) average daily temperature for three consecutive days is less than 40 degrees F, and (2) air temperature is not greater than 50 degrees F for more than one-half of a 24-hour period from midnight to midnight shall be in accordance with ACI 306.1.

B. Hot Weather Concreting
   1. Placement and curing of concrete subject to a combination of (1) rising air temperature (generally greater than 75 degrees F) and (2) wind and low relative humidity shall be in accordance with ACI 305R.
   2. Contractor shall provide plan for minimizing exposure of concrete to adverse conditions due to combinations of high air temperature, direct sunlight, drying winds, and high concrete temperature.
   3. Protect concrete from rapid temperature drop.
   4. Pre-wet subgrade and forms.

PART 2 - PRODUCTS

2.1 FORM MATERIALS

A. Plywood Forms: Douglas Fir or Spruce-Pine-Fir species: Sound, undamaged sheets with clean true edges, exterior glue, facing material to provide finish specified.

B. Lumber: Douglas Fir or Spruce species; construction grade or better; with grade stamp clearly visible.

C. Preformed Steel Wall Forms: Minimum 16 gage thick, Vertically and horizontally matched, tight fitting, stiffened to support weight of concrete without deflection detrimental to tolerances and surface appearance.

D. Form Ties For Exposed Surfaces: Plastic cone snap ties with 1-inch outside diameter by 1-inch (nominal) long cones, with no metal within 1-inch of concrete face after removal;
   1. Manufacturers:
      a. Advance Concrete Formwork, Inc.
      b. Dayton Superior.
      c. Symons - A Dayton Superior Company.

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d. Williams Form Engineering Corporation.
e. Substitutions: As approved by Engineer.

2.2 REINFORCING STEEL

A. Reinforcing Steel: ASTM A615, 60 ksi yield grade carbon steel deformed bars; epoxy coated in accordance with ASTM A775, finish.

B. Reinforcement Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars, welded wire fabric, and dowels in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice" from steel wire, plastic, or precast concrete of greater compressive strength than concrete.

2.3 HEADED SHEAR REINFORCEMENT

A. Manufacturers:
1. Dayton Superior - DSR System.
2. Decon USA - Studrails.
3. Dywidag Systems International - Dywidag Shear System.
4. Substitutions: As approved by Engineer.

B. Headed shear stud reinforcement used to resist punching shear in concrete retaining wall shall be fabricated in accordance with ASTM A1044.

C. Shear studs shall be fabricated from low carbon steel plating, grade designations from 1010 thru 1020, in accordance with ASTM A108;
1. Strength Requirements (Minimum);
a. Yield Strength: 51,000 psi.
b. Tensile Strength: 65,000 psi.
c. Elongation in 2 inches: 20 percent.

2.4 CONCRETE MATERIALS

A. Cementitious Materials
1. Portland Cement: ASTM C150, gray color, Type I except as specified below.
2. Fly Ash: ASTM C618, Class C.

B. Fine and Coarse Aggregates: ASTM C33.

C. Water: ASTM C1602, clean and not detrimental to concrete.

2.5 ADMIXTURES

A. Admixtures to be used in the concrete mixture shall be submitted to the Engineer for approval as part of the mixture design.

B. Chemical admixtures shall be in accordance with ASTM C494.

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C. Admixtures shall be used in accordance with manufacturer's written recommendations.

D. Admixtures containing chlorides, sulfides, or nitrides are not permitted.

E. Admixtures permitted shall be supplied by a single manufacturer for project.

F. Air Entrainment Admixture: ASTM C260;
   1. Manufacturers:
      a. Axim Italcementi Group.
      b. BASF Admixtures, Inc.
      c. Grace Construction Products.
      d. The Euclid Chemical Company.
      e. Substitutions: As approved by Engineer.

2.6 ACCESSORIES

A. Form Release Agent: Colorless material which will not stain concrete, absorb moisture or impair natural bonding or color characteristics of coating, intended for use on concrete;
   1. Manufacturers:
      a. BASF Construction Chemicals, LLC - Building Systems: Castoff.
      b. Dayton Superior - Clean Strip Ultra (J-3).
      c. W.R. Meadows - Duogard.
      d. Substitutions: As approved by Engineer.

2.7 CONCRETE MIXTURE

A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture of field test data, or both, according to ACI 301.

B. Mix concrete in accordance with ASTM C94.

C. Concrete mix designs shall be designed and submitted in accordance with Division 01 and included as part of cost of this Work.

D. Mix designs shall be prepared by a qualified agency acceptable to Engineer. Six (6) copies of mix designs shall be submitted for Engineer's review prior to placing any concrete.

E. Mix design shall indicate brands, types, and quantities of admixtures included, compressive strength, slump, sieve analysis for fine and coarse aggregate, quantities of all ingredients, type and brand of cement, source of aggregate, whether fine aggregate is natural or manufactured.

F. Design of mix shall assure placing and finishing characteristics that meet Project requirements.

G. Mix designs contained in the Schedule of Mixes may be modified and submitted to Engineer for approval, by use of mid or high range water reducing admixtures to control slumps required for pumping of concrete. Strength, placing and finishing requirements shall be maintained.

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H. Concrete mixtures placed directly over vapor retarders shall be designed to have low shrinkage characteristics and designed to minimize slab curling.

I. Initial and final set times of concrete mix designs shall be coordinated between the contractor and concrete supplier.

2.8 SCHEDULE OF MIXES

A. Footings: Proportion normal-weight concrete mix as follows:
   1. Compressive Strength (28 Days): 4000 psi.
   2. Maximum Aggregate Size: 1-1/2 inches.
   3. Maximum Water-Cement Ratio: 0.50.

B. Beams: Proportion normal-weight concrete mix as follows:
   1. Compressive Strength (28 Days): 4000 psi.
   2. Maximum Aggregate Size: 3/4 - inch.
   3. Air Entrainment: 6 percent air content is required with an acceptable air content of plus or minus 1.5 percent.

C. Foundation Walls: Proportion normal-weight concrete mix as follows:
   1. Compressive Strength (28 Days): 4000 psi.
   2. Maximum Aggregate Size: 3/4 - inch.
   3. Air Entrainment: 6 percent air content is required with an acceptable air content of plus or minus 1.5 percent.

PART 3 - EXECUTION

3.1 FORMWORK

A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until concrete structure can support such loads.

B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits stated below.

C. Verify lines, levels, and measurement before proceeding with formwork.

D. Earth forms are not permitted.

E. Align form joints.

F. Coordinate work of other Sections in forming and setting openings, slots, recesses, chases, sleeves, bolts, anchors, and other inserts.

G. Provide chamfer strips for all exposed concrete corners of formwork.

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3.2 REINFORCEMENT

A. Place, support, and secure reinforcement against displacement.

B. Locate reinforcing splices as shown on Drawings.

C. Cut ends of epoxy coated rebars shall be coated with epoxy material equivalent to factory coating.

D. Damage to rebar coating as a result of bending shall be repaired with equivalent coating.

3.3 PLACING CONCRETE

A. Notify Engineer a minimum of 48 hours prior to commencement of concreting operations.

B. Failure to notify Engineer may result in rejection of concrete placed without observation.

C. Place concrete in accordance with ACI 301.

D. Place pumped concrete in accordance with ACI 304.2R. Line coating mix to initiate pumping shall not be used in pour but shall be wasted.

E. Ensure reinforcement and embedded items are not disturbed during concrete placement.

F. Concrete with excessive honeycomb or embedded debris shall be rejected and replaced at no cost to OWNER.

G. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures and mechanical injury.

H. Placing During Hot Weather:
   1. Place concrete during hot weather conditions in accordance with ACI 305R.

I. Placing During Cold Weather:
   1. Place concrete during cold weather conditions in accordance with ACI 306.1.

J. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.

3.4 REPAIR OF VERTICAL SURFACE DEFECTS

A. Upon stripping of forms, vertical surfaces shall be inspected for defects caused by surface air voids, honeycombing, form tie holes, peeling, and fins.

B. Surface air voids shall be repaired with a unit packaged mixture of sand and cement mixed on job site with water and a unit of acrylic. Mixture shall be brushed uniformly on to surface and into voids. Where surface is to be exposed, surface finish of repair shall match adjacent surface.

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C. Honeycombed and other defective concrete shall be removed down to sound concrete and patched to match adjacent surfaces.

3.5 FINISHING OF FORMED SURFACES

A. After removal of forms and repair of defects, surfaces of concrete shall be given finishes specified below.

B. Rough Form Finish: Surface left with texture imparted by forms; form facing material not specified; tie holes and defects (see General Notes on Sheet 8 of 13) shall be patched.

C. Tops of walls or buttresses, horizontal offsets, and similar unformed surfaces occurring adjacent to formed surfaces shall be struck smooth after concrete is placed and shall be floated to a texture reasonably consistent with that of formed surface.

3.6 TOLERANCES

A. All tolerances for concrete work shall be in accordance with ACI 117.

3.7 FIELD QUALITY CONTROL

A. Testing and analysis of concrete shall be performed under provisions of Division 01.

B. Testing firm will cast test cylinders and perform slump and air entrainment tests in accordance with ACI 301.

C. Three concrete test cylinders shall be cast from each increment of 100 cubic yards of each class of concrete placed each day or from each placement of each class if less than 100 cubic yards.

D. During hot or cold weather, as defined in Section 1.6, one additional test cylinder shall be cast from each increment of 100 cubic yards of each class of concrete placed each day or from each pour of each class if less than 100 cubic yards and be cured on site under same conditions as concrete it represents.

E. One slump test will be taken for each set of tests cylinders cast and whenever consistency of concrete appears to vary.

F. No water may be added to the concrete at the site unless pre-approved in writing by the Engineer for that specific mix. If pre-approved, the mix ticket must state how much water may be added.

END OF SECTION

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SECTION 05 12 00

STRUCTURAL STEEL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Fabrication, transportation, delivery, and erection of structural steel.
2. Structural steel, framing members, support members, and welds.
3. Bearing plates and shear stud connectors.

B. Related Sections:
1. Applicable provisions of Division 01 – General Requirements shall govern all work under this Section.

1.2 REFERENCES

A. ASTM International (ASTM):
1. ASTM A108 - Standard Specification for Steel Bar, Carbon and Alloy, Cold-Finished.
2. ASTM A588 – Standard Specification for High-Strength Low Alloy Structural Steel, up to 50 ksi Minimum Yield Point, with Atmospheric Corrosion Resistance.
3. ASTM A847 – Standard Specification for Cold-Formed Welded and Seamless High-Strength, Low-Alloy Structural Tubing with Improved Atmospheric Corrosion Resistance.

B. American Welding Society (AWS):
1. AWS A2.0 - Standard Welding Symbols.
2. AWS D1.1 - Structural Welding Code.

C. American Institute of Steel Construction, Inc (AISC):
1. AISC – Steel Construction Manual, Current Edition.
2. AISC - Code of Standard Practice for Steel Buildings and Bridges.
3. AISC - Specification for Architectural Exposed Structural Steel.

1.3 SUBMITTALS

A. Division 01 – General Requirements: Submittal Procedures.

B. Shop and Erection Drawings:
1. Indicate profiles, sizes, spacing, and locations of structural members, openings, attachments, and fasteners.

C. Show all connections.
1. Indicate welded connections with AWS A2.0 welding symbols. Indicate net weld lengths.
2. Indicate cleaning specifications.
3. Assume responsibility for dimensional errors.

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4. Field verify bearing plate placement into top of wall and modify steel above plates to accommodate field conditions.
5. Fabricator shall check shop drawings before Submittal.

D. Shop drawings shall include the following:
1. Connection drawings, job standards, and any other items that are performance specified or designed by Contractor's engineer.
2. Provide holes for installation of other work.
3. Any omission from shop drawings of any materials required by Contract Documents shall not relieve Contractor of responsibility of furnishing and installing such materials, even though shop drawings may have been reviewed and approved.

E. Welders Certificates: Submit under provisions of Division 01 – General Requirements Manufacturer's Certificates, certifying welders employed on the Work, verifying AWS qualification within the previous 12 months.

1.4 QUALITY ASSURANCE

A. Fabricate structural steel members in accordance with AISC -Specifications and the AISC Code of Standard Practice for Steel Buildings and Bridges.

B. Perform Work identified on Drawing as architecturally exposed in accordance with AISC Specification for Architectural Exposed Structural Steel.

1.5 QUALIFICATIONS

A. Fabricator: Company specializing in performing the work of this Section with minimum ten years documented experience and AISC Certified.

B. Erector: Company specializing in performing the work of this Section with minimum ten years documented experience.

1.6 FIELD MEASUREMENTS

A. Verify that field measurements are as shown on Drawings and shop drawings.

PART 2 - PRODUCTS

2.1 MATERIALS AND EQUIPMENT

A. Structural Steel W-Shape Members: ASTM A588, Corten Weathering Steel, Fy = 50 ksi.

B. Structural Steel Angles, Plates, Channels and Other Rolled Members: ASTM A588, Corten Weathering Steel, Fy = 36 ksi.

C. Rectangular or Square (HSS) Hollow Structural Sections: ASTM A847, Corten Weathering Steel, Grade B, Fy = 46 ksi.

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D. Shear Stud Connectors: ASTM A108 Grade 1015, Fu = 60 ksi Forged Steel, headed and uncoated.

E. Welding Electrodes: E7018 or SG2 MIG wire and shall comply with AWS D1.1; type required for materials being welded.

2.2 FABRICATION

A. Fabricate items of structural steel in accordance with AISC specifications, and as shown on approved shop drawings.

B. Field connections are to be welded, unless other types of connections are indicated.

C. Connections shall support a minimum of one-half the total uniform load capacity shown in the AISC ASD tables for allowable loads on beams for the given shape, span, and steel specified, unless otherwise noted.

D. Welding shall comply with AISC and AWS Codes for procedures, appearance, quality of welds, and for methods used in correcting welding work.

E. All welds shall be made by AWS pre-qualified welders, certified for welds made.

F. Minimum size of fillet welds shall be as specified in TABLE J2.4 of AISC Manual of Steel Construction.

G. Minimum Strength of Welded Connections: Unless noted otherwise on drawings, all shop and field welds shall develop full tensile strength of member of element joined.

H. All members with moment connections, noted on drawings, shall be welded to develop full flexural capacity of member, unless noted otherwise on drawings.

I. Cut, drill, or punch holes perpendicular to metal surfaces. Do not flame cut holes or enlarge holes by burning. Drill holes in bearing plates.

J. Verify or supplement dimensions shown on Drawings by field measurements to assure fit of new work.

K. Jointed members shall be sealed with continuous welds unless otherwise noted.

PART 3 - EXECUTION

3.1 PREPARATION

A. Verify that field conditions are acceptable and are ready to receive work in accordance with Drawings and shop drawings.

B. Verify anchors and anchor rods have been preset into connection work in accordance with Drawings and shop drawings.

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C. Beginning of installation and erection means that existing conditions have been checked and found acceptable.

D. Cost of corrections shall be borne by this Section if variances are not identified prior to start of installation.

3.2 ERECTION

A. Erect structural steel in accordance with AISC Specifications.

B. Store steel on site on substantial shores or blocking to keep free of ground and to prevent bending, buckling, or twisting.

C. Prevent water collection on members.

D. Provide for erection loads, wind, and dead loads, and provide sufficient temporary bracing to maintain structure in safe, plumb, and true alignment until completion of erection and installation of permanent bracing.

E. Do no final welding until structure has been properly aligned and plumbed.

F. Do not field cut or alter structural members without prior approval of Structural Engineer of Record.

G. Field weld components indicated on Drawings and shop drawings. Welding shall be compatible with weathering steel so that no priming is required after welding is completed, and future corrosion of welds will be similar to weathering steel components.

H. Contact surfaces of field connections shall be free from dust, oil, loose scale, burrs, pits, and other defects that prevent solid seating of parts.

I. Reaming is not allowed if reaming weakens or makes it impossible to fill holes or adjust accurately after being reamed.

3.3 ERECTION TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch.

B. Maximum Offset From True Alignment: 1/4 inch.

3.4 FIELD QUALITY CONTROL

A. Field inspection and testing will be performed under provisions of Division 01 – General Requirements.

END OF SECTION

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SECTION 31 02 00

GENERAL REQUIREMENTS FOR SITEWORK

PART 1 - GENERAL

1.1 SUMMARY

A. This Section governs only technical specifications related to site work construction.

B. Section Includes:
1. Definitions.
2. Field Engineering.
3. Pre-installation Meeting.
4. Submittal Procedures.
5. Traffic Control Plan.
6. Quality Control Requirements.
7. Erosion and Sediment Control.
8. Proposed Products List.
9. Product Requirements.
10. Project Closeout Procedures.

C. Related Divisions:
1. Division 02 – Existing Conditions.
2. Division 31 – Earthwork.
3. Division 32 – Exterior Improvements.

1.2 DEFINITIONS

A. Field Engineering: Contractor's establishment of elevations, lines, and levels as indicated on Drawings, utilizing recognized engineering survey practices.

B. Pre-installation Meeting: Meeting to discuss a product or material, typically complex in nature, and review manufacturer's precautions, restrictions, and installation procedures.

C. Demonstration and Training Meeting: Contractor and/or manufacturer representative administered demonstration and training sessions for Owner for each portion of equipment and products that are required to have training in proper operation and maintenance.

D. Submittal Procedures: Specified requirements regarding procedures related to submission of product data, Shop Drawings, manufacturer's certificates, and substitutions.

E. Traffic Control Plan: Plan developed consistent with Manual on Uniform Traffic Control Devices (MUTCD).

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F. Quality Control: Inspection, analysis, and other relevant actions taken to provide control over what is being done, manufactured, or fabricated, so that a desirable level of quality is achieved and maintained during duration of the Work.

G. Erosion and Sediment Control: Enforcement of state law and city or county ordinance for erosion and sediment control including installation, maintenance, and regular Contractor inspection and repair.

H. Proposed Product List: Prepared listing of all materials and products intended to be used for site work related to sewer and water utilities, aggregates, and soils, and pavement mix designs.

I. Product Requirements: Product information regarding manufacturer's data, preparation, fabrication, conveying and erection of Work including material, machinery, components, equipment, fixtures, and systems incorporated in Work.

J. Project Closeout Procedures: Process that provides acceptance of project by Owner and Engineer/Architect including verification and documentation of required project records, and retention of other essential project documentation.

1.3 FIELD ENGINEERING

A. Employ Land Surveyor registered in State of Wisconsin and acceptable to Owner.

B. Contractor shall locate and protect survey control and reference points. Promptly notify Owner of discrepancies discovered.

C. Control datum for survey is that established by Owner provided survey.

D. Verify setbacks and easements; confirm drawing dimensions and elevations.

E. Provide required field engineering services. Establish elevations, lines, and levels, utilizing recognized engineering survey practices.

F. Maintain complete and accurate log of control and survey work as Work progresses.

G. Protect survey control points prior to starting site work; preserve permanent reference points during construction.

H. Promptly report to Owner loss or destruction of reference point or relocation required because of changes in grades or other reasons.

I. Replace dislocated survey control points based on original survey control. Make no changes without prior written notice to Owner.

J. A Registered Land Surveyor shall replace damaged property corners at Contractor's expense.

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1.4 PREINSTALLATION MEETING

A. When required in individual specification sections, convene preinstallation meeting at Project site prior to commencing work of specific section.

B. Require attendance of parties directly affecting, or affected by, Work of specific section.

C. Notify Owner four days in advance of meeting date.

D. Prepare agenda and preside at meeting:
   1. Review conditions of installation, preparation and installation procedures.
   2. Review coordination with related work.

E. Record minutes and distribute copies within two days after meeting to participants, with copies to Owner, Engineer, Architect, Construction Manager, and those affected by decisions made.

1.5 SUBMITTAL PROCEDURES

A. Contractor shall provide Engineer specific submittal information regarding products and materials of this specification section with extended permission of Architect.

B. Submit Shop Drawings and product data covering identified equipment and materials that will become a permanent part of Work to Engineer for review.

C. Shop Drawings and product data shall include drawings, descriptive information, and sufficient detail to show kind, size, arrangement, and operation of component materials and devices needed for installation and coordination with other materials and equipment.

D. All submittals, regardless of origin, shall be stamped with approval of Contractor and identified with name of the Project, Contractor's name, and references to applicable specification sections and Drawings.

E. Each submittal shall indicate intended use of item in Work. When manufacturer data sheets are submitted, clearly identify applicable items and cross out inapplicable data.

F. Manufacturer's data sheets shall be current and include issue number and date.

G. Contractor's stamp of approval is a representation to Engineer that Contractor accepts full responsibility for determining and verifying all quantities, dimensions, field construction criteria, materials, catalog numbers, and similar data, and that Contractor reviewed and coordinated each submittal with requirements of the Work.

H. Contractor shall accept full responsibility for completeness of each submission. When an item consists of components from several sources, Contractor shall submit a complete initial submittal including all components.

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I. Identify deviations from Specifications and Drawings on each submittal and tabulate in Contractor's letter of transmittal. Such submittals shall indicate details of proposed changes, including modifications to other facilities that may result from deviation, and required piping and wiring diagrams.

J. Submit one electronic file of each drawing and necessary data to Engineer. Engineer will return one marked electronic file to Contractor.

K. Engineer will not accept submittals from anyone but Contractor.

L. Submittals shall be consecutively numbered in direct sequence of submittal and without division by subcontracts or trades.

M. Review of Shop Drawings and Product Data:
1. Engineer's review of Shop Drawings and product data will cover only general conformity to Drawings and Specifications, external connections, and dimensions that affect layout. Engineer's review does not indicate a thorough review of all dimensions, quantities, and details of material, equipment, device, or item shown.
2. Engineer's review shall not relieve Contractor of Contractor's responsibility for errors, omissions, or deviations in drawings and data, or of sole responsibility for compliance with the Work.
3. Engineer's submittal review period shall be a maximum of fifteen (15) calendar days from date of submittal or resubmittal.
4. When Shop Drawings and data are returned marked "NOT ACCEPTABLE" or "RETURNED FOR CORRECTION", Contractor shall make corrections as noted by Engineer and resubmit corrected electronic file.
5. When Shop Drawings and product data are returned marked "EXCEPTIONS NOTED" or "APPROVED AS SUBMITTED", no additional revised files need be submitted unless requested by Engineer at time of review.

N. Re-submittal of Shop Drawings and Product Data:
1. Contractor shall accept full responsibility for completeness of each re-submittal.
2. Contractor shall verify that resubmittal provides all corrected data and additional information previously requested by Engineer.
3. When corrected files are re-submitted, Contractor shall indicate in writing revisions made.
4. Requirements specified for initial submittals also apply to re-submittals.
5. Re-submittals shall bear number of first submittal followed by a letter (A, B, etc.) to indicate sequence of re-submittal.
6. Make re-submittals within fifteen (15) days of date of letter returning material to be modified or corrected.

O. Substitutes and "Or-Equal" Items:
1. Whenever a material or article is specified or described by using a single name of a

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proprietary product or a single name of a particular manufacturer or vendor, specified item mentioned shall be understood as establishing type, function, and quality desired.

2. Whenever two or more names of proprietary products or particular manufacturers or vendors are used, it shall be understood that products of one named supplier shall be furnished with no options or substitutions allowed.

1.6 TRAFFIC CONTROL PLAN

A. Submit a traffic control plan for construction in public right-of-way in accordance with Part VI of "Manual on Uniform Traffic Control Devices."

B. Data to be included on a traffic control plan will vary depending upon complexity of project, volume of traffic affected, and roadway geometrics where construction is being performed.

C. Traffic control plan must clearly depict exact sequence of construction operation(s), construction to be performed, and traveled way that will be utilized by all movements of traffic during each phase of construction.

D. Multiple phases of construction will require a separate traffic control plan for each different construction phase or operation.

1.7 QUALITY CONTROL REQUIREMENTS

A. Construction Notification:

1. Contractor shall be responsible for locating existing underground installations in advance of excavating or trenching by contacting local utility identification agency.

B. Licenses, Permits, and Certificates:

1. All licenses, permits, and certificates, required for, and in connection with site and utility work shall be secured by Contractor at their sole cost and expense.
2. Contractor will be required to pay any permit fees for required for utility work.
3. Contractor shall comply with all requirements and recommendations of authority or authorities issuing license, permit, or certificate.

C. Easements and Rights-of-Way:

1. Contractor will confine construction operations to areas designated on Drawings or identified by Engineer.
2. Contractor shall use care in placement of construction tools, equipment, excavated materials, pipe materials, and supplies so as to minimize damage to property and minimize interference with the public.

D. Protection of Property:

1. Contractor shall protect from damage or injury all property including survey monuments, property markers, and benchmarks. Items damaged shall be replaced or

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repaired at Contractor's expense.

2. Locate existing utilities and utility services in advance of excavation and protect against damage. Changes in grade and alignment may be made to Work to avoid conflicts with existing structures if approved by Engineer.

E. Reference Standards:

1. Reference to standards, specifications, manuals, or codes of any technical society, organization, or association, or to laws or regulations of any governmental authority, whether such reference be specific or by implication, shall mean latest edition of appropriate standard, specification, manual, code, law, or regulation in effect on date of first advertisement for the Work, unless specifically stated otherwise in Contract Documents.
2. Should there be a conflict in Reference Standards, Contractor shall request clarification from Engineer before proceeding.

F. Compaction and Gradation Testing:

1. Contractor shall provide and pay for compaction and gradation testing by an Owner approved independent testing laboratory.
   a. Make two initial gradation tests for each type of bedding and backfill material, and make one additional gradation test for each additional 500 tons of each material.
   b. Moisture-density (Proctor) tests and relative density tests on materials, and in-place field density tests, shall be made at intervals determined by Engineer.
   c. Perform compaction testing in accordance with procedures specified in Section 31 23 17 – Site Excavation, Backfill, and Compaction and Section 32 11 23 – Aggregate Base Course.

G. Traffic Control - General:

1. Protect streets, roads, highways, and other public thoroughfares that are to be temporarily closed or restricted for traffic flow by effective barricades equipped with operational warning signals.
2. Locate barricades at nearest intersecting public highway or street on each side of blocked section.
3. Cover open trenches and other excavations with steel plates and have suitable barricades, signs, and lights to provide adequate protection to the public. Provide obstructions such as material piles and equipment with similar warning signs and lights.

H. Maintenance of Traffic:

1. Maintain effected traffic areas throughout duration of construction, in accordance with local, state, or federal requirements which govern Work area.
2. Contractor is responsible for maintaining traffic.

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3. Contractor shall conduct work to minimize interference with traffic, vehicular or pedestrian.
4. Contractor shall obtain and pay for any permit required by local authority for areas where traffic will be obstructed.
5. Contractor shall provide and maintain suitable and safe bridges, detours, or other temporary measures for accommodating public and private travel.
6. Contractor shall provide at least twenty-four (24) hours notice to owners of private drives before performing Work which would obstruct safe passage by drive owner.
7. Illuminate barricades and obstructions with warning lights from sunset to sunrise.
8. Store material storage and perform Work on or alongside public streets and highways to minimize obstruction and inconvenience to public.

I. Traffic Control Devices:
1. Contractor shall provide barricades, cones, construction warning signs, flagmen, and incidental devices to protect personnel and equipment on the Work site.

1.8 EROSION AND SEDIMENT CONTROL

A. Comply with requirements specified in Section 31 25 13 – Erosion Controls, and as indicated on Drawings.

1.9 PROPOSED PRODUCTS LIST

A. Within 15 days after date of Notice to Proceed, submit list of major products proposed for use, with name of manufacturer, trade name, and model number of each product.

B. For products specified only by reference standards, give manufacturer, trade name, model or catalog designation, and reference standards.

1.10 PRODUCT REQUIREMENTS

A. Products include material, equipment, and systems.

B. Comply with specifications and referenced standards as minimum requirements.

C. Components required to be supplied in quantity within a Specification section shall be same, and shall be interchangeable.

D. Do not use materials and equipment removed from existing structure, except as specifically required or allowed by Contract Documents.

E. Products Specified by Reference Standards or by Description Only: Furnish any product meeting those standards.

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F. Products Specified by Naming Two or More Manufacturers: Furnish products of one named manufacturer meeting specifications; no options or substitutions allowed.

G. Products Specified by Naming One or More Manufacturers or with a Provision for Substitutions: Submit a request for substitution of a proposed equal.

1.11 PROJECT CLOSEOUT PROCEDURES

A. Project Records Documents:
   1. Contractor shall maintain, on site, one set of the following record documents:
      a. Drawings.
      b. Specifications.
      c. Approved Shop Drawings.
      d. Product data.
      e. Samples.
   2. Contractor shall store Record Documents separate from documents used for construction.
   3. Contractor shall record actual revisions to the Work and maintain information concurrent with construction progress.
   4. Contractor shall legibly mark each item to record actual construction including:
      a. Measured horizontal and vertical locations of new utilities and existing underground utilities and appurtenances referenced to permanent surface improvements.
      b. Field changes of dimensions and Drawing details.
      c. Details not on original Drawings.
   5. Submit Record Documents to Owner at Final Inspection, including:
      a. Project Drawings.
      b. Survey notes.
      c. Approved submittals.
      d. Operation and Maintenance Manuals.

PART 2 – PRODUCTS - (Not Used)

PART 3 – EXECUTION - (Not Used)

END OF SECTION

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SECTION 31 05 13

SOILS FOR EARTHWORK

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Subsoil materials.
2. Topsoil materials.

B. Related Sections:
1. Applicable provisions of Section 31 02 00 – General Requirements for Sitework shall govern Work under this Section.
2. Section 02 41 13 – Site Demolition.
3. Section 31 05 16 – Aggregates for Earthwork.
4. Section 31 10 00 - Site Clearing.
5. Section 31 23 17 – Site Excavation, Backfill, and Compaction.
6. Section 31 25 13 - Erosion Controls: Slope protection and erosion control.
7. Section 32 90 00 – Planting.
8. Section 32 91 19 - Landscape Grading.

1.2 REFERENCES

A. State of Wisconsin Department of Transportation
1. Standard Specifications for Highway and Structure Construction, Current Edition. (WISDOT)

B. ASTM International (American Society for Testing and Materials)
1. ASTM D2487 - Classification of Soils for Engineering Purposes (Unified Soil Classification System).
2. ASTM D5268 – Topsoil Used for Landscaping Purposes.

1.3 SUBMITTALS

A. Section 31 02 00 – General Requirements for Sitework: Requirements for submittals.

B. Product Data: Submit testing laboratory results for each type of specified soil.

C. Materials Source: Submit name of source of imported materials.

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1.4 QUALITY ASSURANCE

A. Perform Work in accordance with Wisconsin Department of Transportation standards.

PART 2 - PRODUCTS

2.1 SUBSOIL MATERIALS

A. Subsoil Type S1:
1. Excavated and re-used material.
2. Graded.
3. Free of lumps larger than 3 inches, rocks larger than 2 inches, and debris.

B. Subsoil Type S2:
1. Imported borrow.
2. Graded.
3. Free of lumps larger than 3 inches, rocks larger than 2 inches, and debris.
4. Imported subsoil and borrow shall be similar in composition when compared to existing site subsoil.
5. Contractor shall provide 10 lb sample of proposed imported borrow material to laboratory for soil classification analysis conforming to ASTM D2487.

2.2 TOPSOIL MATERIALS

A. Topsoil Type T1:
1. Excavated and reused material.
2. Graded.
3. Soil shall be free of roots, twigs, stones, subsoil, debris, weeds, and foreign matter larger than 1/2 inch.
4. Topsoil shall be evaluated in accordance with ASTM D5268.

B. Topsoil Type T2:
1. Imported borrow.
2. Friable loam.
3. Soil shall be free of roots, twigs, stones, subsoil, debris, weeds, and foreign matter larger than 1/2 inch.
4. Acidity range (pH) of 5.5 to 7.5.
5. Containing minimum of 4 percent and maximum of 25 percent inorganic matter.
6. Limit decaying matter to 5 percent of total content by volume.
7. Topsoil shall be evaluated in accordance with ASTM D5268.
8. Contractor shall provide 10 lb sample of proposed imported borrow material to laboratory for soil classification analysis conforming to ASTM D2487.

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2.3 SOURCE QUALITY CONTROL

A. Section 31 02 00 – General Requirements for Sitework: Testing and analysis of soil material.

B. Testing and Analysis of Topsoil Material designated for Landscaping Purposes: Perform in accordance with ASTM D5268.

C. When tests indicate materials do not meet specified requirements, change material and retest.

D. Furnish materials of each type from same source throughout the Work.

PART 3 – EXECUTION – (Not Used)

END OF SECTION

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SECTION 31 05 16

AGGREGATES FOR EARTHWORK

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Aggregate materials and designations for structure aggregate base course.
2. Aggregate materials and designations for pavement aggregate base course.
3. Aggregate materials and designations for backfill.
4. Aggregate materials and designations for grading purposes.

B. Related Sections:
1. Applicable provisions of Section 31 02 00 – General Requirements for Sitework shall govern Work under this Section.
2. Section 02 41 13 – Site Demolition.
3. Section 31 05 13 – Soils for Earthwork.
4. Section 31 23 17 – Site Excavation, Backfill, and Compaction.
5. Section 31 25 13 - Erosion Controls: Slope protection and erosion control.
6. Section 32 11 23 - Aggregate Base Course.
7. Section 32 91 19 - Landscape Grading.

1.2 REFERENCES

A. ASTM International:
1. ASTM C33 – Standard Specification for Concrete Aggregates.
2. ASTM C136 – Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.

B. State of Wisconsin Department of Transportation:
1. Standard Specifications for Highway and Structure Construction, Current Edition. (WISDOT).

1.3 SUBMITTALS

A. Section 31 02 00 – General Requirements for Sitework: Requirements for submittals.

B. Product Data: Submit gradation information for each type of aggregate specified. Gradation results shall be taken within the past (3) months from contract date.

C. Materials Source: Submit name of source of imported materials.

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1.4 QUALITY ASSURANCE

A. Perform Work in accordance with Wisconsin Department of Transportation standards.

PART 2 - PRODUCTS

2.1 AGGREGATE MATERIALS

A. Aggregate Type A1 (Gravel): Crushed Gravel: free of organic matter and debris; graded in accordance with:
   1. WISDOT 3/4-Inch Gradation.

B. Aggregate Type A2 (Gravel): Crushed Gravel: free of organic matter and debris; graded in accordance with:
   1. WISDOT 1-1/4-Inch Gradation.

C. Aggregate Type A3 (Recycled): Crushed Concrete; free of from wood, steel, roots, bark or other extraneous material; graded in accordance with:
   1. WISDOT 1-1/4-Inch Gradation.

D. Aggregate Type A9 (Granular Fill): Natural gravel/stone; free of clay, shale, organic matter; graded in accordance with:
   1. WISDOT 3-Inch Gradation.

2.2 SOURCE QUALITY CONTROL

A. Section 31 02 00 – General Requirements for Sitework: Testing and analysis of aggregates.

B. When tests indicate materials do not meet specified requirements, change material or material source and retest.

C. Furnish materials of each type from same source throughout the Work.

PART 3 – EXECUTION – (Not Used)

END OF SECTION

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SECTION 31 10 00

SITE CLEARING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Removal of grass and vegetation.
2. Removal of trees, shrubs, and other plant life.
3. Removal of site debris.
4. Clearing activities near existing permanent utilities and structures.
5. Protection of project entrances and exits.

B. Related Sections:
1. Applicable provisions of Section 31 02 00 - General Requirements for Sitework shall govern Work under this Section.
2. Section 02 41 13 - Site Demolition: Removal of site demolition material.
3. Section 31 23 17 – Site Excavation, Backfill, and Compaction: Backfill and compaction of cleared areas.

1.2 REFERENCES

A. State of Wisconsin Department of Transportation
1. Standard Specifications for Highway and Structure Construction, Current Edition. (WISDOT)

B. State of Wisconsin Department of Natural Resources (WDNR)
1. Construction Site Erosion & Sediment Control. (http://www.dnr.state.wi.us/runoff/stormwater/techstds.htm)

C. U.S. Environmental Protection Agency
1. Developing Your Stormwater Pollution Prevention Plan, A Guide for Construction Sites. http://www.epa.gov/npdes/pubs/sw_swppp_guide.pdf.

1.3 DEFINITIONS

A. Tree - Woody perennial plant, single main stem with trunk, diameter of 6 inches or greater. Multiple-stem trees with forks up to 4 feet from ground elevation shall be considered a cluster of trees. Trees that fork above 4 feet shall be considered a single tree.

B. Sapling - Woody perennial plant with single stem with trunk less than 6 inches in diameter.

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C. Root Zone - Area around a tree extending as far from tree base as longest horizontal branches.

D. Surface Water - Soil water that flows through ditch lines, creeks, and streams by gravity.

E. Grubbing - To clear project site by removing roots and stumps.

F. Clearing - Cutting down of bushes and trees and the digging and removal of their roots and stumps.

G. Clearing Limits - Area designated on Drawings scheduled for clearing operations within project site or right-of-way.

H. Herbicide - Post emergence type, used to kill entire plant or vegetation, including root system.

1.4 REGULATORY REQUIREMENTS

A. Contractor shall comply with local, state, and federal regulations applicable to Work of this Section.

B. Contractor shall comply with and be solely responsible for compliance with U.S. Department of Labor OSHA Part 1926 Safety and Health Regulations for Construction for this Work.

C. Contractor performing Work of this Section shall be solely responsible for identifying, furnishing, installing and maintaining equipment and materials required by State and Federal regulations to establish safe working conditions during Work of this Section.

D. Conform to applicable code for environmental requirements, disposal of debris, burning debris on site and use of herbicides.

E. Coordinate clearing Work with utility companies.

PART 2 - PRODUCTS – (Not Used)

PART 3 - EXECUTION

3.1 NOTIFICATION

A. Contractor, prior to any excavation work, shall notify (1) a designated locating service; (2) all utilities, governmental agencies, entities, known to, or which can reasonably be assumed to, have above or below ground pipe, conduit cables, structures, or similar items within limits of project; to locate and mark location of such items.

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B. In accordance with Wisconsin Statute 182.0175, "Damage to Transmission Facilities," Excavator, as defined in 182.0175(1)(bm), shall be solely responsible to provide advance notice to “Diggers Hotline, Inc.” (800-242-8511) not less than three working days prior to commencement of any Excavation, as defined in the statute, required to perform work contained in this Project, and further, Excavator shall comply with all other requirements of this Statute relative to Excavation.

3.2 PREPARATION

A. Verify erosion control is in place prior to start of Work.

B. Verify that existing plant life designated to remain is tagged or identified and protected.

C. Identify a temporary waste area for placing removed materials.

3.3 PROTECTION

A. Maintain and repair damaged erosion control items throughout Work.

B. Protect utilities that remain, from damage.

C. Do not divert or relocate surface water without prior written approval from Owner’s Representative.

D. Protect trees, plant growth, and features designated to remain as final landscaping.

E. Protect benchmarks, survey control points, and existing structures from damage or displacement.

F. Keep entrances and exits, and adjacent roadways affected, free of debris from clearing operations.

3.4 CLEARING

A. Clear area required for access to site and execution of Work.

B. Remove trees and shrubs indicated. Remove stumps, root zone, main root ball, and root system to a depth of 24 inches.

C. Remove surface rock larger than 2 inches.

D. Clear undergrowth and deadwood, without disturbing subsoil.

3.5 REMOVAL

A. Remove debris, rock, and extracted plant life from site.

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B. Notify Owner's Representative if underground storage tanks and piping is uncovered during Work.

C. Cease work in immediate area of tanks until direction is given to proceed.

END OF SECTION

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SECTION 31 23 17

SITE EXCAVATION, BACKFILL, AND COMPACTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Verification of subsurface conditions and utilities prior to excavation.
2. Saw cutting of pavements prior to excavation.
3. Excavation for structure foundation.
4. Excavation for slabs-on-grade.
5. Structure backfilling to subgrade elevations.
6. Backfill under slabs-on-grade.
7. Backfill for over-excavation corrections.
8. Consolidation and compaction.

B. Related Sections:
1. Applicable provisions of Section 31 02 00 – General Requirements for Sitework shall govern Work under this Section.
2. Section 31 05 16 – Aggregates for Earthwork: Aggregate backfill materials.
3. Section 31 25 13 – Erosion Controls.
4. Section 32 11 23 – Aggregate Base Course: Preparation for aggregate base course.
5. Section 32 91 19 - Landscape Grading: Topsoil placement.

1.2 REFERENCES

A. ASTM International (American Society for Testing and Materials)
1. ASTM C518 - Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
2. ASTM C578 – Specification for Rigid, Cellular Polystyrene Thermal Insulation.
3. ASTM D698 - Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort 12,400 ft.-lbf/ft^3.
4. ASTM D1557 - Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort 56,000 ft.-lbf/ft^3.
5. ASTM D2487 - Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System).
6. ASTM D6938 – Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).

B. State of Wisconsin Department of Transportation
1. Standard Specifications for Highway and Structure Construction, Current Edition. (WISDOT)

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1.3 SUBMITTALS

A. Section 31 02 00 – General Requirements for Sitework: Requirements for submittals.

B. Provide certified analysis of material(s) to Engineer prior to any use on Work.

1.4 REGULATORY REQUIREMENTS

A. Contractor shall comply with all local, state, and federal regulations applicable to Work of this Section.

B. Contractor shall comply with and be solely responsible for compliance with U.S. Department of Labor OSHA Part 1926 Safety and Health Regulations for Construction for this Work.

C. Contractor performing Work of this Section shall be solely responsible for identifying, furnishing, installing and maintaining equipment and materials required by state and federal regulations to establish safe working conditions during Work of this Section.

PART 2 PRODUCTS

2.1 BEDDING AND BACKFILL MATERIALS

A. Crushed Gravel Backfill: Type A1 or A2 as defined in Section 31 05 16 – Aggregates for Earthwork.

B. Site Excavated Material (Spoil) Backfill: Type S1 as defined in Section 31 05 13 – Soils for Earthwork.

C. Imported Subsoil Material Backfill: Type S2 as defined in Section 31 05 13 – Soils for Earthwork.

2.2 AGGREGATE SLURRY BACKFILL

A. Place materials in a clean cement mixer truck and thoroughly mixed in following quantities:

1,350 lbs.	sand
775 lbs.	1-1/4 Inch stone
1,150 lbs.	3/4 Inch stone
25 gals.	(+0 to –0.5) water/cu.yd.

B. Lean concrete backfill shall conform to above with addition of a minimum of one bag of cement per cubic yard.

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PART 3 EXECUTION

3.1 NOTIFICATION

A. Contractor, prior to any excavation work, shall notify (1) a designated locating service; (2) all utilities, governmental agencies, entities, known to, or which can reasonably be assumed to have above or below ground pipe, conduit cables, structures, or similar items within limits of project; to locate and mark location of such items.

B. In accordance with Wisconsin Statute 182.0175, "Damage to Transmission Facilities," Excavator, as defined in 182.0175(1)(bm), shall be solely responsible to provide advance notice to “Diggers Hotline, Inc.” (800-242-8511) not less than three working days prior to commencement of any Excavation, as defined in the statute, required to perform work contained in this Project, and further, Excavator shall comply with all other requirements of this Statute relative to Excavation.

3.2 SITE VERIFICATION

A. Verify that survey benchmark and intended elevations for Work are as indicated.

3.3 FIELD MEASUREMENTS

A. Verify that survey benchmark and intended elevations for the Work are as shown on Drawings.

B. Primary line and grade will be furnished by Owner and will be established by Engineer.

C. Contractor shall notify Owner 48 hours prior to its need for line and grade. Any cost as a result of delay experienced by Contractor due to its failure to adhere to this requirement shall be borne by Contractor.

D. Line and grade stakes will be set by Engineer, parallel to proposed work and offset there from in a manner that will best serve Contractor's work operations wherever practical. Contractor shall provide Engineer with desired offset.

E. Contractor shall render whatever assistance may be required by Engineer and shall arrange its work operations in such manner as to avoid interference with establishment of primary lines and grades.

F. Contractor shall check accuracy of line and grade stakes by means of visual and taping checks and shall be responsible for protection and preservation of such stakes.

G. Initial primary line and grade will be set by Engineer at no cost to Contractor. Cost of re-staking shall be borne by Contractor.

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H. Contractor shall bear sole responsibility for correct transfer of all construction lines and grades from primary line and grade points and for correct alignment and grade of finished structure, based upon primary line and grade established by Engineer.

I. Except for those lot corners and survey monuments that fall within trench excavation, Contractor shall be solely responsible for protection and/or replacement of all survey corners that exist throughout work area.

J. Corners will be located and marked by Engineer, upon request by Contractor, prior to commencing its work.

K. A Registered Land Surveyor shall replace damaged corners at Contractor's expense.

3.4 SAWING AND BREAKING PAVEMENT

A. Saw concrete pavement, slabs or bases to a minimum 1/2 of depth of existing pavement, slab, or base prior to removal.

B. Saw cut asphalt pavement full depth before removal.

C. Cut pavements evenly along edges of excavation prior to their removal in such a way as to avoid excessive removal or ragged, uneven edges.

3.5 PREPARATION FOR EXCAVATION

A. Identify required lines, levels, contours, and datum.

B. Stake and flag locations of known utilities.

C. Notify utility company to remove and relocate utilities that interfere with Work.

D. Protect above and below grade utilities indicated to remain.

E. Protect plant life, lawns and other features remaining as portion of final landscaping.

F. Protect benchmarks, survey control points, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.

G. Cut out soft areas of subgrade not capable of in situ compaction. Backfill with Type A2, as specified in Section 31 05 16 – Aggregates for Earthwork, fill and compact to density equal to or greater than requirements for subsequent backfill material.

3.6 FIELD QUALITY CONTROL FOR EXCAVATION

A. Field inspection will be performed under provisions of Section 31 02 00 – General Requirements for Sitework.

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B. Provide for visual inspection of bearing surfaces.

3.7 STRUCTURE EXCAVATION

A. Underpin adjacent structures that may be damaged by excavation work, including utilities and pipe chases.

B. Excavate subsoil required to accommodate site structures and construction operations.

C. Machine slope banks to angle of repose or less, until shored.

D. Excavation cut not to interfere with normal 45 degree bearing splay of foundation.

E. Grade top perimeter of excavation to prevent surface water from draining into excavation.

F. Hand trim excavation. Remove loose matter.

G. Remove lumped subsoil, boulders, and rock.

H. Notify Engineer of unexpected subsurface conditions and discontinue affected Work in area until notified to resume work.

I. Correct unauthorized excavation at no extra cost to Owner.

J. Correct areas over-excavated in error.

K. Stockpile excavated material in area designated on site. Remove excess material not being reused, from site upon approval from Owner and environmental consultant.

3.8 PROTECTION

A. Protect excavations by methods required to prevent cave-in or loose soil from falling into excavation.

B. Protect bottom of excavations and soil adjacent to and beneath foundation from freezing.

3.9 EXAMINATION PRIOR TO BACKFILLING

A. Verify fill material to be reused are acceptable.

B. Verify foundation perimeter drainage installation has been inspected.

3.10 BACKFILLING

A. Backfill with materials and to contours and elevations shown on Drawings. Generally, compact subgrade to density requirements for subsequent backfill materials.

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B. Place specified backfill in loose lift layers. Use compaction equipment that will achieve desired compaction requirements.

C. Systematically backfill to allow for natural settlement. Do not backfill over porous, wet, frozen, or spongy subgrade surfaces.

D. Where sidewall material is loose or unstable, place geotextile cloth material over sidewall prior to backfilling.

E. Employ a placement method that does not disturb or damage pipe in trench.

F. Maintain optimum moisture content of backfill materials to attain required compaction density.

G. Backfill simultaneously on each side of unsupported non-basement foundation walls.

H. Slope grade away from structure minimum 2 inches in 10 feet, unless noted otherwise.

I. Make grade changes gradual. Blend slope into level areas.

J. Leave fill material stockpile areas completely free of excess fill materials.

K. Remove surplus backfill materials from site.

3.11 MECHANICAL COMPACTION

A. Mechanically compact backfill by means of a tamping roller, sheepsfoot roller, pneumatic tire roller, vibrating roller, or other mechanical tampers. Impact, free-fall, or "stomping" type compaction equipment shall not be allowed.

B. Flooding or jetting of backfill for compaction purposes shall not be allowed.

C. Contractor shall furnish written notification to Owner’s Representative prior to start of work as to size and type of mechanical compaction equipment to be used.

D. Place material for mechanically compacted backfill in lifts, which, prior to compaction, shall not exceed thickness specified below for type of compaction equipment used:
   1. Vibratory equipment including vibratory plate, vibratory smooth-wheel rollers, and vibratory pneumatic-tired rollers: maximum lift thickness two (2) feet.
   2. Rolling equipment, including sheepsfoot (both vibratory and non-vibratory), grid, smooth-wheel (non-vibratory), pneumatic-tired (non-vibratory), and segmented wheels: maximum lift thickness one (1) foot.
   3. Hand-directed mechanical tampers: maximum lift thickness of six (6) inches.

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3.12 TOLERANCES FOR BACKFILL

A. Top Surface of Backfill: Plus or minus 1 inch from required elevations.

3.13 COMPACTION REQUIREMENTS

A. Granular Material shall be compacted to 95 percent of modified Proctor density.

B. Excavated Material to be used for backfill shall be compacted to a density equal to adjacent undisturbed trench wall or as specified.

3.14 FIELD QUALITY CONTROL

A. Field inspection and testing will be performed under provisions of Section 31 02 00 - General Requirements for Sitework.

B. Testing and analysis of fill material will be performed in accordance with ASTM D698, ASTM D1557 and Section 31 02 00 - General Requirements for Sitework.

C. Compaction and moisture testing will be performed in accordance with ASTM D6938 and Section 31 02 00 - General Requirements for Sitework.

D. If tests indicate Work does not meet specified requirements, remove Work, replace, and retest at no cost to Owner.

3.15 PROTECTION OF FINISHED WORK

A. Reshape and recompact fills subjected to vehicular traffic.

B. Contractor shall have available a supply of steel plates with minimum dimensions of four (4) feet by eight (8) feet by one (1) inch.

C. During winter months, do not leave plates in roadway over night.

3.16 SCHEDULE OF BACKFILL

A. Section 31 05 16 – Aggregates for Earthwork defines “A” designated fill materials and Section 31 05 13 – Soils for Earthwork defines “S” designated fill materials.

B. Fill to Correct Over-Excavation:
   1. Aggregate Type A2 fill, flush to required elevation, compacted to 90 percent modified Proctor density.
   2. Lean concrete to minimum compressive strength of 1000 psi.

C. Foundations:
   1. Aggregate Type A1 fill. Place materials in continuous loose lifts layers not exceeding 7-inch depth, compacted to 95 percent modified Proctor density.

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D. Fill Under Driveways.

1. Aggregate Slurry Fill placed to 12 inches below finish grade, placed in continuous applications.

E. Fill Under Grass Area.

1. Subsoil Type S1 or S2 fill, to 6 inches below finish grade. Place materials in continuous loose lifts layers not exceeding 12-inch depth, compacted to 90 percent modified Proctor density.

F. Fill Under Landscaped Areas:

1. Subsoil Type S1 or S2 fill, to 18 inches below finish grade. Place materials in continuous loose lifts layers not exceeding 12-inch depth, compacted to 85 percent modified Proctor density.

END OF SECTION

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SECTION 31 25 13

EROSION CONTROLS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Equipment and materials for erosion and sediment control to minimize erosion and siltation during construction.
2. Erosion and sediment control provisions detailed on Drawings and specified herein are minimum requirements for erosion control program.
3. Contractor to provide additional erosion and sediment control materials and methods required by state or local ordinances, whichever is more stringent.

B. Related Sections:
1. Applicable provisions of Section 31 02 00 – General Requirements for Sitework shall govern Work under this Section.
2. Section 32 90 00 – Planting.

1.2 REFERENCES

A. ASTM International (American Society for Testing and Materials):
1. ASTM D4355 – Test Method for Deterioration of Geotextiles by Exposure to Light, Moisture and Heat in a Xenon Arc Type Apparatus.
2. ASTM D4491 – Test Methods for Water Permeability of Geotextiles by Permittivity.
3. ASTM D4632 - Test Method for Grab Breaking Load and Elongation of Geotextiles.
4. ASTM D4751 - Test Method for Determining Apparent Opening Size of a Geotextile.

B. State of Wisconsin Department of Natural Resources (WDNR)
1. Construction Site Erosion & Sediment Control. http://www.dnr.state.wi.us/runoff/stormwater/techstds.htm

C. State of Wisconsin Department of Natural Resources – Conservation Practice Standards (WDNR - CPS);
1. Silt Fence: WDNR – CPS 1056.
2. Stone Tracking Pad and Tire Washing: WDNR – CPS 1057.
3. Storm Drain Inlet Protection for Construction Sites: WDNR – CPS 1060.

D. State of Wisconsin Department of Transportation
1. Standard Specifications for Highway and Structure Construction, Current Edition. (WISDOT).
2. Erosion Control Product Acceptability Lists for Multi–Modal Applications. (PAL)

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E. U.S. Environmental Protection Agency

1. Developing Your Stormwater Pollution Prevention Plan: A Guide for Construction Sites.
http://www.epa.gov/npdes/pubs/sw_swppp_guide.pdf

F. City of Milwaukee

1. Chapter 290 Erosion Control of Milwaukee Code of Ordinances.

1.3 DEFINITIONS

A. Definitions shall be in accordance with Wisconsin Department of Natural Resources – Construction Practice Standards, as defined by each standard.

1.4 SUBMITTALS

A. Section 31 02 00 – General Requirements for Sitework: Requirements for submittals.

B. Provide erosion control plan indicating proposed methods, materials, and schedule for effecting erosion and siltation control to prevent erosion damage to site and adjacent area.

C. Plan shall include following:

1. Proposed methods for erosion and siltation control.
2. Erosion plan scale of 1 inch equals 40 feet, indicating location of erosion control materials, siltation basins, etc.
3. Schedule for implementation of plan.
4. Provision for maintenance and upkeep of erosion control and siltation materials, identifying persons responsible for said maintenance.

1.5 REGULATORY REQUIREMENTS

A. Comply with City of Milwaukee ordinance for construction site erosion control.

B. Comply with applicable state and federal rules and regulations governing erosion and siltation on construction sites.

C. Permit

1. Apply for, pay fee, and obtain State stormwater discharge permit.
2. Prepare construction site erosion control plan, Consolidated Permit form, and submit form and current fee to Wisconsin Department of Natural Resources at least 14 working days prior to commencing land disturbing construction activities.
3. At completion of construction activity, file Notice of Termination.

1.6 EROSION CONTROL PRINCIPLES

A. Keep disturbed area small.

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B. Stabilize disturbed areas with mechanical or structural and vegetative methods.

C. Keep runoff low through use of short slopes, low gradients, and preservation of natural vegetative cover.

D. Protect disturbed areas from storm water runoff.

E. Retain sediment within site boundaries.

F. Implement a thorough maintenance and follow-up program.

PART 2 PRODUCTS

2.1 MATERIALS

A. Silt Fence: (WDNR – CPS 1056)

1. Provide temporary silt fencing designed to intercept and slow the flow of sediment-laden sheet flow runoff from areas of disturbed soil.
2. Fence Geotextile Fabric:
   a. Geotextile fabric shall consist of either woven or non-woven polyester, polypropylene, stabilized nylon, polyethylene or polyvinylidene chloride.
   b. Non-woven fabric may be needle punched, heat bonded, resin bonded, or a combination of.
   c. All silt fence geotextile fabric shall meet the following requirements;

Test Requirement	Method	Value
Minimum Grab Tensile Strength In the Machine Direction	ASTM D4632	120 lbs.
Minimum Grab Tensile Strength In the Cross Machine Direction	ASTM D4632	100 lbs.
Maximum Apparent Opening Size Equivalent (Standard Sieve)	ASTM D4751	No. 30
Minimum Permittivity	ASTM D4491	0.05 scc^{-4}
Minimum Ultraviolet Stability Percent of Strength Retained after 500 Hours of Exposure.	ASTM D 4355	70%

   d. Silt fence shall have a maximum a maximum flow rate of 10 gallons/minute/square foot at 50mm constant head as determined by multiplying permittivity in 1/second as determined by ASTM D4491 by a conversion factor of 74.

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3. Silt Fence Supports: Silt fences shall be supported by either steel or wood supports specified as follows;
   a. Steel Supports:
      1) The full height of the silt fence shall be supported by steel posts at least 5 feet long with a strength of 1.33 pounds per foot and have projections for the attachment of fasteners.
   b. Wood Supports:
      1) The full height of the silt fence shall be supported by 1-1/8 inch by 1-1/8-inches air or kiln-dried posts of hickory or oak.

B. Stone Tracking Pad and Tire Washing: (WDNR – CPS 1057)
1. Tracking Pad:
   a. Tracking pad shall be installed prior to any construction traffic leaving the site.
   b. Aggregate for tracking pads shall be 3 to 6 inch clear or washed stone. All material to be retained in a 3-inch sieve.
2. Tire Washing:
   a. Tire wash rack shall consist of a heavy grating over a lowered area. The rack shall be strong enough to support the vehicles that will cross it.

C. Storm Drain Inlet Protection for Construction Sites: (WDNR – CPS 1060)
1. Inlet protection products are intended to intercept, pond and filter sediment-laden runoff. Protection systems include geotextile fabric and fabric hold-down systems.
2. Materials:
   a. Fabric Material: Type FF, Woven polypropylene.
   b. Physical Properties:

Test	Method	Value[1]
Grab Tensile Strength, (lb.)	ASTM D4632	200 lbs
Puncture Strength, (lb.)	ASTM D4833	105 lbs (Min.)
Apparent Breaking Elongation Machine Direction, %	ASTM D4632	24 (Min.)
Apparent Breaking Elongation Cross Direction, %	ASTM D4632	10 (Min.)
Apparent Opening Size	ASTM D4751	600 (Max.)
Permittivity	ASTM D4491	1.9 (Min.)

(1) All numerical values represent minimum/maximum average roll values (i.e., the average of minimum test results on any roll in a lot should meet or exceed the minimum specified values).

3. Contractor shall have the responsibility of providing identification of the fabric supplied for inlet protection units. Types of inlet protection systems include the following;
   a. Type A, shall be utilized around field inlets until permanent stabilization methods have been established. Type A inlet protection shall be utilized on

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pavement inlets prior to installation of curb and gutter or pavement.

b. Type C, shall be utilized on street inlets with curb heads. Provide a 2 inch x 4 inch minimum, piece of wood and wrap and attach fabric to wood. Place wood blocking and fabric over inlet with wood straddling inlet opening a minimum of 8 inches in each direction. Secure 2 x 4 inch board to grate with wire or plastic ties. Verify and secure wood blocking to rest on inlet grate and that fabric covers remaining curb head opening. Wood blocking shall not block entire inlet curb opening.

4. Manufactured bags, such as sand bags used as inlet protection devices shall conform the following minimum criteria;
   a. Minimum Size = 14 x 26 inches.
   b. Grab Tensile Strength of Fabric (ASTM D4632) = 95 lbs minimum.
   c. UV Stability (ASTM D4355) = 70 percent minimum.
   Note: To provide sufficient strength, fabric shall be sewn together with double stitching.

PART 3 EXECUTION

3.1 INSTALLATION

A. Silt Fence: (WDNR – CPS 1056)

1. When silt fence is installed as a stand-alone practice on a slope, silt fence shall be placed on the contour.
2. The parallel spacing shall not exceed the maximum slope lengths for the appropriate slope as follows:

Slope	Fence Spacing
<2%	100 feet
2 to 5%	75 feet
5 to 10%	50 feet
10 to 33%	25 feet
>33%	20 feet

3. Silt fences shall not be placed perpendicular to the contour.
4. The ends of the silt fence shall be extended upslope to prevent water from flowing around the ends of the fence.
5. Installed silt fences shall be a minimum 14 inches high and shall not exceed 28 inches in height measured from the installed ground elevation.
6. Steel Supports:
   a. The full height of the silt fence shall be supported by steel posts at least 5 feet long with a strength of 1.33 pounds per foot and have projections for the attachment of fasteners.
   b. Silt fence shall be attached in at least 3 places on the support, on the upslope side with 50 pound plastic tie straps or wire fasteners.

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c. To prevent damage to the fabric from wire fastener, the protruding ends shall be pointed away from fabric.

7. Wood Supports:
   a. The full height of the silt fence shall be supported by 1-1/8 inch by 1-1/8-inches air or kiln-dried posts of hickory or oak.
   b. Silt fence fabric shall be stapled, using at least 0.5-inch staples, to the upslope side of the posts in at least 3 places.
   c. Wood posts shall be a minimum of 3 feet long for 24-inch high silt fence, and a minimum of 4 feet for 36-inch silt fence fabric.
8. The maximum spacing of posts for non-woven silt fence shall be 3 feet and for woven fabric, 8 feet.
9. Silt fence shall have a support cord.
10. Where joints are required to join the ends of fabric, each end of the fabric shall be securely fastened to a post. Posts shall then be wrapped around each other to produce a stable, secure joint or shall be overlapped the distance between two posts.
11. A minimum of 20 inches of the post shall extend into the ground after installation.
12. Silt fence shall be anchored by spreading at least 8 inches of the fabric in a 4-inch wide by 6-inch deep trench, or 6-inch deep V-trench on the upslope side of the fence.
13. Backfill anchoring trench and compact.
14. On the terminal ends of silt fence the fabric shall be wrapped around the post such that the staples are not visible.
15. Silt fencing shall at a minimum be inspected by the Contractor weekly and within 24 hours after every rain event that produces 1/2-inch of rain or more during a 24-hour period.
16. Damaged or decomposed fences, undercutting, or flow channels around the ends of silt fencing shall be repaired immediately after discovery.
17. Silt fencing and all accessories shall be removed completely once the disturbed area is permanently stabilized and no longer susceptible to erosion.

B. Stone Tracking Pad and Tire Washing: (WDNR – CPS 1057)
1. Tracking Pad:
   a. Tracking pad shall be installed prior to any traffic leaving the site.
   b. Aggregate shall be placed in a layer at least 12 inches thick. Contractor shall supplement additional aggregate over life of project for repair or replenish aggregate to maintain functional tracking pad as specified.
   c. For sites with high water tables, or where saturated conditions are expected throughout the duration of the project, stone tracking pads shall be underlain with a WisDOT Type R Geotextile Fabric to prevent migration of underlying soil into the stone.
   d. Tracking pad shall be the full width of the egress point and a minimum 50 feet long.
   e. Contractor shall prevent surface water from passing through the tracking pad.

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f. Surface water flow shall be diverted away from tracking pads or conveyed under and around the tracking pad by Contractor's selected method of conveyance or diversion.

2. Tire Washing:

a. If tracking pad does not remove sediment from tires prior to entering roads or streets, Contractor shall provide pressurized water removal operation to wash tires clean prior to entering streets or roads.

b. Rocks lodged between the tires of dual wheel vehicles shall be removed prior to leaving the construction site.

C. Storm Drain Inlet Protection for Construction Sites: (WDNR – CPS 1060)

1. Inlet protection devices are for drainage areas of one acre or less. Runoff from areas larger than one acre should be routed through a designed sediment trapping or settling practice upstream of the inlet.
2. Type A, shall be utilized around field inlets until permanent stabilization methods have been established. Type A inlet protection shall be utilized on pavement inlets prior to installation of curb and gutter or pavement.
3. Type C, shall be utilized on street inlets with curb heads. Provide a 2 inch x 4 inch minimum, piece of wood and wrap and attach fabric to wood. Place wood blocking and fabric over inlet with wood straddling inlet opening a minimum of 8 inches in each direction. Secure 2 x 4 inch board to grate with wire or plastic ties. Verify and secure wood blocking to rest on inlet grate and that fabric covers remaining curb head opening. Wood blocking shall not block entire inlet curb opening.
4. For all inlet protection devices ponding water to settle sediment is encouraged, however ponding shall not interfere with the flow of traffic, create a safety hazard, or cause property damage.
5. All inlet protection devices shall have provisions such as weep holes or emergency spillways to safely pass water if inlet protection device becomes clogged.
6. No gaps shall be left in the material used that would allow the flow of water to bypass the inlet protection device.
7. Manufactured bags used for inlet protection shall be installed along a level contour. Turn ends of sandbag row up slope to prevent flow around ends.
8. Stack sandbags to required height. Upper rows of sandbags shall overlap joints in lower rows.
9. Construct sandbag barriers with a setback of at least 3 feet from toe of slope. Where it is determined to be not practicable due to specific site conditions, sandbag barrier may be constructed at toe of slope, but shall be constructed as far from toe of slope as practicable.

3.2 MAINTENANCE

A. Inspect erosion control devices within 24 hours after each rainfall or daily during periods of prolonged rainfall.

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B. Repair or replace damaged or defective materials or installation immediately.

C. Remove sediment deposits within 24 hours after each storm event or when deposits reach one-half height of fence or barrier, whichever occurs first.

D. Apply replacement bales or additional mulch, netting, or matting immediately to maintain suitable cover.

E. Where vegetative cover has been placed, inspect until vegetative cover is established and functioning as intended.

3.3 REMOVAL OF EROSION CONTROL DEVICES

A. Maintain erosion control measures disturbed earth has been paved or vegetated.

B. Remove erosion control devices prior to final inspection and acceptance of Project site by Owner.

C. Restore or replace areas disturbed or damaged by removal of erosion control devices to satisfaction of Owner's Representative.

END OF SECTION

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SECTION 32 11 23

AGGREGATE BASE COURSE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Aggregate Materials.
2. Sub-grade Preparation.
3. Test Rolling Equipment and Procedures.
4. Aggregate Installation Requirements.
5. Aggregate Shoulder.
6. Base Course Schedule.

B. Related Sections:
1. Applicable provisions of Section 31 02 00 – General Requirements for Sitework shall govern Work under this Section.
2. Section 31 05 16 - Aggregates for Earthwork.
3. Section 31 23 17 - Site Excavation, Backfill, and Compaction.
4. Section 32 13 13 - Concrete Paving: Finish concrete pavement.
5. Section 32 91 19 - Landscape Grading: Topsoil fill at areas adjacent to aggregate base course.

1.2 REFERENCES

A. City of Milwaukee, Department of Public Works
1. General Specifications, dated January 31, 1992, with subsequent revisions.
2. Street Construction Specifications, dated July 1, 1992 with revisions dated July, 2014.

B. State of Wisconsin, Department of Transportation
1. Standard Specifications for Highway and Structure Construction, Current Edition. (WISDOT)

C. ASTM International (American Society for Testing and Materials)
1. ASTM D698 – Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort 12,400 ft.-lbf/ft^3.
2. ASTM D1557 – Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort 56,000 ft.-lbf/ft^3.
3. ASTM D6938 – Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).

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PART 2 - PRODUCTS

2.1 AGGREGATE MATERIALS

A. Aggregate Material: Type A1 as specified in Section 31 05 16 – Aggregates for Earthwork.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify substrate is dry and has been inspected, and gradient and elevation are correct.

3.2 SUBGRADE PREPARATION

A. Correct irregularities in substrate gradient and elevation by scarifying, reshaping, and recompacting.

B. Do not place fill on soft, muddy, or frozen surfaces.

3.3 TEST ROLLING SUBGRADE

A. Test rolling shall be used to verify stability and uniformity of subgrade. Perform this Work in presence of Owner's Representative.

B. Use test rolling equipment conforming to following description:
   1. Tandem axle, dual wheel dump truck.
   2. Tire pressure shall be no less than 90 percent of manufacturer's recommended maximum inflation.
   3. Minimum gross weight of loaded truck shall be 60,000 pounds.
   4. Provide weigh slip to Owner's Representative.

C. Perform test rolling procedure as follows:
   1. Operate equipment at a rate not to exceed 3 to 5 mph or a comfortable walking pace. Adjust speed to allow Owner's Representative to measure any deflections and areas of rutting.
   2. Operate test rolling equipment in a pattern so that affected areas are loaded with at least one pass.
   3. After test rolling, check subgrade for conformance to drawings, and correct any surface irregularities. Re-shape subgrade within tolerances specified.

D. Test Rolling Evaluation:
   1. Rutting up to 1-inch is acceptable. Rutting in excess of 1-inch but not more than 6 inches, shall be considered a failure and requires reworking soil and compaction to required density.

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2. Deflection (pumping) up to 1-inch is acceptable. Deflection in excess of 1-inch but not more than 2 inches shall be acceptable if there is not substantial cracking or lateral movement of soil.
3. Deflection in excess of 2 inches but not more than 6 inches shall be considered a failure, and requires reworking soil and compaction to required density.
4. Rutting and deflection in excess of 6 inches will require review and recommendation for corrective action by an approved Geotechnical Engineer.
5. After remedial work is performed, a final test roll shall be performed upon completion of work.
6. If remedial work is performed as directed, second test roll may be waived at discretion of Owner's Representative.

3.4 AGGREGATE INSTALLATION REQUIREMENTS

A. Spread aggregate over prepared substrate to a total compacted thickness as indicated on Drawings.

B. Place aggregate in maximum 7-inch loose lifts and compact to specified density.

C. Level and contour surfaces to elevations and gradients indicated.

D. Add small quantities of fine aggregate to coarse aggregate as appropriate to assist compaction.

E. Add water to assist compaction. If excess water is apparent, remove aggregate and aerate to reduce moisture content.

F. Use mechanical tamping equipment in areas inaccessible to compaction equipment.

3.5 TOLERANCES

A. Section 31 05 16 – Aggregates for Earthwork defines "A" designated base course materials.

B. Flatness: Maximum variation of 1/4-inch measured with 10-foot straight edge.

C. Scheduled Compacted Thickness: Within 1/4-inch.

D. Variation from Design Elevation: Within 1/4-inch.

3.6 FIELD QUALITY CONTROL

A. Section 31 02 00 – General Requirements for Sitework: Field inspection.

B. Perform compaction testing in accordance with ASTM D698, ASTM D1557, ASTM D6938, and Section 31 02 00 – General Requirements for Sitework.

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C. Perform moisture content testing in accordance with ASTM D6938 and Section 31 02 00 – General Requirements for Sitework.

D. If tests indicate Work does not meet specified requirements, remove Work, replace, and retest.

E. Frequency of Tests: As determined by Owner's Representative.

3.7 BASE COURSE SCHEDULE

A. Section 31 05 16 – Aggregates for Earthwork defines "A" designated base course materials.

B. Under Concrete Pavement:
   1. Aggregate Type A1, compact to 95 percent modified Proctor density.

C. Under Sidewalk:
   1. Aggregate Type A1, compact to 95 percent modified Proctor density.

END OF SECTION

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SECTION 32 13 13

CONCRETE PAVING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Materials and Installation requirements for exterior concrete components as follows;
   a. Sidewalks.
   b. Curb and combination curb and gutter.
   c. Handicap ramps.
   d. Aggregate base course.
2. Exterior Concrete Design Requirements as follows;
   a. Concrete mix design.
   b. Reinforcement.
   c. Concrete curing and sealing.
   d. Jointing.
   e. Quality control and testing.
   f. Concrete placement and finishing.

B. Related Sections:
1. Applicable provisions of Section 31 02 00 – General Requirements for Sitework shall govern Work under this Section.
2. Section 31 23 17 – Site Excavation, Backfill, and Compaction: Compacted subbase for paving.
3. Section 32 11 23 - Aggregate Base Course: Compacted granular base for paving.
4. Section 32 91 19 - Landscape Grading: Preparation of subsoil at pavement perimeter.

1.2 REFERENCES

A. City of Milwaukee, Department of Public Works
1. General Specifications, dated January 31, 1992 with subsequent revisions.
2. Street Construction Specifications, dated July 1, 1992 with revisions dated July, 2014.

B. American Concrete Institute (ACI)
1. ACI 224.3R, Joints in Concrete Construction, Chapter 6 – Pavements.
2. ACI 301 – Structural Concrete.
3. ACI 304 - Guide for Measuring, Mixing, Transporting and Placing Concrete.
4. ACI 305 – Hot Weather Concreting.
5. ACI 306 – Cold Weather Concreting.
6. ACI 308 – Standard Practice for Curing Concrete.
7. ACI 309 – Guide for Consolidation of Concrete.

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8. ACI 325 – Guide for Construction of Concrete Pavements and Concrete Bases.
9. ACI 330 – Guide for Design and Construction of Concrete Parking Lots.
10. ACI 330.1 – Specification for Unreinforced Concrete Parking Lots.
11. ACI 347 – Guide to Formwork for Concrete.

C. ASTM International (American Society for Testing and Materials)

1. ASTM A82 – Specification for Steel Wire, Plain, for Concrete Reinforcement.
2. ASTM A184 - Specification for Fabricated Deformed Steel Bar Mats for Concrete Reinforcement.
3. ASTM A185 - Specification for Steel Welded Wire Reinforcement, Plain, for Concrete.
4. ASTM A497 - Specification for Steel Welded Wire Reinforcement, Deformed, for Concrete.
5. ASTM A615 - Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.
6. ASTM A767 – Specification for Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement.
7. ASTM A775 - Specification for Epoxy-Coated Reinforcing Steel Bars.
8. ASTM A884 - Specification for Epoxy-Coated Steel Wire and Welded Wire Fabric for Reinforcement.
9. ASTM A934 - Specification for Epoxy-Coated Prefabricated Steel Reinforcing Bars.
10. ASTM C31 – Practice for Making and Curing Concrete Test Specimens in the Field.
11. ASTM C33 - Specification for Concrete Aggregates.
12. ASTM C39 – Test Method for Compressive Strength of Cylindrical Concrete Specimens.
13. ASTM C94 - Specification for Ready-Mixed Concrete.
14. ASTM C143 – Test Method for Slump of Hydraulic-Cement Concrete.
15. ASTM C150 - Specification for Portland Cement.
16. ASTM C172 - Practice for Sampling Freshly Mixed Concrete.
17. ASTM C231 – Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.
18. ASTM C260 - Specification for Air-Entraining Admixtures for Concrete.
19. ASTM C309 - Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
20. ASTM C494 - Specification for Chemical Admixtures for Concrete.
21. ASTM C618 - Specification for Fly Ash as Admixture for Concrete.
22. ASTM C1116 - Specification for Fiber-Reinforced Concrete and Shotcrete.
23. ASTM C1193 - Guide for Use of Joint Sealants.
24. ASTM C1602 – Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete.
25. ASTM D1751 - Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction Nonextruding and Resilient Bituminous Types.
26. ASTM D1752 - Specification for Preformed Sponge Rubber Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction.

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27. ASTM D3406 – Specification for Joint Sealant, Hot-Applied, Elastomeric-Type, for Portland Cement Concrete Pavements.
28. ASTM D5249 - Backer Material for Use with Cold- and Hot-Applied Joint Sealants in Portland-Cement Concrete and Asphalt Joints.
29. ASTM D6690 – Specification for Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements.

D. United States Access Board:
1. ADA Accessibility Guidelines for Buildings and Facilities.(ADAAG)

1.3 SUBMITTALS

A. Section 31 02 00 – General Requirements for Sitework: Requirements for submittals.

B. Submit proposed mix design of each class of concrete to Engineer not later than 10 days after Notice to Proceed or 15 days prior to the first concrete placement, whichever comes first.

C. Contractor shall submit a jointing plan for expansion, isolation, contraction and construction joints prior to placing any concrete.

D. Jointing plan shall include details for tie bar joints indicating tie bar size and length, tie bar supports, and distance between tie bars.

E. Include sequence of concrete placement indicating location of construction joints.

F. Jointing plan shall meet the requirements of the referenced ACI Standards.

G. Product Data: Submit data on joint filler, reinforcement, admixtures, and curing compounds, as needed.

1.4 QUALITY ASSURANCE

A. Perform Work in accordance with specified ACI requirements.

B. Obtain cementitious materials from same source throughout.

1.5 ENVIRONMENTAL REQUIREMENTS

A. Conform to requirements of Section 31 02 00 – General Requirements for Sitework.

B. Do not place concrete when base surface temperature is less than 40 degrees F, or surface is wet or frozen.

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PART 2 PRODUCTS

2.1 FORM MATERIALS

A. Wood or Steel form material, profiled to suit conditions.

2.2 REINFORCEMENT

A. Tie Bars: ASTM A615, Grade 60, deformed.

B. Welded Steel Wire Fabric: Plain type, ASTM A185; in flat sheets; unfinished finish.

C. Reinforcement Supports:
1. Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars, welded wire fabric, and dowels in place.
2. Manufacture bar supports according to CRSI's "Manual of Standard Practice" from steel wire, plastic, or precast concrete of greater compressive strength than concrete.
   a. Provide wire bar supports with plates or horizontal runners where base material will not support chair legs.

2.3 CONCRETE MATERIALS

A. Cement: ASTM C150 Normal – Type 1A, gray color.

B. Fine and Coarse Mix Aggregates: ASTM C33.

C. Water: ASTM C1602, potable, not detrimental to concrete.

D. Air Entrainment: ASTM C260.

E. Flyash: ASTM C618. Class C.

2.4 CHEMICAL ADMIXTURES

A. Chemical admixtures shall be in accordance with ASTM C494.

B. Concrete may contain Type A Water-reducing admixture and Type D Water-reducing and retarding admixture.

C. Admixtures are to be used in accordance with manufacturer's recommendations.

D. Chemical admixtures containing chlorides, sulfides, or nitrides are not permitted.

E. A single manufacturer shall supply permitted admixtures.

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F. Admixture manufacturer's are to be approved in writing by Owner's Representative prior to use.

2.5 ACCESSORIES

A. Joint Filler: ASTM D1751, Bituminous fiber, 1/2-inch wide by depth of concrete less 1/8-inch.

B. Form Release Agent: Colorless material which will not stain concrete, absorb moisture or impair natural bonding or color characteristics of coating, intended for use on concrete.

2.6 CURING AND TREATMENT MATERIALS

A. Water: Potable and clean.

B. Membrane Curing Compound: ASTM C309, Type II, Class A, white pigmented.

2.7 CONCRETE MIX

A. Mix concrete in accordance with ASTM C94.

B. Schedule of Mixes:

Class	Name	Maximum Aggregate Size (inch)	Maximum Slump** (inch)	Minimum Cement Sacks/cu.yd.	Minimum Compressive Strength (psi/28 days)	Maximum Water Cement Ratio
9*	Exterior Walks, Curbs, Gutters Drives, Ramps	3/4	3	6.25	4000	0.45

* Air Entrained Concrete Mix. Normal Acceptable range of air content is 4-7 percent.
** Slump Tolerances Maximum slump of 3-inch.

C. Prepare and submit concrete mix designs in accordance with Section 31 02 00 – General Requirements for Sitework, and include as part of cost of this Work.

D. A qualified agency acceptable to Owner's Representative shall prepare mix designs. Submit one electronic copy of mix designs for Engineer's review prior to placing any concrete.

E. Mix design shall indicate brands, types, and quantities of admixtures included, compressive strength, slump, sieve analysis for fine and coarse aggregate, quantities of all ingredients, type and brand of cement, source of aggregate, and whether fine aggregate is natural or manufactured.

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F. Use accelerating admixtures in cold weather only when approved by Owner's Representative in writing. Use of admixtures will not relax cold weather placement requirements.

G. Use set retarding admixtures during hot weather only when approved by Owner's Representative in writing.

2.8 DETECTABLE WARNING PLATES

A. Detectable warning plates design shall comply with ADA guideline requirements.

B. Manufacturers: (Iron Plates)
1. Neenah Foundry – Detectable Warning Plates; www.nfco.com; (800) 558-5075.
2. East Jordan Iron Works, Inc. – Duralast Detectable Warning Plates; www.ejco.com; (800) 626-4653.
3. Or approved equal.
a. Iron Plates:
1) ASTM A48, cast iron.
2) Plate Size: 24 inches x 30 inches.
3) Color: Natural iron.

C. Plate Tolerances:
1. Squareness: 1/8-inch maximum difference in diagonal measurements.
2. Maximum Deviation From Plane: 1/16-inch in 48 inches.

2.9 SOURCE QUALITY CONTROL AND TESTS

A. Section 31 02 00 – General Requirements for Sitework: Provide mix design for Class 9 concrete.

B. Submit proposed mix design to appointed firm for review prior to commencement of Work.

C. Tests on cement, aggregates, and mixes will be performed to ensure conformance with specified requirements.

D. Test samples in accordance with ACI 301.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 31 02 00 – General Requirements for Sitework: Coordination and project conditions.

B. Verify compacted Subgrade and granular base is acceptable and ready to support paving and imposed loads.

C. Verify gradients and elevations of base are correct.

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3.2 SUBBASE

A. Section 32 11 23 - Aggregate Base Course, forms base construction for Work of this section.

3.3 PREPARATION

A. Moisten base to minimize absorption of water from fresh concrete.

B. Coat surfaces of utility frames with oil to prevent bond with concrete pavement.

C. Notify Owner's Representative minimum 24 hours prior to commencing concrete operations.

3.4 FORMING

A. Place and secure forms to correct location, dimension, profile, and gradient.

B. Assemble formwork to permit easy stripping and dismantling without damaging concrete.

C. Place joint filler vertical in position, in straight lines. Secure to formwork during concrete placement.

3.5 PLACING CONCRETE

A. Place concrete in accordance with specified ACI Requirements.

B. Ensure reinforcement, inserts, embedded parts, and formed joints are not disturbed during concrete placement.

C. Place concrete continuously over full width of panel and between predetermined construction joints.

3.6 JOINTS

A. Place contraction joints as follows for identified entities:
   1. Curb and Gutter: 10 feet.
   2. Sidewalks: 5 feet.
   3. Area Paving:
      a. 7-inch non-reinforced slabs: 15 foot to 20 foot spacing in each direction.

B. Place expansion joints using joint filler as follows for identified entities:
   1. Curb and Gutter: 300 feet.
   2. Sidewalks: 100 feet.
   3. Area Paving: Areas next to building foundation and fixed components with separate foundations.

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C. Jointing shall be performed by hand tools or saw cutting. Jointing tools and equipment must provide minimum joint depth as specified by ACI requirements.

D. If method of jointing is saw cutting, Contractor shall perform saw cutting operations as soon as possible following curing process, without damaging new concrete.

3.7 INSTALLING DETECTABLE WARNING PLATES

A. Reference manufacturer's installation requirements prior to installing detectable warning plates.

B. Set plates into wet concrete at locations shown on Drawings. Install plates into concrete to match top of concrete elevation. Do not over depress.

C. Clean any wet concrete off panel surface.

3.8 FINISHING

A. Sidewalk Paving: Broom finish. Edge sidewalk to 1/2-inch radius.

B. Curbs and Gutters: Broom finish.

C. Direction of Texturing: Transverse to pavement direction.

D. Place curing compound on exposed concrete surfaces immediately after finishing.

3.9 TOLERANCES

A. Section 31 02 00 – General Requirements for Sitework: Tolerances.

B. Maximum Variation of Surface Flatness: 1/4-inch in 10 feet.

C. Maximum Variation from True Position: 1/4-inch.

3.10 FIELD QUALITY CONTROL

A. Section 31 02 00 – General Requirements for Sitework: Testing and inspection services.

B. Concrete testing shall be paid for by Contractor.

C. Take three concrete test cylinders for every 75 or fewer cubic yards of concrete placed each day.

D. Take one additional test cylinder during cold weather and cure on site under same conditions as concrete it represents.

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E. Take one slump test for each set of test cylinders taken.

F. Maintain records of placed concrete items. Record date, location of pour, quantity, air temperature, and test samples taken.

3.11 PROTECTION

A. Immediately after placement, protect pavement from premature drying, excessive hot or cold temperatures, and mechanical injury.

B. Do not permit pedestrian traffic over pavement for 2 days minimum after finishing and vehicular traffic over pavement for 7 days minimum after finishing.

END OF SECTION

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SECTION 32 90 00

PLANTING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Plant Materials.
2. Soil Amendment Materials.
3. Testing of all topsoil to be used for site planting and amending it in accordance with the recommendations of the Soils Analysis.
4. Landscape Accessories.
5. Planting Soil Preparation.
6. Plant Material Schedule.
7. Planting Operations.
8. Tree Planting.
9. Fertilizing.
10. Inspection and Approvals.
11. Maintenance Service.
12. Schedule of Planting Soil Mixture.

B. Related Sections:
1. Applicable provisions of Division 01 – General Requirements shall govern Work under this Section.

1.2 REFERENCES

A. American National Standards Institute (ANSI):
1. Z60.1 - American Standard for Sizing, Handling, and Planting Nursery Stock.

B. ASTM International (ASTM):
1. ASTM C136 – Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
2. ASTM D2487 – Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System).

1.3 DEFINITIONS

A. Topsoil: As specified in Section 31 05 13 – Soils for Earthwork.

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B. Plants: Living trees, shrubs, ground cover, grasses, flowers, and bulbs specified in this Section, and described in ANSI Z60.1.

C. Clump Form Trees and Shrubs: Plants with a minimum of three and a maximum of five main stems.

D. Multi-Stem Trees and Shrubs: Plants with multiple stems arising from the root crown in the manner of a shrub.

E. Weeds: Includes Dandelion, Quack Grass, Morning Glory, Mustard, Chickweed, Crabgrass, Canadian Thistle, and otherwise plants not specified for this project.

1.4 QUALITY ASSURANCE

A. All tree, shrub, seed, sod, and related landscape materials and operations included in this Section shall be awarded as "one contract" to Contractor, who will be responsible for implementation.

B. Owner's Representative reserves right to review planting materials at growing site.

C. Inspection:
1. No plant material shall be planted by the Contractor until it is inspected and approved by the Owner's Representative at the site of the project.
2. Only those plants to be planted in any single day shall be approved prior to planting.
3. Plants installed without this approval may be subject to rejection by the Owner's Representative.
4. All rejected material shall be immediately removed from the site and replaced with acceptable material at no additional cost to the Owner.

D. Observation at growing site does <u>not</u> preclude right of rejection at job site. Plants damaged in transit or at job site shall be rejected.

E. Qualifications of Landscape Contractor:
1. Landscape work is to be provided by a single firm specializing in Landscape work having not less than five (5) years successful experience in Landscape projects of similar scope and location to this proposed project.
2. Provide at least one person, with a minimum of four (4) years similar experience, who shall be present on site at all times during execution of this portion of the work, who shall be thoroughly familiar with the type of materials being installed and the proper methods for their installation, and who shall direct all work performed under this section.
3. Employ only qualified personnel familiar with required work.

F. A maintenance program is required for this project, for protection of Owner and Contractor whereas adequate time and monies may be scheduled to properly establish hardy, vigorous

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growth and to provide pleasant visual environment envisioned by design and construction documents.

G. Live plant nursery shall be located within 100 miles of Project and shall specialize in growing and cultivating plants specified in this Section, with minimum five (5) years experience.

1.5 SUBMITTALS

A. Following items required prior authorization; submit to Owner's Representative for written approval prior to use on project:
   1. Samples:
      a. Provide representative sample quantities of the following:
         1) Backfill for plant beds, 5 lb. packaged, fully amended per soils test analysis and blended as described in this Section.
         2) Mulching material.
   2. Required Landscape Submittals:
      a. Topsoil report from soils test analysis and recommended schedule of amendments for each type of planting application: Turf, native seeding, plant beds, and trees.
      b. Final topsoil gradients.

B. Certification:
   1. File Certificates of Inspection of plant materials required by State, County and Federal authorities and copy Owner's Authorized Representative, if required.
   2. Submit fertilizer, vendor's information, guarantees, and present labels on containers.
   3. Submit certificates of inspection as required by governmental authorities.

C. Provide Plant Material Record Drawings.
   1. Legibly mark a copy of the Contract Documents to record actual construction. Provide to Landscape Architect a minimum of three (3) days prior to final walkthrough.
   2. Identify field changes in dimension, detail, and changes made by Change Order.

D. Topsoil Report:
   1. Contractor shall retain the services of an independent testing firm to conduct sampling, testing and analysis of salvaged and imported soil and amendments as required by this section and elsewhere in the Contract Documents. Materials testing firm shall be subject to approval by the Owner.
   2. Soil-Testing Laboratory Qualifications: An independent laboratory, recognized by the State Department of Agriculture, with experience and capability to conduct testing indicated and that specializes in types of tests to be performed.
   3. Soil Analysis: For each unamended soil type, furnish Owner's Representative with soil analysis and a written report by a qualified soil-testing laboratory stating percentages of organic matter; gradation of sand, silt, and clay content; cation

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exchange capacity; sodium absorption ratio; deleterious material; pH; and mineral and plant-nutrient content of the soil.

a. Testing methods and written recommendations shall comply with USDA's Handbook No. 60. The soil-testing laboratory shall oversee soil sampling, with depth, location, and number of samples to be taken per instructions from Landscape Architect. If sample quantities are not provided, Contractor shall provide a minimum of three (3) representative samples taken from varied locations for each soil to be used or amended for planting purposes.

b. Report suitability of tested soil for turf, native seeding and plant growth.

c. Based on test results, state recommendations for soil treatment and soil amendments to be incorporated for each type of planting application. State recommendations in weight per 1000 sq. ft. or volume per cu. yd. for nitrogen, phosphorus, and potash nutrients and soil amendments to be added to produce satisfactory planting soil suitable for healthy, viable plants.

d. Report presence of problem salts, minerals, residual chemicals from agricultural practices (atrazine) or heavy metals, including aluminum, arsenic, barium, cadmium, chromium, cobalt, lead, lithium, and vanadium. If such problem materials are present, provide additional recommendations for corrective action.

4. Collection of soil specimens shall be completed in accordance with accepted practices, and shall be subject to approval by the Owner's Representative.

1.6 REGULATORY REQUIREMENTS

A. Comply with regulatory agencies for fertilizer and herbicide application.

B. Plant Materials shall be certified by State of Wisconsin Department of Agriculture, as described by ANSI Z60.1, be true to habit, and be free of insects and disease.

1.7 DELIVERY, HANDLING, AND STORAGE

A. Deliver, handle and store products under provisions of Division 01 – General Requirements.

B. Plant materials smaller than those specified in Schedule will not be accepted, and shall not be stored at site.

C. Trees and Shrubs:

1. Provide freshly dug trees and shrubs. Do not prune prior to delivery.
2. Spray deciduous plants in foliage with an approved "anti-desiccant" immediately after digging to prevent dehydration.
3. Do not bend or bind-tie trees or shrubs in such manner as to damage bark, break branches, or destroy natural shape.
4. Provide protective covering during delivery to prevent wind burn damage. Do not drop balled, burlapped, or other stock during delivery.

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5. Keep plants moist at all times, water daily or as needed, and provide adequate drainage.
6. Deliver trees and shrubs after preparations for planting have been completed and plant immediately.
7. If planting is delayed more than six (6) hours after delivery, set trees and shrubs in shade, protect from weather and mechanical damage, and keep roots moist by covering with mulch, burlap or other acceptable means of retaining moisture.
8. Do not remove container-grown stock from containers until planting time.
9. Do not lift, move, and adjust to plumb, or otherwise manipulate plants by trunks or stems.

D. Install plants immediately after delivery. Complete planting within 32 hours after delivery.

E. Deliver fertilizer in waterproof bags showing weight, chemical analysis, and name of manufacturer.

1.8 JOB CONDITIONS

A. Planting – General:
1. Layout:
a. Prior to the excavation of planting areas or plant pits, or placing trees stakes, the Contractor shall ascertain the location of all utility lines, electric cables, sprinkling system, and conduits so that proper precautions may be taken not to disturb or damage any subsurface improvements.
b. Trees shall **not** be planted within five (5) feet of the center line of water lines, storm and sanitary sewer lines and within three (3) feet of the centerline of gas, underground electric or telecommunication lines unless authorized by the Owner's Representative.
c. Should obstruction be found, the Contractor shall promptly notify the Owner’s Representative who will arrange to relocate the plant material. Necessary adjustments shall be approved by the Landscape Architect.
2. Pruning:
a. Contractor shall do no pruning to undamaged, live portions of the plant material prior to installation.

B. Planting Restrictions:
1. Soil Condition: Neither planting nor other site work shall be carried out in saturated or muddy ground conditions or under other climatic conditions which will inhibit proper execution. No planting shall occur until an acceptable time has expended beyond all application of herbicides or other vegetative controls.

C. Protection:
1. Do not move equipment over existing or newly placed structures without approval of Owner's Representative.

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2. Provide board-roading as required to protect paving.
3. Protect other improvements from damage, with protection boards, ramps and protective sheeting.
4. Protection of Plant Material:
   a. Contractor shall maintain all plant material in a healthy growing condition prior to and during planting operation.
   b. Contractor shall be responsible for vandalism, theft or damage to plant materials until completion of the maintenance period.
   c. Provide barricades, snow fencing, hire watchmen or whatever means are deemed necessary to totally protect all plantings.
5. Any irrigation system will be operational prior to planting. Locate, protect, and maintain the irrigation system during planting operations. Repair irrigation system components damaged during planting operations, at the Contractor's expense.

D. Utilities:
1. Determine locations of all underground utilities and perform work in a manner that will avoid possible damage. Hand Excavate, if required, to minimize possibility of damage to underground utilities.
2. Coordinate work with general contractor to prevent damage to underground system.
3. Should obstructions or conflicts with utilities be found, the Contractor shall submit written notification to Owner's Representative of all discrepancies in the drawings, or existing conditions which may interfere with work in this section.

E. Plant Location Staking:
1. All trees shall be staked with size and type of material on stake, per layout plans and other Contract Documents. All plant material locations shall be approved in advance of plant installations. All plantings not specifically approved in advance by the Owner's Representative shall be subject to removal and replanting in approved location.

1.9 CLEANUP

A. Organize delivery, handling, and storage of materials and equipment to facilitate ease of construction sequencing and daily cleanup.

B. During landscape work, keep pavements clean and open to traffic, construction vehicles, and persons employed by project. Moisten or stabilize topsoil to prevent water and wind erosion.

C. Protect landscape work and materials from damage due to landscape operations, operations by other contractors and trades, and trespassers.

D. Maintain protection during installation and maintenance periods. Treat, repair, or replace damaged landscape work as directed.

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E. Contractor shall ensure uninterrupted normal business operations at site during planting operations, and maintain a clean, orderly, and safe work area during every stage of construction.

F. At end of each day, properly remove spoil of materials and packaging generated by operations of this contractor from site.

1.10 WARRANTY

A. Warrant trees, shrubs, plants, turf and all other installations for a minimum period of two continuous growing seasons after date identified on certificate of substantial completion, against defects including death and unsatisfactory growth, except for defects resulting from neglect by Owner, abuse or damage by others, or unusual phenomena or incidents which are beyond Landscape Contractor's control.

B. Warranty shall include two entire continuous growing seasons. Temperature fluctuations in the weather, natural hazards, or other climatic conditions are not considered unusual phenomena and will not waive the Contractor's warranty requirements.

C. Remove and replace trees, shrubs or other plants found to be dead or in unhealthy condition during warranty period within sixty (60) days with a plant equivalent in size and form.

D. Make final replacements during growth season following end of warranty period.

E. Replace trees and shrubs which are in doubtful condition at end of warranty period; unless, in opinion of Owner's Representative, it is advisable to extend warranty period for a full growing season.

F. Another warranty inspection will be conducted at end of extended warranty period, if any, to determine acceptance or rejection.

G. During warranty period, ensure trees, shrubs, and ground cover remain in a healthy, vigorous condition and renew, treat, or replace any unsightly plants in a timely manner.

H. At end of warranty period, Owner, Landscape Architect, Owner’s Representative, and Contractor shall make a joint inspection. Renew, treat, or replace plants and lawn areas not in healthy growing condition.

I. Replacement of nursery grown plants shall be of current size and species as specified and shall be replaced within initial growing season, with a new one year warranty commencing on date of replacement.

J. All replacement stock is subject to same warranty requirements as original stock. Repair any damage to adjacent site features due to replacement operations.

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PART 2 PRODUCTS

2.1 PLANT MATERIALS

A. Provide trees, shrubs, and plants of size, species, and quantity shown and scheduled for Landscape Work, nursery-grown under similar climatic conditions, and complying with recommendations and requirements of ANSI Z60.1, American Standard for Nursery Stock. Bare root stock is not acceptable.

B. All plants shall be of specimen quality; wide, full, and dense. Plants that are not of specimen quality will be rejected by Owner's Representative.

C. Deciduous Trees: Provide balled and burlapped trees of height and caliper scheduled and as shown and with branching configuration recommended by ANSI Z60.1 for type and species required. Provide single-stem, well-developed trees for this project.

D. Coniferous Trees and Shrubs: Provide balled and burlapped (B&B) of sizes shown or listed. Dimensions indicate minimum spread crown or height as true to growth habit of plant. Container-grown coniferous shrubs will be acceptable in lieu of balled and burlapped shrubs, subject to specified limitations for container-grown stock. Containerized stock shall be free of circling roots due to being in container for too long.

E. Undersized, diseased, root bound, or otherwise damaged plants are not acceptable, and shall immediately be returned to grower by Contractor.

2.2 SOIL AMENDMENT MATERIALS

A. Contractor shall pay for and provide the following chemical or organic amendments to topsoil at site, if recommended, and in the proportions as stated in the "Soils Test Analysis Report" and as directed by the Owner's Representative.

1. Organic Soil Amendments - Organic soil amendments shall be capable of passing the 1-inch sieve. The material shall be free of rocks, gravel, wood, debris, and of noxious weeds and their seeds:
   a. Peat Moss: Shredded, loose, Type 1 sphagnum moss free of lumps, roots, weeds, seeds, inorganic or acidic materials, with a minimum of 85 percent organic material measured by weight.
   b. Humus: Decomposed animal and plant matter, rich in nutrients with no identifiable fibers and within pH range suitable for intended use.
   c. Composted Pine Bark Fines: Potting grade with no particles larger than 1/2-inch, less than 10 percent wood fiber.
   d. Compost: Well-aged organic compost of sheep or cow manure.
2. Lime: Natural dolomitic limestone containing not less than 85 percent of total carbonates with a minimum of 30 percent magnesium carbonates, ground so that not less than 90 percent passes a 10-mesh sieve and not less than 50 percent passes a 100-mesh sieve.
3. Aluminum Sulfate: Commercial grade.

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4. Bone Meal: Commercial, raw, finely ground; four (4) percent nitrogen and 20 percent phosphoric acid.
5. Fertilizer: 50 percent of elements derived from organic sources, of proportion necessary to eliminate inherent deficiencies of topsoil being not less than 10 percent total nitrogen, 10 percent available phosphoric acid, and five (5) percent soluble potassium.
6. Herbicide: Pre-emergence type herbicide applied per manufacturer's specifications.
7. Pesticide: Commercial grade, used at minimum concentrations as recommended by manufacturer and administered only by experienced technical personnel familiar with safe use and handling.
8. Water: Clean, fresh, and free of substances or matter that could inhibit vigorous growth of plants. Owner shall supply water at Contractor's expense.

B. Fertilizer for Lawns: Provide a complete commercial fertilizer with trace elements 20/12/8. Furnish nitrogen in a form that will be available to lawn during initial growing period with at least 50 percent in organic form. Contractor shall submit recommendation based upon Topsoil Test Analysis for approval. Both "preplanting" and "maintenance" fertilizers shall be included.

2.3 LANDSCAPE ACCESSORIES

A. Mulching material shall be natural shredded hardwood bark mulch, free of debris, twigs, leaves, and growth or germination inhibiting ingredients, no larger than four (4) inches in any dimension, and suitable for top dressing of planting saucers and beds. Bark mulch shall not contain any wood, and no artificial coloration shall be added.

B. Stakes and Guys, if Required by Contractor: One (1) tree staking kit for each tree; including three (3) earth anchors, three (3) rust-proof, heavy-duty tension buckles and UV-coated, flexible tree tie webbing as manufactured by Arborbrace, (561) 628-3591, or equivalent as acceptable to the Landscape Architect.

C. Anti-Desiccant: Emulsion type, film-forming agent designed to permit transpiration but retard excessive loss of moisture from plants. Deliver in manufacturer's fully identified containers and mix in accordance with manufacturer's instructions.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that a fully prepared subsoil base is ready to receive topsoil and other work of this Section.

B. Verify that required underground utilities are available, in proper location, and ready for use.

C. Saturate soil with water to test drainage.

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D. Report conditions detrimental to plant growth or implementation to Owner's Representative prior to planting.

E. Beginning of installation means acceptance of existing site conditions.

3.2 PROTECTION

A. Prior to start of any work of this Section, make contact with buried and overhead utility locating services or agencies to determine depth, location, clearances, and other precautions to avoid damage to existing facilities, equipment, and those employed at site.

B. Hand excavate as required.

C. Maintain grade stakes set by others.

D. Secure, encircle, or otherwise protect Work from intrusion by trespassers, equipment, or others employed at site.

3.3 SUBGRADE SOIL PREPARATION

A. Remove or mow all vegetation to a height 3 inches.

B. Remove all rocks, debris, and litter that will prevent compliance with topsoil and seeding specifications.

C. Final grade area to within two (2) inches of subgrade elevations.

D. Till or disc the subsoil to a depth of two (2) inches to four (4) inches to allow aeration.

3.4 PLANTING SOIL PREPARATION

A. General:
1. Lay out individual tree and shrub locations and bed areas for multiple plantings. Stake all locations and outline areas and secure Owner's Representative's acceptance before start of planting work. Make all locational adjustments as may be requested.

B. Preparation of Planting Soil:
1. Before mixing, clean topsoil of roots, plants, sod, stones, clay lumps and other extraneous materials harmful or toxic to plant growth.
2. Mix soil amendments and fertilizers with topsoil at rates specified in soils test analysis report. Delay mixing of fertilizer if planting will not follow placing of planting soil within 48 hours.
3. Refer to schedule at the end of this section for planting soil mixture requirements.
4. Mix soil amendments and fertilizer by suitable means to assure complete mixing and uniform texture using proportions for each use as recommended by soils test analysis

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report.

5. For pit and trench type backfill, mix planting soil prior to backfilling, and stockpile at site.
6. For planting beds and lawns, mix planting soil either prior to planting or apply on surface of topsoil and mix thoroughly before planting.
7. Apply phosphoric acid fertilizer (other than that constituting a portion of complete fertilizers) directly to subgrade before applying planting soil and tilling.

3.5 PLANT MATERIAL SCHEDULE

A. Plant Material Schedule is a detailed plant listing indicating static design usage, common and scientific names, minimum size and symbols, and shall be used in conjunction with landscape construction details.

B. Provide trees of size and species shown and scheduled for landscape work, nursery-grown under similar climatic conditions, and complying with definitions, requirements, and sizing of ANSI Z60.1.

C. All quantities listed are assembled for convenience of landscape bidding. Successful contractor shall develop lawn areas and install plant material shown on Drawings. Any discrepancies between quantities of plants listed and the quantities shown on the Drawings, the Drawing shall govern.

D. Sizes of planting stock listed is minimum acceptable size for each plant introduced to site. Additionally, when excessive pruning reduces height, replace plant.

E. Substitutions: No plant or landscape material substitutions shall be accepted without written permission of the Owner's Representative. This applies to the genus, species, and variety of all plants and miscellaneous landscape items.

F. All plants shall be true to name and in all cases, botanical names shall take precedence over common names. All plants of each clone, species, or cultivar shall be delivered to the site labeled with their full botanical name.

G. The Contractor shall review the Drawings and Specifications to coordinate the work indicated in this section with all other related work. In case of any discrepancy, Contractor shall notify Owner's Representative. However, the Planting Specifications take precedence over the Planting Drawings.

3.6 FIELD QUALITY CONTROL

A. A pre-installation meeting at site with General Contractor, Site Contractor, Landscape Contractor, and Landscape Architect will be scheduled by Owner's Representative.

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B. This meeting will be conducted by Owner's Representative. Contract Documents and procedures will be reviewed and any discrepancies, problems, or questions shall be discussed and resolved prior to commencement of any work.

C. Required field inspection will be performed under provisions of Division 01 – Quality Requirements.

D. Plants will be rejected when ball of earth surrounding roots has been disturbed or damaged prior to or during planting.

E. Substitutions of plant material will not be permitted beyond seven days after conclusion of pre-installation meeting.

3.7 PLANTING OPERATIONS

A. Prior to beginning of Work specified in this Section, verify that site grading and preparation have been properly completed where necessary for this work.

B. Proceed with complete landscape work as rapidly as portions of site become available, working within seasonal limitations for each kind of landscape work required.

C. Plant trees and shrubs after final grades are established and prior to planting of lawns, unless otherwise acceptable to Owner's Representative.

D. If planting of trees and shrubs occurs after lawn work, protect lawn areas and promptly repair damage to lawns resulting from planting operations.

E. Recommended Schedule of Implementation:
   1. Live Landscape Plant Materials
      a. Spring: Mid-April through June
      b. Fall: Mid-August through late October

F. Make every effort to install plant materials during normal planting season for each type of landscape work required.

G. If for any reason installation cannot be completed during these times, take extra care to insure healthy growth of plant material.

H. Correlate planting with specified maintenance periods to provide maintenance from date of completion.

I. Work specified in this Section will be postponed until next planting season if other work under this Contract is completed too late in year for planting work to be performed properly.

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3.8 TREE PLANTING

A. Excavate pits with angled sides.

B. Scarify side walls to alleviate glazing.

C. Excavate pit at least three (3) times wider than ball diameter and equal to ball depth. (Note: trees and shrubs planted with crown/root flare of plant lower than adjacent grade will be rejected.)

D. Where rubble fill is encountered, notify Owner's Representative and prepare planting pits properly by removal of rubble or other acceptable methods. When conditions encountered are severe and extensive, as determined by Owner's Representative, proceed with additional work at the direction of the Owner's Representative.

E. Drainage: If subsoil conditions indicate the retention of water in planting areas, as shown by seepage or other evidence indicating presence of underground water, notify the Owner's Representative before backfilling.

F. For trees to be planted in individual holes in areas of good soil that is to remain in place, save the existing soil to be used as backfill.

G. Backfill excavations for trees and allow to percolate before planting. When excavation is approximately 2/3 full, water thoroughly before placing remainder of backfill. Repeat watering until no more is absorbed. Water again after placing final layer of backfill. No settling of root balls will be allowed.

H. Select best viewing angle and set balled and burlapped stock, plumb, and in center of pit or trench with crown/root flare at or slightly above elevation of adjacent finished grades.

I. Remove burlap and wire basket from top one-half of ball. When set, place additional backfill and eliminate voids and air pockets.

J. Encircle planting pit with three (3) inch high earth saucer to allow for mulching and watering during establishment. All trees to have minimum six (6) foot diameter mulch ring.

K. Mulch tree planting areas with not less than three (3) inch thickness of mulch, and finish level with adjacent lawn grades as directed in field. Keep mulch minimum two (2) inches away from all stems and tree trunk root flares.

L. If deciduous trees are moved in full leaf, spray with anti-desiccant at nursery before moving, and again two weeks after planting.

M. Prune only dead or damaged branches in accordance with standard horticultural practice, unless otherwise directed by Owner’s Representative. Do not cut tree leaders.

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N. Stake and guy trees immediately after planting, if required. Contractor shall be responsible for determining if a tree requires staking or guying. Adverse site conditions such as windy sites, slopes greater than 3:1, shallow or unstable soils, bare root plantings or large specimen plantings may require staking or guying.

O. Trees to remain staked for one additional full growing season. Contractor shall remove stakes and accessories as a part of this project. Removal shall occur at end of warranted period for trees.

3.9 FERTILIZING

A. In order to fully satisfy requirements of tree, seed, and sod planting operations, provide fertilizer of neutral character, with some elements derived from organic sources and containing a percentage of nitrogen, phosphorous, and potassium in a form that will be available to plants during initial period of growth.

B. Fertilize lawns as required to maintain healthy, vigorous turf. A minimum two (2) applications are required.

C. Apply fertilizer immediately after time of planting and other application just prior to end of 60-day maintenance period.

D. Prepare and execute fertilizer operations per manufacturer's recommendations and at rates and varieties specified earlier within this Section.

E. Lightly water to aid dissipation of fertilizer.

3.10 INSPECTION AND APPROVALS

A. Design scope, character, color composition, detailing, texture, dynamism, and Contract Documents have been created to satisfy specific site requirements of Owner and governmental agencies. Any modification not set forth and approved at time of pre-installation meeting must be denied.

B. When inspected landscape work does not comply with requirements, replace rejected work and continue specified maintenance until Work is re-inspected and found to be acceptable.

C. Contractor shall remove plant identification tags after final inspection and approvals.

D. Final acceptance shall include fertilization and maintenance required to establish vigorous, healthy plantscape as set forth by standard landscape practices and contract documents.

E. At end of substantial completion and when compliance with contract documents is established, Owner’s Representative will issue a "Substantial Completion" to Owner, which includes a request for a release of 95 percent payment of total planting contract.

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F. Remaining five (5) percent of planting contract will be issued by Owner during month of June following plant installation and final acceptance.

3.11 MAINTENANCE SERVICE

A. Contractor shall perform maintenance services for a period of 60 days beyond date of substantial completion.

B. Maintain plant life immediately after planting to establish vigorous growing conditions.

C. During "maintenance period" provide an ongoing, pleasant visual environment where any plant which is not responding to transplanting is immediately replaced, lawns are repaired, and weeds are constantly removed without exception.

D. Maintain trees by pruning, cultivating and weeding as required for healthy growth for the full maintenance period and during the period before final acceptance of the full project. Restore planting saucers. Maintain moisture depth to ensure vigorous growth.

E. Tighten and repair stake and guy supports, if used, and reset trees and shrubs to proper grades or vertical position as required.

F. Maintain sodded turf areas for the full maintenance period (in no case less than 30 days), longer as required to establish an acceptable lawn, and not less than the overall project final completion.

G. Maintain manicured turf areas by watering, fertilizing, weeding, mowing, trimming, and other operations such as rolling, regrading and replanting as required to establish a smooth, acceptable lawn, free of eroded or bare areas. Submit fertilizing schedule for three (3) applications per year.
   1. Do not over water lawns causing stress on trees.
   2. Mow grass at uniform height between three (3) inches and 3-1/2 inches.

3.12 SCHEDULE OF PLANTING SOIL MIXTURE

A. Subject to the recommendation of the Soils Test Analysis Report and Owner's Representative Approval.

END OF SECTION

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SECTION 32 91 19

LANDSCAPE GRADING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Final grading requirements.
2. Placement of topsoil.

B. Related Sections:
1. Applicable provisions of Section 31 02 00 – General Requirements for Sitework shall govern Work under this Section.
2. Section 31 05 13 – Soils for Earthwork.
3. Section 31 23 17 – Site Excavation, Backfill, and Compaction: Backfilling trenches.
4. Section 32 90 00 - Planting.
5. Section 32 92 23 – Sodding.

1.2 REFERENCES

A. ASTM International (ASTM):
1. ASTM D5268 – Topsoil Used for Landscaping Purposes.

1.3 SUBMITTALS

A. Section 31 02 00 – General Requirements for Sitework: Requirements for submittals.

B. Soils Test Samples: As specified in Section 32 90 00 - Planting.

C. Materials Source: Submit name of source of imported materials.

PART 2 PRODUCTS

2.1 MATERIALS

A. Topsoil: As specified in Section 31 05 13 – Soils for Earthwork.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 31 02 00 – General Requirements for Sitework: Coordination and project conditions.

B. Verify substrate base has been contoured and compacted.

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3.2 SUBSTRATE PREPARATION

A. Eliminate uneven areas and low spots.

B. Remove debris, roots, branches, stones, in excess of one (1)-inch in size. Remove contaminated subsoil.

C. Scarify surface to depth of three (3) inches where topsoil is scheduled. Scarify in areas where equipment used for hauling and spreading topsoil has compacted subsoil.

3.3 PLACING TOPSOIL

A. Place topsoil in areas where sodding and planting is required. Place topsoil during dry weather and on dry, unfrozen subgrade.

B. Break down all clods and lumps using the appropriate equipment to provide a uniformly textured soil.

C. For all areas of sod ensure that, for the upper two (2) inches, 100 percent of the material passes a one (1) inch sieve and at least 90 percent passes the No. 10 sieve.

D. Fine grade topsoil to eliminate rough or low areas and to ensure positive drainage. Maintain profiles and contour of subgrade.

E. Remove all vegetable matter, roots, weeds, rocks, and foreign material while spreading.

F. Manually spread topsoil close to plant material to prevent damage.

G. Lightly compact placed topsoil.

H. Remove surplus subsoil and topsoil from site.

I. Leave stockpile area and site clean and raked, ready to receive landscaping.

3.4 TOLERANCES

A. Section 31 02 00 – General Requirements for Sitework: Tolerances.

B. Top of Topsoil: Plus or minus 1/2-inch.

3.5 PROTECTION OF INSTALLED WORK

A. Section 31 02 00 – General Requirements for Sitework: Protecting installed Work.

B. Protect landscaping and other features remaining as final Work.

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C. Protect existing structures, paving, and curbs.

D. Prohibit construction traffic over topsoil.

3.6 SCHEDULE

A. Compacted topsoil thicknesses:
   1. Sod: Four (4) inches.

END OF SECTION

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SECTION 32 92 23

SODDING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Preparation of subsoil.
2. Placing topsoil.
3. Fertilizing.
4. Sod installation.
5. Maintenance.

B. Related Sections:
1. Applicable provisions of Section 31 02 00 – General Requirements for Sitework shall govern Work under this Section.
2. Section 31 05 13 - Soils for Earthwork: Topsoil material.
3. Section 31 23 17 – Site Excavation, Backfill, and Compaction: Rough grading over cut.
4. Section 32 90 00 - Planting.
5. Section 32 91 19 - Landscape Grading: Preparation of subsoil and placement of topsoil in preparation for the Work of this section.

1.2 REFERENCES

A. ASTM International
1. ASTM C602 - Specification for Agricultural Liming Materials.

B. Turfgrass Producers International (TPI)
1. TPI - Guideline Specifications for Turfgrass Sodding.

1.3 DEFINITIONS

A. Weeds: Vegetative species other than specified species to be established in given area.

1.4 SUBMITTALS

A. Section 31 02 00 – General Requirements for Sitework: Requirements for submittals.

B. Product Data: Submit data for sod grass species, fertilizer, mulch, and other accessories.

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C. Submit minimum 10 lb sample of topsoil proposed. Forward sample to approved testing laboratory in sealed containers to prevent contamination.

D. Test Reports: Indicate topsoil nutrient and pH levels with recommended soil supplements and application rates.

E. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.5 CLOSEOUT SUBMITTALS

A. Section 31 02 00 – General Requirements for Sitework: Requirements for submittals.

B. Operation and Maintenance Data: Submit maintenance instructions, cutting method and maximum grass height.

1.6 QUALITY ASSURANCE

A. Sod: Root development capable of supporting its own weight without tearing, when suspended vertically by holding upper two corners.

B. Perform Work in accordance with Wisconsin Department of Transportation standards.

C. Sod Producer shall be located within 100 miles of Project and shall specialize in sod production and harvesting with minimum five years experience, and shall be certified by the State of Wisconsin.

1.7 QUALIFICATIONS

A. Sod Producer: Company specializing in manufacturing Products specified in this section with minimum five (5) years experience.

B. Installer: Company specializing in performing work of this section.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Section 31 02 00 – General Requirements for Sitework: Product storage and handling requirements.

B. Deliver sod in rolls and protect exposed roots from dehydration.

C. Do not deliver more sod than can be laid within 32 hours after stripping. Do not harvest or ship when moisture content will adversely affect sod survival.

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1.9 COORDINATION

A. Section 31 02 00 – General Requirements for Sitework: Requirements for coordination.

1.10 MAINTENANCE SERVICE

A. Section 31 02 00 – General Requirements for Sitework: Maintenance service.

B. Maintain sodded areas for three (3) months from Date of Substantial Completion.

PART 2 PRODUCTS

2.1 SOD

A. Manicured Turf - Sod: TPI approved field-grown grade; cultivated grass sod, type as indicated below; with strong fibrous root system, free of burned or bare spots, undesirable native grasses, and containing no more than five (5) weeds per 1,000 square feet.

1. Sod shall be a blend composed of a minimum of four different bluegrass varieties which are best suited to the local climate.
2. Sod shall be minimum age of 18 months, with root development that will support its own weight, without tearing, when suspended vertically by holding upper two (2) corners.
3. Submit sod certification indicating percentages of grass species and location of sod source to Owner's Representative, prior to procurement.
4. Roll machine-cut sod in accordance with TPI guidelines, in running bond pattern.
5. Cut sod in area not exceeding one square yard with a uniform minimum one (1) inch topsoil base.

2.2 SOIL MATERIALS

A. Topsoil: As specified in Section 31 05 13 – Soils for Earthwork.

2.3 ACCESSORIES

A. Fertilizer: Commercial grade; recommended for grass, with fifty percent of elements derived from organic sources; of proportion necessary to eliminate deficiencies of topsoil.

B. Lime: ASTM C602, agricultural limestone containing a minimum 80 percent calcium carbonate equivalent.

C. Water: Clean, fresh and free of substances or matter capable of inhibiting vigorous growth of grass.

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2.4 HARVESTING SOD

A. Machine cut sod in accordance with TPI.

B. Cut sod in area not exceeding 1 sq yd, with minimum 1/2-inch and maximum 1-inch topsoil base.

2.5 SOURCE QUALITY CONTROL

A. Section 31 02 00 – General Requirements for Sitework: Testing, inspection and analysis requirements.

B. Analyze to ascertain percentage of nitrogen, phosphorus, potash, soluble salt content, organic matter content, and pH value.

C. Provide recommendation for fertilizer and lime application rates for specified sod grass species as result of testing.

D. Testing is not required when recent tests are available for imported topsoil. Submit these test results to testing laboratory. Indicate, by test results, information necessary to determine suitability.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 31 02 00 – General Requirements for Sitework: Verification of existing conditions before starting work.

B. Verify prepared soil base is ready to receive the Work of this section.

3.2 FERTILIZING

A. Apply lime at application rate recommended by soil analysis. Work lime into top 6 inches of soil.

B. Apply fertilizer at application rate recommended by soil analysis.

C. Apply fertilizer after smooth raking of topsoil and prior to installation of sod.

D. Apply fertilizer no more than 48 hours before laying sod.

E. Mix fertilizer thoroughly into upper 4 inches of topsoil.

F. Lightly water soil to aid dissipation of fertilizer.

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3.3 MANICURED TURF - SOD INSTALLATION

A. Moisten prepared topsoil surface immediately prior to installing sod.

B. Lay sod immediately upon delivery to site to prevent deterioration.

C. Contractor shall immediately remove from site, or return to grower, dried, torn, dormant, coarse bladed or otherwise objectionable sod rolls.

D. Take extra care when sodding operations are required beyond recommended schedule of implementation. Under no circumstances shall sod be laid on frozen ground.

E. Lay sod to form a solid mass with tightly fitted joints.

F. Compress butt ends and sides of sod strips to reduce shrinkage. Stagger sod strips to offset joints in adjacent courses and tamp lightly to ensure contact with subgrade.

G. Where sodding operations are scheduled throughout areas whose gradient exceeds one (1) vertical foot for each four (4) horizontal feet, Contractor shall anchor sod strips with 10-inch staples to prevent slippage.

H. Provide quality sod lawn whose grasses have been blended within rates specified earlier within this Section.

I. Water sod thoroughly with a fine spray immediately after planting. Saturate existing soils to a depth of four (4) inches throughout.

J. Within ten days after laying of sod, Contractor shall return to site to work topsoil into minor cracks between sod strips where shrinkage has occurred.

K. To be acceptable, grass must be firmly rooted in the ground and shall be full, viable, and free of bare spots. Dead or bare spots shall not exceed four (4) square inches in size nor comprise more than one (1) percent of the lawn areas.

3.4 MAINTENANCE

A. Mow grass at regular intervals to maintain at maximum height of 2-1/2 inches. Do not cut more than 1/3 of grass blade at each mowing.

B. Neatly trim edges and hand clip where necessary.

C. Immediately remove clippings after mowing and trimming.

D. Water to prevent grass and soil from drying out.

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E. Roll surface to remove or irregularities.

F. Control growth of weeds. Apply herbicides. Remedy damage resulting from improper use of herbicides.

G. Immediately replace sod on areas showing deterioration or bare spots.

H. Protect sodded areas with warning signs during maintenance period.

END OF SECTION

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SECTION 332000 - EARTH MOVING – BIOFILTRATION AREA

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes

1. Preparing subgrades for biofiltration facility.
2. Excavating and backfilling for biofiltration facility.
3. This section specifically excludes earthworks within the footprint of the proposed monument sign area.

1.2 DEFINITIONS

A. Backfill: Soil material used to fill an excavation.

B. Bedding Course: Aggregate layer placed over the excavated subgrade in a trench before laying pipe.

C. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill.

D. Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated.

1. Authorized Additional Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions as directed by Engineer. Authorized additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.
2. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions without direction by Engineer. Unauthorized excavation, as well as remedial work directed by Engineer, shall be without additional compensation.

E. Fill: Soil materials used to raise existing grades.

F. Structures: Footings, foundations, retaining walls, slabs, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.

G. Subgrade: Uppermost surface of an excavation or the top surface of a fill or backfill immediately below pea gravel drainage or topsoil materials.

H. Utilities: On-site underground pipes, conduits, ducts, and cables, as well as underground services within buildings.

1.3 QUALITY ASSURANCE

A. Preexcavation Conference: Conduct conference at project site.

1.4 PROJECT CONDITIONS

A. Utility Locator Service: Notify utility locator service for area where Project is located before beginning earth moving operations.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.

B. Satisfactory Soils: Well graded inorganic soil, free of rock or gravel larger than 1inch in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.

C. Unsatisfactory Soils: Poorly graded or organic soils.

1. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction.

D. Engineered Soil: Per Wisconsin Department of Natural Resources Technical Standard 1004.

E. Bedding for storm sewer piping shall be in accordance with the most recent edition of the Standard Specifications for Sewer and Water Construction in Wisconsin.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth moving operations.

B. Protect and maintain erosion and sedimentation controls during earth moving operations.

C. Protect subgrades and foundation soils from freezing temperatures and frost. Remove temporary protection before placing subsequent materials.

3.2 EXCAVATION, GENERAL

A. Unclassified Excavation: Excavate to subgrade elevations regardless of the character of surface and subsurface conditions encountered. Unclassified excavated materials may include rock, soil

materials, and obstructions. No changes in the Contract Sum or the Contract Time will be authorized for rock excavation or removal of obstructions.

1. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.

3.3 EXCAVATION FOR STRUCTURES

A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch. If applicable, extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.

1. Excavations for Footings and Foundations: Do not disturb bottom of excavation. Excavate by hand to final grade just before placing concrete reinforcement. Trim bottoms to required lines and grades to leave solid base to receive other work.

3.4 EXCAVATION FOR WALKS AND PAVEMENTS

A. Excavate surfaces under walks and pavements to indicated lines, cross sections, elevations, and subgrades.

3.5 EXCAVATION FOR UTILITY TRENCHES

A. Excavate trenches to indicated gradients, lines, depths, and elevations.

B. Excavate trenches to uniform widths to provide the following clearance on each side of pipe or conduit.

1. Clearance: 12 inches each side of pipe.

C. Trench Bottoms: Excavate and shape trench bottoms to provide uniform bearing and support of pipes and conduit. Shape subgrade to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits. Remove projecting stones and sharp objects along trench subgrade.

1. Excavate trenches 6 inches deeper than elevation required in rock or other unyielding bearing material, 4 inches deeper elsewhere, to allow for bedding course.

3.6 SUBGRADE INSPECTION

A. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities without additional compensation.

3.7 STORAGE OF SOIL MATERIALS

A. Stockpile borrow soil materials and excavated satisfactory soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.

1. Stockpile soil materials away from edge of excavations.

3.8 UTILITY TRENCH BACKFILL

A. Place backfill on subgrades free of mud, frost, snow, or ice.

B. Place and compact bedding course on trench bottoms and where indicated. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits. Bedding shall be accordance with the most recent edition of the Standard Specifications for Sewer and Water Construction in Wisconsin.

C. For work outside of the public right of way: place and compact initial satisfactory soil backfill over the pipe or conduit.

1. Carefully compact initial backfill under pipe haunches and compact evenly up on both sides and along the full length of piping or conduit to avoid damage or displacement of piping or conduit.

D. For work outside of the public right-of-way: place and compact final backfill of satisfactory soil to final subgrade elevation.

E. For utility work within the public right-of-way: Bedding and backfill for utility trenches shall be in accordance with City of Milwaukee requirements.

F. Install warning tape directly above utilities, 12 inches below finished grade, except 6 inches below subgrade under pavements and slabs.

3.9 SOIL FILL

A. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.

B. Place and compact fill material in layers to required elevations as follows:

1. Under biofiltration area, use satisfactory soil material.

3.10 SOIL MOISTURE CONTROL

A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill soil layer before compaction to within 2 percent of optimum moisture content.

1. Do not place backfill or fill soil material on surfaces that are muddy, frozen, or contain frost or ice.
2. Remove and replace, or scarify and air dry, otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.

3.11 COMPACTION OF SOIL BACKFILLS AND FILLS

A. Place backfill and fill soil materials in layers not more than 8 inches in loose depth for material compacted by heavy compaction equipment, and not more than 4 inches in loose depth for material compacted by hand-operated tampers.

B. Compact soil materials to not less than the following percentages of maximum dry unit weight according to ASTM D 1557 Modified Proctor

1. Under biofiltration area, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill soil material at 90 percent.
2. For utility trenches, compact each layer of initial and final backfill soil material at 90 percent.
3. For Engineered Soil refer to Drawings for compaction requirements.

3.12 GRADING

A. General: Uniformly grade areas to a smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.

B. Site Rough Grading: Finish subgrades to required elevations within the following tolerances:

1. Plus or minus 1 inch.

3.13 FIELD QUALITY CONTROL

A. Testing Agency: Contractor shall engage a qualified geotechnical engineering testing agency to perform tests and inspections.

B. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earth moving only after test results for previously completed work comply with requirements.

C. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil materials to depth required; recompact and retest until specified compaction is obtained.

3.14 PROTECTION

A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.

B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.

C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.

1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

3.15 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Remove surplus waste materials, including but not limited to excess borrow material, unsatisfactory soil, trash, and debris, and legally dispose of them off Owner's property.

B. Excavated soil from the biofiltration area shall be disposed of at the designated location as indicated on the Drawings.

END OF SECTION 332000

SECTION 332319 – DEWATERING – BIOFILTRATION AREA

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes construction dewatering.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at project site.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Dewatering Performance: Design, furnish, install, test, operate, monitor, and maintain dewatering system of sufficient scope, size, and capacity to lower, control, remove, and dispose of ground water and permit excavation and construction to proceed on dry, stable subgrades.

PART 3 - EXECUTION

3.1 PREPARATION

A. Provide temporary grading as necessary to facilitate dewatering and control of surface water.

3.2 INSTALLATION

A. Install dewatering system complete with pump equipment, standby power and pumps, filter material gradation, valves, appurtenances, water disposal, and surface-water controls.

B. Provide standby equipment, available for immediate operation, to maintain dewatering on continuous basis if any part of system becomes inadequate or fails.

3.3 OPERATION

A. Operate system continuously until dewatering is no longer required.

B. Operate system to lower and control ground water to permit excavation, construction of structures, and placement of fill materials on stable subgrades.

C. Remove dewatering system from Project site on completion of dewatering.

END OF SECTION 332319

Section 33 90 00 – Landscaping

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work Included: Labor, materials and equipment required to complete all landscaping including, but not limited to:
   1. Finish grading of topsoil;
   2. Soil treatment;
   3. Seeded turf construction;
   4. Planting of trees, shrubs, perennials, grasses, ground covers & annuals;
   5. Topsoil & bed amendments for planting;
   6. Installation of mulches & bed edging
   7. Protection and maintenance;
   8. One (1) season warranty on perennials & grasses
   9. Two (2) year maintenance & warranty on biofilter plantings
   10. Two (2) year maintenance of native seed mix areas;
   11. All other labor and materials required to complete landscape work.

1.02 QUALITY ASSURANCE

A. Samples, Tests and Inspection Notice of Sources: Within ten (10) days following acceptance of the bid, provide written notification to Landscape Architect of sources of the material required or desired to be inspected or tested.

B. Plants: Contractor will be responsible for certificates of inspection of plant materials that may be required by the Federal, State or other authorities to accompany shipments of plants. Inspection and approval by Landscape Architect of plants at place of growth or upon delivery will not in any way impair right of rejection for failure to meet other requirements during progress of Work.

C. Plant Quality: All materials shall be true to the species and variety/hybrid/cultivar as specified, nursery-grown in accordance with good horticultural practices and under climatic conditions similar to the site location. Specimens obtained specifically for this project shall have been freshly dug and properly prepared for planting:
   1. The contractor shall provide written lists / invoices of plant materials ordered for the project, including plan sources, species, sizes & root conditions.
   2. Trees and shrubs with a damaged, cut or crooked leader, abrasion of bark, sunscald, frost crack, disfiguring knots, insects (including eggs and larvae) or insect damage, cankers/cankerous lesions or fungal mats, mold, prematurely-opened buds, or cuts of limbs over 3/4″ (1.9 cm) diameter that are not completely callused will be rejected.
   3. Balled and burlapped plants will not be accepted if the ball is dry, cracked, or broken before or during planting.
   4. Container-grown plants shall not be pot-bound, nor have kinked, circling, or bent roots.
   5. Herbaceous perennials, annuals and bulbs shall only be supplied from nurseries certified by state plant inspectors. Substitutes or collected material may be used if approved by Owner and/or Landscape Architect.

D. Seed Mixes: Submit all sources, mix names, manufacturer analyses and guarantees of germination as specified for Landscape Architect review/approval.

E. Bulk Landscape Materials: Submit samples of all landscape materials outlined in PART 2 including (but not limited to) soils, bed amendments, fertilizer, stone, edging, sod and/or seed as specified for Landscape Architect review/approval.

F. Topsoil Testing: Prior to planting, contractor is responsible for obtaining soil tests for all topsoil (existing stockpile or newly imported.)
   1. Soil testing results shall include (but is not limited to) soil pH, percent organic matter, phosphorus, potassium, calcium, cation exchange capacity, sodium absorption ratio, deleterious material, mineral & plant-nutrient content and texture (percentages of sand, silt and/or clay.)
   2. Report presence of problem salts, minerals or heavy metals including aluminum, arsenic, barium, cadmium, chromium, cobalt, lead, lithium and/or vanadium. If such problem materials are present, provide additional recommendations for corrective action.
   3. Soil treatment recommendations shall be provided, measured by weight per 1,000 SF (or volume per CY) for nitrogen, phosphorus and potash nutrients and soil amendments to be added to produce satisfactory planting soil suitable for healthy, viable plants.
   4. Contaminated soil shall be removed from the project site if discovered.
   5. Remove excessive clay, gravel, stones, materials detrimental to healthy plant growth and/or debris greater than 1" dia. Mix new topsoil mix into existing soil if needed.

1.03 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Tagging: All plants are to be labeled by their plant name & size. Labels shall be securely attached to all plants, bundles and containers when delivered. Labels shall be durable, legible and constructed of weather-resistant materials. All labels shall remain on plant material until the project has been inspected by the Landscape Architect. Plants with no labels will be assumed to be deficient (incorrect size and/or species) unless otherwise proven via nursery receipt.

B. Delivery: During transport, no plant shall be bound with rope or wire in a manner that damages trunks or breaks branches. Plants shall not be dragged, lifted or pulled by their trunks, branches or foliage in a damaging way. No plant shall be thrown off a truck or loader to the ground.

C. Protection After Delivery:
   1. Landscape materials shall be installed within 72 hours of delivery to the project site. Schedule material deliveries accordingly to limit on-site storage.
   2. Cover soil balls of B/B plants which cannot be planted immediately upon delivery with moist soil or mulch or provide other protection from drying winds and sun.
   3. Plant or heel-in bare root plants immediately upon delivery. Water all plants as necessary until planted.

4. Keep containerized plants in a shaded area, well-covered with wood chips, soil or other approved material, and kept well-watered.
5. If not planted immediately after delivery, or unless plant locations require navigation into tight confines, all tree & shrub canopies are to be un-bound while waiting for installation.

1.04 GUARANTEE AND REPLACEMENT

A. Guarantee: All perennial plants (perennials & grasses) shall be guaranteed for duration of one (1) full growing season after planting and shall be alive and in satisfactory growth at end of guarantee period. All biofilter plants shall be guaranteed for duration of two (2) years after planting and shall be alive and in satisfactory growth at the end of the guarantee period.
   1. At any time during the guarantee period, the Contractor may be requested to remove or replace, without cost to the Owner, and within a specified planting period, any plants not in a healthy and flourishing condition as determined by the Owner and/or Landscape Architect. Replacements will not be held off until the end of the warranty period.

B. Replacement: Prior to end of the guarantee periods, the Landscape Architect may make inspection upon written notice requesting such inspection submitted by Contractor at least ten (5) days before anticipated date:
   1. Remove from the site all plants required under contract which are dead or not in satisfactory growth, as determined by Landscape Architect. Replace these and all missing plants, due to Contractor error, as soon as conditions permit but during proper season. In case of any questions regarding condition and satisfactory establishment of a rejected plant, Contractor may elect to allow such plant to remain through another complete growing season at which time the rejected plant, if found to be dead, in an unhealthy or badly impaired condition, shall be replaced.
   2. If present, native seed mix areas which are not successfully established by the end of the first year of the two-year warranty period shall be re-sown at by Contractor at no additional cost to the Owner. These areas shall be inspected at the end of the second year of the two-year warranty period, and shall again be re-sown if necessary by Contractor at no additional cost to the Owner.

C. Materials and Operation:
   1. Replace with plants of same kind and size as specified in plant list. Furnish and plant as specified. Replacement materials will be furnished with new one-year guarantees. One replacement per individual plant.
   2. Replace native seed mix areas with same mix as originally required and per the original specifications, unless otherwise discussed and a mutually-acceptable substitute mix is chosen and approved by the Landscape Architect.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Topsoil: Sufficient topsoil to complete planting of trees, shrubs, perennials, grasses, ground covers & annuals.
   1. Topsoil shall be weed free, natural, fertile, friable soil, possessing characteristics of representative productive soils in the vicinity.
   2. Obtain from naturally, well drained areas.
   3. Soil shall not be excessively acid or alkaline or contain toxic substances which may be harmful to plant growth.
   4. Topsoil shall be without admixtures of stones, stumps, roots, debris or other objects 1" or more in diameter which might be a hindrance to planting operations.
   5. Topsoil present on site, if meeting all of the requirements above, may be utilized. Existing topsoil shall be stripped & stored by the earthwork contractor.
   6. Unless otherwise indicated in Sections 31 00 00 and/or 31 05 00, all topsoil shall be furnished and placed by the earthwork contractor.

B. Plant Starter Mix: Trees pits & landscape beds including shrubs, perennials, grasses, ground covers and/or annuals shall receive a blend of topsoil & plant starter mix as specified in the landscape plans. Plant starter mix to be mixed into the top 6″ of the landscape beds:
   1. Selected soil, black peat, aged compost & washed sand.
      - Liesener Soils, Jackson WI
      - Approved equal

C. Soil Amendments & Fertilizers: Additional amendments if specified in the landscape plans:
   1. Peat moss: Type 1 sphagnum, weed/seed free, 3.1-5.0 pH.
   2. Compost: Standard commercial-grade compost containing sheep or cow manure.
   3. Commercial Fertilizer: Fertilizer shall be granular, non-burning, composed of not less than 50% organic, slow-acting w/ guaranteed analysis. Fertilizer must meet the requirements of the Wisconsin Department of Agriculture as to registration and labeling and must be delivered to the site in sealed & labeled bags. All fertilizer to be spread at the rate specified by the manufacturers:
      a. Lawns: Furnish & spread in the topsoiled area a commercial lawn starter fertilizer mixture.
      b. Plantings: Furnish & install a commercial 16-8-8 starter fertilizer mixture (Nutripak or sim.)
   4. Mycorrhizal Fungi: Dry, granular inoculant containing at least 5300 spores per lb. of vesicular-arbuscular mycorrhizal fungi and 95 million spores per lb. of ectomycorrhizal fungi, with a maximum of 5.5 percent inert material

D. Materials for Staking and Wrapping: All stakes & wrapping to be installed as specified in the tree/shrub planting details as shown in the landscape plans:
   1. Stakes shall be 6' to 8' long sections of unflanged metal or 2" x 2" hardwood. Support ties shall be 2" or wider bands of polypropylene or elasticized or webbed strapping. Ground anchors shall be arrowhead shaped earth anchors of malleable iron castings, aluminum castings or stamped steel.

2. Trunk Wrapping Material: Perforated drainage tubing or similar material approved by Landscape Architect, large enough in diameter to prevent abrasion of the trunk and to allow air circulation between the tubing and the trunk.

E. Seeded turf: See landscape plans for seed mixes. Turf seed mixes shall be provided for review/approval as specified in the landscape plans. Deliver seed to the site in unopened containers; include the manufacturer's guaranteed analyses.

F. Specialty seed mixes: Native seed mixes shall be provided for review/approval as specified in the landscape plans. Deliver seed to the site in unopened containers; include the manufacturer's guaranteed analyses:
   1. Forb and grass seed shall conform to the Wisconsin Statutes and Wisconsin Administrative Code Chapter ATCP regarding noxious weed seed content and labeling.
   2. Test forb and grass seed according to the methods and procedure used for sampling and analyzing seed for purity, germination, and noxious weed seed content specified in the current edition of Rules for Testing Seed, Published by the Association of Official Seed Analysts.
   3. Use seed within one year of the test date appearing on the label.
   4. Species composed of pure live seed (PLS) shall contain no named or improved varieties. PLS shall be from Wisconsin, Northern Illinois, Northeastern Iowa or Eastern Minnesota nurseries specializing in growing native species from Wisconsin genotypes.
   5. Grasses classified as “agriculture grasses” shall be PLS as specified. Other seed shall be “clean” according to high quality industry standards. All seed shall be cold, dry stratified. Seed mixture shall be blended by the vendor and ratios of various species shall be guaranteed by the vendor in writing as specified. Minimum percent purity for native species is 90 percent. Any substitutions of species due to availability must be approved by project architect or engineer.

G. Plant Materials:
   1. Plant List: A list of plants is shown on planting plan.
   2. Nomenclature: Names of plants required under this contract conform to those in "Standardized Plant Names", latest edition, prepared by American Joint Committee on Horticulture Nomenclature. Names of varieties not included therein conform to generally accepted common names.
   3. Provide quantities necessary to complete planting as shown. Quantities shown in the plant schedule on the drawings are for convenience only. Take actual count from plans.
   4. Quality and Size: Plants shall have a habit of growth that is normal for species and shall be sound, healthy, vigorous and free from insect pests, plant diseases and injuries:
      a. All plants shall be equal to or exceed the measurements specified in plant list, which are minimum acceptable sizes, measured before pruning with branches in normal position. Larger plant materials can be used upon approval; their installation shall not increase the contract price.
      b. Do only necessary pruning at time of planting.

c. Requirements for measurement, branching, grading, quality, balling and burlapping of trees shall conform to standards currently recommended by "American Standard for Nursery Stock".
d. Take caliper measurement of trees at height of 6" above the ground up to and including 4" caliper size and 12" above ground for larger sizes.

5. Substitutions will be permitted only upon submission of proof that a plant is not obtainable within geographic area or similar plant hardiness zone, and authorization by Landscape Architect of Change Order providing for use of nearest equivalent obtainable size or variety of plant having same essential characteristics within an equitable adjustment of contract price. In the event that substitutes are necessary, notify the Landscape Architect in writing prior to ordering and include a listing of all requested substitute plant species, quantities & sources for review & approval.
6. Balled and Burlapped Plants: Plants designated "B&B" in the plant list shall be balled and burlapped. They shall be dug with firm, natural ball of soil of sufficient diameter and depth to encompass fibrous and feeding root system necessary for full recovery of the plant. Balls shall be firmly wrapped with burlap or similar material and bound with twine, cord or wire mesh. Where necessary to prevent breaking or cracking of the ball during planting, ball may be secured to a platform.

H. Bark Mulch: Finely shredded hardwood bark mulch, free from branches, heartwood, insects and other organic matter. Max. bark pieces to not exceed 3″ length & 1/4″ thickness. See Landscape Notes for specific depths & locations.
1. Wood chips are not an acceptable substitute.
2. Bark mulch not conforming to this specification shall be removed from the project site, regardless of whether it has been placed in landscape areas, and replaced with proper mulch. If mulch is rejected, contractor shall supply a product sample for Landscape Architect approval prior to replacing the rejected mulch.

I. Soil Separation Fabric/Weed Barrier: Non-woven fabric of 100 percent polypropylene staple fiber. Fabric shall be freely permeable to moisture transmittal. Nominal weight of 3.0 ounces per square yard. Provide only where landscape fabric is indicated in the landscape plans.
- “Typar Professional Landscape Fabric”
- Approved equal

J. Anti-Desiccant: If required as protection for leaf surfaces, anti-desiccant shall be permeable to permit transpiration, mixed & applied in accordance with manufacturer’s specifications.

K. Pre-emergent Herbicide (Selective and Non-Selective): Effective for controlling the germination or growth of weeds within planted areas at the soil level directly below the mulch layer.

L. Post-Emergent Herbicide (Selective and Non-Selective): Effective for controlling weed growth that has already germinated.

PART 3 – EXECUTION

3.01 CONSTRUCTION AND PLANTING METHODS

A. Time of Planting: Landscape Contractor will be notified when other Divisions of work have progressed sufficiently to commence work.
   1. Planting Seasons:
      - Spring, April 1st through June 15th.
      - Fall, August 15th through November 1st.
   2. Seeding Seasons (including native seed mixes):
      - Spring, April 1st through June 15th.
      - Fall, September 1st through October 15th.
   3. Evergreen exceptions: No conifers or evergreen trees/shrubs shall be planted after October 15th.
   4. At option and at full responsibility of Landscape Contractor, planting operations may be conducted at other times of year without additional compensation. All inspection and warranty terms will still be valid and enforced.

B. Pruning and Repair: New Plants:
   1. Prune trees and shrubs as required to repair injuries. Limit amount of pruning to the minimum necessary to remove dead, injured and/or broken branches.
   2. Prune in such a manner as not to change the natural habit, shape or overall height of plant.
   3. Make cuts flush, leaving no stubs. Where bark is bruised or scarred, trace back injured cambium to living tissue and remove. Smooth and shape wounds to not retain water.
   4. So that proper installation heights & sizes can be verified, do not prune shrubs prior to inspection by the Landscape Architect.

C. Obstructions Below Ground or Overhead: Contact Digger’s Hotline and/or Private Lines (or equivalent) to have all public and private on-site utilities located prior to beginning work. It is not contemplated that planting will be done where underground or overhead obstructions, harmful substances or unsuitable soils will be encountered. If such conditions are encountered, notify Landscape Architect & project representative immediately to determine the appropriate course of action.

D. Topsoil furnishing, spreading & fine grading: Landscape contractor is responsible for fine grading of the topsoil (and/or other soil mixes). Rough grading shall be completed by others. Coordinate with the General Contractor and/or earthwork contractor to ensure that all minimum planting depths and soil types are provided as indicated on the landscape plan. Unless otherwise indicated:
   1. Seeded areas: min. 6″ soil.
   2. Ornamental landscape areas (i.e. trees, shrubs, perennials, grasses and/or annuals): min, 18″ soil.
   3. Biofilter areas: depth per Civil plans.

E. New Planting:
   1. Pre-emergent herbicides: If on-site soils appear weedy, or if adjacent vegetation may disperse undesirable seeds onto the project, use of pre-emergent herbicides will be acceptable if approved by Owner and Landscape Architect prior to use.

2. Layout: Locate new plantings where shown on Drawings, unless otherwise approved by Landscape Architect:
   a. For all trees and large shrubs, stake their locations.
   b. For all shrub & perennial masses, lay out the materials in their respective beds.
   c. Contact the Landscape Architect for field approval, providing at least three days' notice. If unnecessary, the field visit may be omitted at the Landscape Architect's sole discretion.
3. Planting Pits: Dig pits and prepare soil prior to moving plants to their respective locations for planting to ensure that they will not be unnecessarily exposed to drying elements or to physical damage:
   a. Dig circular pits with sloped sides for all plants. Scarify sides and bottom of pits to eliminate glazed surfaces. Dig diameters of pits 2.5-3.0x greater than spread of roots or root balls.
   b. For shrub planting beds, till entire bed area to a depth of 4-6", then excavate individual shrubs to their correct depth.
   c. Make depth of pits for trees and shrubs sufficient to accommodate roots. Refer to the plant installation details as shown in the landscape plans.
4. Drainage Test at Tree Pits and Shrub Beds: Fill with 6" of water. Water shall drain completely within 24 hours.
   a. Notify Landscape Architect in writing of areas not passing drainage test. Provide proposal and cost estimate for corrective Work.
   b. Landscape Contractor is responsible for plant failure occurring as a result of inadequate drainage not reported to Landscape Architect.
5. Setting Plants: Unless otherwise specified, plant all trees and shrubs in pits, centered at such a depth that finished grade level after settlement will be the same as that at which plant was grown:
   a. Plant trees and shrubs upright and face to give best appearances or relationship to street and adjacent structures.
   b. After placement, remove burlap from top 1/2 of root balls after planting. Remove synthetic burlap completely. Remove platforms, wire and surplus binding from entire plant. Bio-degradable plant containers shall be split, non-biodegradable containers removed.
   c. Root systems of all containerized plants shall be split or crumbled by hand.
   d. Place topsoil or prepared soil and compact carefully to avoid injury to roots and to fill all voids. When hole is nearly filled, add water as necessary and allow it to soak away.
   e. Fill hole to finished grade and form a shallow saucer around each plant by placing a ridge of topsoil around edge of each pit. No soil is to cover the top of the rootball.
   f. After soil settles, fill in with additional soil to level of finished grade. Trees shall be moved by their root balls, not their trunks.

6. Soil Preparation: Use topsoil as specified herein or suitable existing soil thoroughly mixed with the soil amendments and/or plant starter mix as indicated on the landscape plans. Do not use poor soils, gravel, hard-pan or other soils injurious to plants. Thoroughly mix soil with amendments at rates specified by the manufacturers.
7. Dispose of excess soil at no additional cost to Owner.

F. Guying, Staking & Wrapping:
1. The Contractor shall be responsible for installing staking, guying and/or protective wrapping as specified and/or detailed. Adverse site conditions such as windy sites, shallow or unstable soils, bare root plantings or large specimen plantings will require staking or guying.
2. Trunk protection, where required, shall be secured at the top and bottom of the trunk in a manner so as not to restrict or damage the bark. The Landscape Contractor will be responsible for removing all guying, staking and/or trunk protection at the end of the warranty.
3. Staking and Guying: Ties made of approved material shall be attached directly to the stakes or may be attached to stakes by wire. In no case shall the wire extend around the tree trunk. Ties shall be attached loosely enough to allow 2-3″ of play in the trunk. For drooping stems, ties shall be placed at the point of the stem at which the top can stand up on its own. Stakes shall be driven outside the root ball. For trees larger than 3" in caliper and for all evergreen trees, use ties attached to 3 guy wires and ground anchors. Ground anchors are to be driven at about a 45-degree angle to the ground and placed at 120-degree intervals around the trunk. Staking and guying shall further conform to the drawings.

G. Pruning:
1. Prune in accordance with current American National Standards (ANSI) for Tree Care Operations. Perform all pruning work in a manner consistent with the landscape design intent. Plants overhanging and blocking pedestrian and/or vehicular paths shall be pruned as needed to allow the desired clearance.
2. Double leaders, dead branches and any branches damaged or broken during the planting process shall be pruned. This will be the only pruning allowed at planting. Pruning shall conform to American National Standard for Tree Care Operations, ANSI A300.
3. Trim hedges if indicated on plans. Only shear outer edges of hedges to maintain shape; do not shear between individual shrubs.
4. Trim Oaks, Honeylocusts & Elms while dormant to reduce disease risk. If such species are trimmed during non-dormant seasons, the contractor must seal immediately and completely all pruning wounds after each cut with an approved wound dressing.
5. Plants that flower before late spring shall be pruned immediately after flowering. Those that flower in summer or fall should be pruned in winter or spring before new growth emerges.
6. Other species may be trimmed throughout the year, except during leaf-out or during leaf drop.
7. Prune using scissor-style cutting devices, not anvil-style hand pruners, pole pruners or loppers.

3.02 SOD AND/OR SEED AREA PREPARATION

A. Finished Grading: Sodded and/or Seeded Areas: After subgrade has been prepared and topsoil furnished & placed by Section 31 00 00 and/or Section 31 05 00, Landscape Contractor shall do all final grading and lightly compact topsoil. Do not spread topsoil in a frozen or muddy condition. Apply fertilizer as herein specified. Prepare areas to form a level and loose seed bed. Lightly roll areas before final raking to locate & repair soft spots and mounds.
   1. Allow for compaction or settling of approximately 20 percent when spreading topsoil.
   2. Scarify and smooth areas where topsoil has not been removed. Remove all sticks, stones and rubbish.
   3. All weed growth in turf areas shall be removed prior to the beginning of work. Use of pre-emergent herbicides will be acceptable if approved by the Owner & Landscape Architect prior to use.

B. Soil Improvements: Applying Fertilizer: Apply commercial lawn starter fertilizer at the manufacturer’s rate to lawn areas being prepared for seeding.

C. Fertilize in accordance with current federal, state and local laws, through EPA-registered materials and application techniques, and performed under the supervision of a licensed certified applicator. Apply a granular, non-burning product composed of not less than fifty (50) percent organic slow-acting professional fertilizer with a mechanical rotary or drop-type distributor approximately thirty (30) days after sodding, at a rate equal to 1 lb. per 1,000 sq. ft., and thoroughly water into the soil.

3.03 SEEDED TURF

A. Season: Seed lawn areas during the seasons indicated in Part 3.01(A)(2).

B. Inspection and Tests of Grass Seed: All seed must be Blue Tag Certified and accompanied by duplicate statement of vendors certifying that each container of seed delivered is fully labeled in accordance with Federal Requirement. No Bent or Poa Annua will be acceptable. Each seed lot shall be tested by State Seed and Testing Laboratory.

C. Method of Seeding: Uniformly seed area with the specified mixture(s) and rate(s) indicated on the landscape plans. Sow with appropriate seeding equipment.
   1. Sow seed with a cultipacker, Brillion seeder, slit-seeder, drop- or broadcast-spreader, sowing half of seed in one direction and the other half at right angles to first sowing.
   2. Seeds to be within the top 1/4” of soil.
   3. Do not seed during stormy weather or if wind speeds exceed 12 MPH.

D. Mulching: Marsh hay or threshed straw of oats, wheat or rye are acceptable. No canary reed grass. Mulch material must be free of matured seed or noxious weeds, clean, small-grained, air-dry, well-seasoned, and free of rot/mildew.

1. Spread mulch uniformly in continuous blanket over all seeded areas using two 55 bales per acre or 2″ depth, whichever is greater. Mulch should be stabilized either by anchoring tools or plastic netting.
2. For slopes 4 to 1 or greater, in ditches or in problem swales, coordinate with the erosion control contractor to ensure proper fabric and/or mats are in place. See the erosion control plans for add’l applications.
3. Maintain mulched areas until grass is mowed. Provide protection against traffic and repair mulched areas when removed or bunched by wind or other causes.
4. Hydro-mulching consisting of wood fiber mulch and soil stabilizing tackifier will be accepted as a no-cost alternate for turf applications if approved by Landscape Architect prior to construction.
5. Hydro-seeding will not be accepted.

E. Cleaning & repair: Waste & excess material shall be promptly removed. Adjacent paved areas are to be cleaned, and any damage to adjacent turf areas shall be repaired as indicated on the landscape plans.
   1. Hydro-mulch overspray residue shall be immediately removed. It shall be the contractor’s sole responsibility to repair or replace any damage to any site elements caused by hydro-mulching overspray.

F. Watering: Seeded areas are to be watered daily to maintain adequate surface soil moisture for proper seed germination. Watering shall continue for not less than 30 days after seeding. Thereafter, apply 1/2" of water twice-weekly until final acceptance, as required in the absence of rain.

3.04 NATIVE SEEDED AREAS

A. Native Seeded Areas are to be prepared, sown, established, maintained and/or otherwise installed according to the establishment procedures specified by the seed source. The Contractor shall provide a detailed outline of the specific installation & establishment processes for review, and shall coordinate with the Owner and Landscape Architect for approval prior to installation. Seed installation processes shall substantially conform to each individual seed supplier’s requirements, typ.

3.05 MAINTENANCE

A. Pre-Maintenance Review:
   Notify Landscape Architect in writing when planting has been substantially completed in order to establish the start of the 52- week maintenance period.

B. Generally: Contractor shall supply a maintenance schedule to the Owner & Landscape Architect for review/approval prior to commencing planting. Contractor shall be responsible for all necessary maintenance equipment, materials, supply and labor to provide required levels of maintenance. Contractor to note pruning and/or shearing requirements in 3.01(G)(2.)

C. Maintenance of Sod: Contractor will be required to furnish and apply sufficient water to keep grass in good growing condition for a period of 52 weeks after planting and shall do all weeding, mowing, trimming, fertilizing & maintenance as required. During maintenance period, re-sod spots larger than 1 sq ft. not having a uniform stand of grass. Mow grass at least twice before acceptance. Grass shall be mown to a height of 3″, but no more than 40% of grass leaf shall be removed in any one cutting. Weed trimmers shall not be used at tree bases.

D. Maintenance of Standard Seeded Areas: Contractor will be required furnish and apply sufficient water to keep grass in good growing condition for a period of 52 weeks after planting and shall do weeding, mowing, trimming, fertilizing & maintenance as required. Repair all erosion damage caused by rain and re-seed areas larger than 12″ dia. where grass population is sparse. Grass shall be mown to a height of 3″, but no more than 40% of grass leaf shall be removed in any one cutting. Weed trimmers shall not be used at tree bases.

E. Maintenance of Native Seed Mixes (No-mow seed mix, channel seed mix, upland seed mix, etc): Maintain seed mixes in good growing condition for a period of two (2) years after seeding. Maintenance procedures shall follow the recommended schedules & tasks as specified by the supplier of the specialty seed mixes. The contractor shall furnish a 24-month maintenance calendar for Owner & LA review prior to seed installation. After each of the first and second years of growth, re-seed areas larger than 12″ dia. where seed population is sparse.

E. Dormant Seeding: No dormant seeding shall be performed unless approved by Landscape Architect prior to commencing work. If dormant seeding is done, or if lawns are planted late in the season and growing season ends prior to the end of the specified maintenance period, continue maintenance into the growing season of the following spring for the balance of the required maintenance period. All other maintenance requirements still apply, and the contractor shall be solely responsible for ensuring proper germination prior to completion of the project.

F. Maintenance of Plantings: Water and maintain all plantings for a period of 52 weeks after planting. Supply & distribution of clean & contaminant-free water for landscape irrigation is the responsibility of the contractor. Unless secured ahead of time through the Owner and/or General Contractor, assume that water will not be available on-site and that a hydrant meter rental & permit may be necessary. Contractor shall be responsible to supply all watering equipment, whether through the use of a tanker truck, hoses, sprinklers or combination thereof. If specified on the landscape plan, the contractor shall supply a temporary irrigation system and operate it as required for the specified duration.

3.06 INSPECTION AND ACCEPTANCE

A. Date of Substantial Completion (DSC): Initial inspection of the substantially completed landscape installation will be made by the Landscape Architect upon written notice requesting such inspection, submitted by Contractor at least five (5) days prior to the anticipated date. Note that the project landscape installation’s DSC will likely vary from the remainder of project’s DSC.
   1. The Landscape Architect will visually inspect the project and note any omissions, errors or deficiencies in the exterior construction.
   2. A written punch list document of pending issues will be drafted and sent to the General Contractor for distribution to the appropriate contractor(s.)
   3. Issues contained in the punch list document will be resolved by the respective contractors within two weeks (14 days) of delivery, unless impossible due to season.
   4. Upon completion of all the punch list items, the Landscape Architect may make a second site inspection to verify that all deficiencies have been corrected. This second inspection may be omitted at the Landscape Architect’s sole discretion.

B. Secondary Inspection of lawns and plantings to determine completion of contract work, exclusive of possible replacement of plants, may be made by Landscape Architect at the conclusion of the 60-day maintenance period upon written notice requesting such inspection, submitted by Contractor at least five (5) days prior to anticipated date. Condition of lawns will be noted and determination made by Landscape Architect whether maintenance shall continue.

C. Final Acceptance: After all inspections, Contractor will be notified in writing by Landscape Architect of acceptance of work of this Section, exclusive of possible replacement of plants subject to guarantee or any specified work which has not been completed which shall be subject to reinspection before acceptance.

* * *

Attachment A

CENTURY CITY
SOIL MANAGEMENT PLAN -
BIOFILTRATION AREA
MARCH 2015

Introduction

This Materials Management Plan (MMP) is based upon previous environmental site assessment work completed at Century City and the planned construction of the bio-filtration area. Site investigation activities conducted at the property have identified the presence of polynuclear aromatic hydrocarbons (PAHs), volatile organic compound (VOC), and metal-related impacts associated with shallow fill material across the site from the ground surface to depths ranging from 4 to 8 feet below ground surface (bgs). Tables of the quality data and a soil boring location map are attached.

Soils excavated for construction will require on-site management. Additionally, any storm water that accumulates during construction work will require proper management and disposal. The intent of this plan is to provide environmental protocols for managing soil excavated during construction, managing and disposing of excess surface water generated during site work, identifying impacted media, and addressing potential contingency situations.

Soil and storm water conditions will be evaluated and managed in accordance with this plan under the direction and guidance of Sigma on behalf of the Owner. Sigma will provide a 40-hour OSHA trained environmental professional on-site during all soil excavation activities. Sigma will screen soils with an organic vapor monitor (OVM) in the field, observe and document any subsurface conditions or areas of known or unknown contamination, monitor soil excavation areas, collect soil samples as needed, oversee the activities and ensure proper execution of this plan, and/or provide on-call services.

Soil Management

To the extent possible excavated soil shall be reused on-site. Excavated soil that cannot be reused within the project area may be stockpiled at the location designated on Drawings.

- Although not anticipated, if soil staining, odors or other indicators of obvious impact are observed the material shall be temporarily stockpiled on-site and the Owner's representative contacted for further evaluation.

- Although not anticipated, unknown underground storage tanks (USTs) may be encountered during excavation activities. If a UST is discovered, work will be stopped in that area, access to the work area will be restricted with caution tape and/or signage, and the general contractor/earthworks contractor shall contact the Owner's representative. The earthworks subcontractor may continue work in another location if feasible.

- Soil excavated for structures may be reused as backfill in the same excavation, pending geotechnical soil qualities and project specifications. If the soil cannot be reused in the same excavation, it shall be stockpiled at the location designated on Drawings.

- Only clean soil material shall be utilized within the top 18 inches of the biofiltration area. Material excavated from the project site is not considered clean for this purpose, so the clean soil material will need to be imported.

Water Management

- Groundwater, perched water or storm water that accumulates in excavations may be discharged to the local sanitary sewer system in accordance with Milwaukee Metropolitan Sewerage District (MMSD) and City of Milwaukee permitting requirements.

  Other water disposal options may be acceptable if performed in accordance with local, state, and/or federal regulations. Alternative water disposal options shall be approved by the Owner prior to implementation.

Attachments

Table 2 - Soil Quality Data
Table 3 - Groundwater Analytical Data
Figure 5 - Soil Quality Map
Figure 5 - Groundwater Quality Map

Table 2
Pre-Remedial Soil Analytical Table
Century City Lot 1 Area A1, Lot 2 Area A2 and B1, Lot 3 Area A
3945 North 31st Street, 2725 and 3055 West Hopkins Street, Milwaukee, Wisconsin
Project Reference 14161

Compound	Units	Groundwater Pathway RCL [4]	Non-Industrial Direct Contact RCL [8]	Industrial Direct Contract RCL [6]	DCD-MW1		DCD-SB2		DCD-SB3		DCD-SB4		DCD-SB5		DCD-SB6		DCD-SB7			DCD-SB8	DCD-SB9		DCD-SB10	
					0-2	14-16	2-4	17-19	1-3	7-9	2-4	11-13	2-4	15-17	2-4	5-7	1-3	9-11	9-11 DUP	5-6	2-4	10-12	2-4	8-10
					10/13/09	10/13/09	9/29/09	9/29/09	9/30/09	9/30/09	9/29/09	9/29/09	9/30/09	9/30/09	9/29/09	9/29/09	9/30/09	9/30/09	9/30/09	10/19/09	9/29/09	9/29/09	9/30/09	9/30/09
RCRA Metals:																								
Aluminum	mg/kg	601.2903	77500	100000	11000	15000	17000	6600	25000	20000	11000	23000	24000	18000	7600	20000	23000	26000	21000	9900	14000	23000	19000	22000
Antimony	mg/kg	0.542	31.3	409	<0.33	<0.33 UJ	0.72 J	0.46 J	0.52 J	0.52 J	0.73 J	1.4	0.75 J	0.5 J	0.81 J	1.7	0.94 J	0.73 J	<0.33	<0.33	0.66 J	1.1 J	0.72 J	0.72 J
Arsenic	mg/kg	0.584	0.39	1.59	[5.7]	[5.2 J]	<0.65	<1.6	<1.6	<1.6	<0.65	<1.6	<1.6	<1.6	0.44 J	<1.6	<0.32	<1.6	<0.65	[1.9]	<1.6	<1.6	<0.32	<1.6
Barium	mg/kg	164.8	15300	100000	59	79 J	140	38	120	98	67	140	120	82	33	94	120	75	52	49	51	120	94	80
Beryllium	mg/kg	6.32	156	2010	0.6	0.79	0.74	0.34	1.7	0.89	0.45	1	1	0.83	0.36	0.85	0.99	1.1	0.97	0.64	0.64	1	0.82	0.96
Cadmium	mg/kg	0.752	70.2	803	0.26 J	0.1 J	0.17 J	0.75	0.27 J	<0.04	0.54	<0.04	<0.04	0.1 J	0.18 J	<0.04	0.2 J	0.07 J	0.13 J	0.28 J	0.069 J	<0.04	<0.04	0.094 J
Calcium	mg/kg	NS	NS	NS	91000	150000	88000	150000	53000	120000	73000	93000	80000	110000	40000	90000	6300	62000	74000	130000	110000	100000	43000	95000
Chromium	mg/kg	360000	NS	NS	13	20	25	9.9	30	31	15	36	34	28	14	29	32	36	30	17	22	36	27	32
Cobalt	mg/kg	3.6239	23.4	304	6	8.3	7.8	5.4	9.9	12	6.9	12	10	7	7.8	17	12	11	9	5.6	7.5	11	7.9	12
Copper	mg/kg	91.6	3130	40900	15	20	19	11	99	24	18	28	24	19	12	22	17	24	26	14	17	27	20	32
Iron	mg/kg	NS	54800	100000	13000	16000	16000	11000	24000	19000	15000	20000	22000	16000	12000	18000	23000	23000	21000	11000	16000	23000	17000	22000
Lead	mg/kg	27	400	800	26	4.9	10	4.7	99	6.1	98	8.4	7.8	7	12	8.7	52	8.5	9.1	9.7	7.6	7.5	19	11 J
Magnesium	mg/kg	NS	NS	NS	33000	53000	38000	57000	36000	37000	33000	34000	38000	38000	20000	33000	7800	34000	35000	62000	38000	36000	26000	36000
Manganese	mg/kg	39.1304	1830	22900	300	460	400	790	340	410	620	410	510	430	540	500	420	360	400	320	430	370	630	460
Mercury	mg/kg	0.208	3.13	3.13	0.01 J	0.015 J	0.058	0.0075 J	0.09	0.017 J	0.065	0.016 J	0.022 J	0.015 J	0.046	0.022 J	0.054	0.019 J	0.018 J	0.0042 J	0.016 J	0.015 J	0.037	0.018 J
Nickel	mg/kg	13.0033	NS	NS	13	21	22	13	29	28	15	29	29	24	16	31	24	34	29	16	22	28	24	32
Potassium	mg/kg	NS	NS	NS	2000	4600	5400	2600	5400	6000	2200	7600	5800	6600	2200	5500	3400	8300	6900	3100	5000	7500	4700	6500
Selenium	mg/kg	0.52	391	5110	<0.32	<0.32	4	1 J	8.8	4.8	2.2	4.6	6.1	4.2	2.8	5	8.9	6	3.6	<0.32	4	5.1	5.2	6.9
Silver	mg/kg	0.8497	391	5110	<0.16	<0.82	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	0.2 J	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16
Sodium	mg/kg	NS	NS	NS	2000	990	970	340	2300	1300	560	750	1000	480	500	700	700	1100	810	540	670	810	1200	1500
Thalium	mg/kg	0.284	0.782	10.2	<2	<2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vanadium	mg/kg	NS	393	5110	22	33	32	16	44	42	28	47	44	37	20	39	48	46	42	23	29	50	38	49
Zinc	mg/kg	NS	23500	100000	46	43	47	190	110	38	180	43	40	66	42	38	55	55	47	29	39	42	38	46
VOCs																								
Benzene	ug/kg	5.5	1490	7410	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20
tert-Butylbenzene	ug/kg	NS	183000	183000	< 23	< 23	< 23	< 23	< 23	< 23	< 23	< 23	< 23	< 23	< 23	< 23	< 23	< 23	< 23	< 23	< 23	< 23	< 23	< 23
sec-Butylbenzene	ug/kg	NS	145000	145000	< 25	< 25	< 25	< 25	< 25	< 25	< 25	< 25	< 25	< 25	< 25	< 25	< 25	< 25	< 25	< 25	< 25	< 25	< 25	< 25
n-Butylbenzene	ug/kg	NS	108000	108000	< 35	< 35	< 35	< 35	< 35	< 35	< 35	< 35	< 35	< 35	< 35	< 35	35 J	< 35	< 35	< 35	< 35	< 35	< 35	< 35
Carbon Tetrachloride	ug/kg	3.9	854	4250	34 J	< 21	< 21	< 21	< 21	< 21	< 21	< 21	< 21	< 21	< 21	< 21	< 21	< 21	< 21	< 21	< 21	< 21	< 21	< 21
1,1-Dichloroethane	ug/kg	483.6	4720	23700	<22	<22	<22	<22	<22	<22	<22	<22	<22	<22	<22	<22	<22	<22	<22	<22	<22	<22	<22	<22
cis-1,2-Dichloroethene	ug/kg	41.2	156000	2040000	<24	<24	<24	<24	<24	<24	<24	<24	<24	<24	<24	<24	<24	<24	<24	<24	<24	<24	<24	<24
trans-1,2 Dichloroethene	ug/kg	58.8	211000	976000	<29	<29	<29	<29	<29	<29	<29	<29	<29	<29	<29	<29	<29	<29	<29	<29	<29	<29	<29	<29
Ethylbenzene	ug/kg	1570	7470	37000	< 16	< 16	< 16	< 16	< 16	< 16	< 16	< 16	< 16	< 16	< 16	< 16	< 16	< 16	< 16	< 16	< 16	< 16	< 16	< 16
Isopropylbenzene	ug/kg	NS	NS	NS	< 30	< 30	< 30	< 30	< 30	< 30	< 30	< 30	< 30	< 30	< 30	< 30	< 30	< 30	< 30	< 30	< 30	< 30	< 30	< 30
p-Isopropyltoluene	ug/kg	NS	162000	162000	< 30	< 30	< 30	< 30	< 30	< 30	< 30	< 30	< 30	< 30	< 30	< 30	< 30	< 30	< 30	< 30	< 30	< 30	< 30	< 30
Naphthalene	ug/kg	658.7	5150	26000	< 117	< 117	< 117	< 117	< 117	< 117	< 117	< 117	< 117	< 117	< 117	< 117	1320	< 117	< 117	< 117	< 117	< 117	< 117	< 117
n-Propylbenzene	ug/kg	NS	264000	264000	< 29	< 29	< 29	< 29	< 29	< 29	< 29	< 29	< 29	< 29	< 29	< 29	< 29	< 29	< 29	< 29	< 29	< 29	< 29	< 29
Toluene	ug/kg	1107.2	818000	818000	< 23	< 23	< 23	< 23	< 23	< 23	< 23	< 23	< 23	< 23	< 23	< 23	26.7 J	< 23	< 23	< 23	< 23	< 23	< 23	< 23
Trichloroethene (TCE)	ug/kg	3.6	644	8810	28.7 J	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20
1,2,4-Trimethylbenzene	ug/kg	1379.3	89800	219000	27 J	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	38 J	< 20	< 20	< 20	< 20	< 20	< 20	< 20
1,3,5-Trimethylbenzene	ug/kg	1379.3	182000	182000	< 24	< 24	< 24	< 24	< 24	< 24	< 24	< 24	< 24	< 24	< 24	< 24	< 24	< 24	< 24	< 24	< 24	< 24	< 24	< 24
Vinyl Chloride	ug/kg	0.1	67	2030	<17	<17	<17	<17	<17	<17	<17	<17	<17	<17	<17	<17	<17	<17	<17	<17	<17	<17	<17	<17
Total Xylenes	ug/kg	3940	258000	258000	26.4 J	<33	<33	<33	<33	<33	<33	<33	<33	<33	<33	<33	81 J	<33	<33	<33	<33	<33	<33	<33
PAHs																								
Acenaphthene	ug/kg	NS	3440000	33000000	< 17	< 17	1230	< 17	248 J	< 17	< 17	< 17	< 17	20 J	109	< 17	1070	< 17	< 17	< 17	< 17	< 170	< 17	< 17
Acenaphthylene	ug/kg	NS	NS	NS	< 12	< 12	672	< 12	< 120	< 12	27 J	24 J	< 12	< 12	395	20 J	355	< 12	< 12	52	18 J	< 120	< 12	< 12
Anthracene	ug/kg	196744.2	17200000	100000000	< 14	< 14	5500	< 14	1400	< 14	60	44	< 14	47	749	55	2230	23 J	17 J	21.1 J	55	< 140	< 14	< 14
Benzo(a)anthracene	ug/kg	NS	148	2110	20.8 J	< 15	[7480]	< 15	[2900]	29 J	101	78	< 15	62	1030	66	[2380]	30 J	16 J	149	99	183 J	43 J	18 J
Benzo(a)pyrene	ug/kg	470	15	211	14.1 J	< 7	[6430]	< 7	[2750]	26	90	71	< 7	53	[783]	47	[1870]	25	14 J	164	74	< 70	44	19 J
Benzo(b)fluoranthene	ug/kg	480	148	2110	23.1 J	< 10	[7500]	< 10	[3260]	31	131	99	< 10	64	978	63	[2750]	41	21 J	212	95	271 J	206	33
Benzo(g,h,i)perylene	ug/kg	NS	NS	NS	< 11	< 11	3620	< 11	1780	19 J	42	33 J	< 11	36	339	21 J	617	14 J	12 J	97	40	121 J	20 J	15 J
Benzo(k)fluoranthene	ug/kg	NS	1480	21100	< 16	< 16	3850	< 16	1600	< 16	44 J	37 J	< 16	31 J	448	24 J	994	16 J	< 16	97	44 J	< 160	29 J	< 16
Chrysene	ug/kg	145.1	14800	211000	20.4 J	< 12	7070	< 12	2830	25 J	108	92	< 12	64	970	69	2580	39	24 J	151	102	196 J	49	26 J
Dibenzo(a,h)anthracene	ug/kg	NS	15	211	< 16	< 16	[1030]	< 16	[430 J]	< 16	< 16	< 16	< 16	< 16	[127]	< 16	[224 J]	< 16	< 16	[30.3 J]	< 16	< 160	< 16	< 16
Fluoranthene	ug/kg	88817.9	2290000	22000000	30.9 J	12.2 J	13300	< 12	1770	60	223	181	13 J	155	1840	142	5070	69	41	172	< 12	272 J	99	29 J
Fluorene	ug/kg	14814.8	2290000	22000000	< 23	< 23	1970	< 23	2930	< 23	38 J	30 J	< 23	27 J	646	32 J	1490	< 23	< 23	< 23	29 J	< 230	< 23	< 23
Indeno(1,2,3-cd)pyrene	ug/kg	NS	148	2110	< 16	< 16	[3930]	< 16	1790	16 J	47 J	37 J	< 16	32 J	400	27 J	738	< 16	< 16	87	< 16	< 160	23 J	< 16
1-Methyl naphthalene	ug/kg	NS	15600	53100	56 J	< 27	< 270	< 27	< 270	< 27	< 27	< 27	< 27	< 27	144	< 27	603	< 27	< 27	< 27	< 27	< 270	< 27	< 27
2-Methyl naphthalene	ug/kg	NS	229000	368000	62	< 17	< 170	< 17	< 170	< 17	< 17	< 17	< 17	< 17	90	< 17	374	< 17	< 17	< 17	< 17	< 170	< 17	< 17
Naphthalene	ug/kg	658.7	5150	26000	35 J	< 13	141 J	< 13	< 130	< 13	< 13	< 13	< 13	< 13	202	< 13	628	< 13	< 13	< 13	< 13	< 130	< 13	< 13
Phenanthrene	ug/kg	NS	NS	NS	51	< 9	9950	18.7 J	2250	35	190	139	11 J	143	1820	134	5150	70	52	33	179	< 90	62	< 9
Pyrene	ug/kg	54472.5	1720000	16500000	29.8 J	< 15	11540	< 15	1200	55	185	140	< 15	134	1570	104	4510	55	33 J	175	< 15	238 J	84	28 J
Additional SVOCs																								
2,4-Dimethylphenol	ug/kg	NS	1220000	12300000	< 13	< 13	< 130	< 13	< 130	< 13	< 13	< 13	< 13	< 13	< 13	< 13	< 65	< 13	< 13	< 13	< 13	< 130	< 13	< 13
Bis(2-	ug/kg	NS	183000	1850000	< 14	< 14	< 140	< 14	< 140	< 14	< 14	< 14	< 14	< 14	< 14	< 14	< 70	< 14	< 14	< 14	< 14	< 140	< 14	< 14
Dibenzofuran	ug/kg	NS	78200	1020000	16.4 J	< 15	1350	< 15	492	< 15	23 J	16 J	< 15	16 J	342	15 J	1210	< 15	< 15	< 15	< 15	< 150	< 15	< 15
Diphenylamine	ug/kg	NS	1530000	15400000	< 21	< 21	< 210	< 21	< 210	< 21	< 21	< 21	< 21	< 21	37 J	< 21	< 105	< 21	< 21	< 21	< 21	< 210	< 21	< 21
Isophorone	ug/kg	NS	512000	1810000	< 13	< 13	< 130	< 13	< 130	< 13	< 13	< 13	< 13	< 13	< 13	< 13	< 65	< 13	< 13	< 13	< 13	< 130	< 13	< 13
Phenol	ug/kg	2299.8	18300000	100000000	< 9	< 9	< 90	< 9	< 90	< 9	< 9	< 9	< 9	< 9	< 9	< 9	< 45	< 9	< 9	< 9	< 9	< 90	< 9	< 9
PCBs:																								
PCB 1254	mg/kg	NS	0.222	0.744	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.00376	NA	NA	NA	NA
Petroleum Hydrocarbons:																								
Diesel Range Organics	mg/kg	NS	NS	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Table 2
Pre-Remedial Soil Analytical Table
Century City Lot 1 Area A1, Lot 2 Area A2 and B1, Lot 3 Area A
3945 North 31st Street, 2725 and 3055 West Hopkins Street, Milwaukee, Wisconsin
Project Reference 14161

Compound	Units	Groundwater Pathway RCL [4]	Non-Industrial Direct Contact RCL [8]	Industrial Direct Contract RCL [6]	DCD-SB11		DCD-SB12		DCD-SB13A	DCD-SB13B	DCD-SB14		DCD-SB15		DCD-SB16			DCD-SB17		DCD-SB18		DCD-SB20
					2-4	7-9	0-2	7-9	9-10	7-8	2-4	5-7	1-3	8-10	2-4	2-4 DUP	6-8	1-3	5-7	1-3	8-10	4-5
					9/29/09	9/29/09	9/30/09	9/30/09	10/19/09	10/20/09	10/7/09	10/7/09	10/7/09	10/7/09	10/7/09	10/7/09	10/7/09	10/7/09	10/7/09	10/7/09	10/7/09	10/16/09
RCRA Metals:																						
Aluminum	mg/kg	601.2903	77500	100000	12000	16000	16000	21000	12000	3500	20000	20000	11000	14000	17000	16000	20000	3300	20000	7800	5800	12000
Antimony	mg/kg	0.542	31.3	409	1.3	0.96 J	<0.33	1.4	<0.33	<0.33	2.2	1.4	<0.33	0.86 J	1.3	1.3 J	0.58 J	<0.33	2.3	<0.33	<0.33	<0.33
Arsenic	mg/kg	0.584	0.39	1.59	[4.2]	<1.6	<1.6	<1.6	[3.7]	[6.7]	[14]	<3.2	<1.6	<1.6	[2.3]	<0.32	<1.6	<1.6	<0.32	<1.6	<1.6	[5.8]
Barium	mg/kg	164.8	15300	100000	92	73	96	110	58	110	180	75	62	64	65	65	80	21	3200	29	28	66
Beryllium	mg/kg	6.32	156	2010	0.56	0.69	0.69	0.86	0.84	0.26	3.3	0.94	0.53	0.63	0.72	0.81	0.87	0.19	0.84	0.35	0.25	0.69
Cadmium	mg/kg	0.752	70.2	803	0.35	<0.04	0.48	<0.04	0.46	0.49	0.68	0.18 J	0.22 J	0.26 J	0.61	0.38	0.24 J	0.33	0.57	0.24 J	0.21 J	0.39
Calcium	mg/kg	NS	NS	NS	52000	110000	140000	55000	33000	120000	49000	62000	16000	100000	33000	23000	92000	130000	40000	82000	110000	89000
Chromium	mg/kg	360000	NS	NS	19	24	25	29	23	5.9	27	31	17	20	40	26	29	5.7	33	12	11	18
Cobalt	mg/kg	3.6239	23.4	304	8	6.7	8.9	11	14	2.6	11	11	9.6	7.6	9.7	10	9.5	5.1	11	5	14	8.4
Copper	mg/kg	91.6	3130	40900	22	17	30	25	18	8.7	34	22	11	22	54 J	32 J	21	12	29	20	18	22
Iron	mg/kg	NS	54800	100000	23000	14000	21000	19000	18000	7300	20000	21000	16000	16000	34000	22000	20000	8600	27000	12000	8800	15000
Lead	mg/kg	27	400	800	22	5.3	120	7.8	16	200	49	7.8	11	8	31 J	15 J	7.8	12	170	5.4	3.8	64
Magnesium	mg/kg	NS	NS	NS	28000	39000	48000	28000	16000	33000	20000	38000	7200	39000	20000	13000	34000	62000	22000	33000	40000	40000
Manganese	mg/kg	39.1304	1830	22900	450	360	760	340	470	500	410	520	330	390	640	660	420	510	650	350	300	400
Mercury	mg/kg	0.208	3.13	3.13	0.095	0.021 J	0.086	0.02 J	0.03	0.086	0.065	0.025	0.032	0.016 J	0.037	0.065	0.012 J	0.017 J	0.17	0.0069 J	0.0073 J	0.063
Nickel	mg/kg	13.0033	NS	NS	21	19	23	28	30	6.3	35	29	18	21	27	27	26	8.3	28	13	9.4	17
Potassium	mg/kg	NS	NS	NS	2700	4500	4600	6400	2200	1200	4100	4600	1400	3600	3200	3200	6000	900	4400	2100	1600	3500
Selenium	mg/kg	0.52	391	5110	7.7	3.2	4.9	5.4	<0.32	<0.32	4.8	2.8	4.4	2.1	8.7	5.7	2.8	<0.32	6.5	0.51 J	<0.32	<0.32
Silver	mg/kg	0.8497	391	5110	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	0.31 J	<0.16	0.34 J	<0.16	<0.16	<0.16	0.43 J	<0.16	<0.16	<0.16
Sodium	mg/kg	NS	NS	NS	730	510	780	1000	840	920	1900	860	1100	690	1900	2200	1600	620	1600	600	510	480
Thalium	mg/kg	0.284	0.782	10.2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.4
Vanadium	mg/kg	NS	393	5110	29	33	42	40	35	9.4	52	36	33	28	41	43	38	11	35	21	16	27
Zinc	mg/kg	NS	23500	100000	77	33	160	41	87	110	74	46	40	36	74	54	43	60	150	48	40	80
VOCs																						
Benzene	ug/kg	5.5	1490	7410	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20
tert-Butylbenzene	ug/kg	NS	183000	183000	< 23	< 23	< 23	< 23	< 23	67 J	< 23	< 23	< 23	< 23	< 23	< 23	< 23	56 J	114	< 23	< 23	< 23
sec-Butylbenzene	ug/kg	NS	145000	145000	< 25	< 25	< 25	< 25	< 25	380	< 25	< 25	< 25	< 25	< 25	31.4 J	< 25	560	1320	< 25	< 25	< 25
n-Butylbenzene	ug/kg	NS	108000	108000	< 35	< 35	< 35	< 35	< 35	226	< 35	< 35	< 35	< 35	< 35	114	< 35	330	360	< 35	< 35	< 35
Carbon Tetrachloride	ug/kg	3.9	854	4250	< 21	< 21	< 21	< 21	< 21	< 21	< 21	< 21	< 21	< 21	< 21	< 21	< 21	< 21	< 21	< 21	< 21	< 21
1,1-Dichloroethane	ug/kg	483.6	4720	23700	<22	<22	<22	<22	<22	<22	<22	<22	<22	<22	<22	<22	<22	<22	<22	<22	<22	<22
cis-1,2-Dichloroethene	ug/kg	41.2	156000	2040000	<24	<24	<24	<24	<24	<24	<24	<24	<24	<24	<24	<24	<24	<24	<24	<24	<24	<24
trans-1,2 Dichloroethene	ug/kg	58.8	211000	976000	<29	<29	<29	<29	<29	<29	<29	<29	<29	<29	<29	<29	<29	<29	<29	<29	<29	<29
Ethylbenzene	ug/kg	1570	7470	37000	< 16	< 16	< 16	< 16	< 16	< 16	< 16	< 16	< 16	< 16	< 16	< 16	< 16	< 16	17.4 J	< 16	< 16	< 16
Isopropylbenzene	ug/kg	NS	NS	NS	< 30	< 30	< 30	< 30	< 30	380	< 30	< 30	< 30	< 30	< 30	< 30	< 30	290	1020	< 30	< 30	< 30
p-Isopropyltoluene	ug/kg	NS	162000	162000	< 30	< 30	< 30	< 30	< 30	96	< 30	< 30	< 30	< 30	< 30	< 30	< 30	34 J	58 J	< 30	< 30	< 30
Naphthalene	ug/kg	658.7	5150	26000	< 117	< 117	< 117	< 117	< 117	254 J	< 117	< 117	< 117	< 117	< 117	200 J	< 117	153 J	122 J	< 117	< 117	< 117
n-Propylbenzene	ug/kg	NS	264000	264000	< 29	< 29	< 29	< 29	< 29	500	< 29	< 29	< 29	< 29	< 29	< 29	< 29	520	1840	< 29	< 29	< 29
Toluene	ug/kg	1107.2	818000	818000	42 J	< 23	< 23	< 23	< 23	< 23	< 23	< 23	30.8 J	< 23	< 23	< 23	< 23	< 23	23.6 J	< 23	< 23	< 23
Trichloroethene (TCE)	ug/kg	3.6	644	8810	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20
1,2,4-Trimethylbenzene	ug/kg	1379.3	89800	219000	< 20	< 20	< 20	< 20	< 20	102	< 20	< 20	34 J	< 20	< 20	48 J	< 20	155	150	< 20	< 20	< 20
1,3,5-Trimethylbenzene	ug/kg	1379.3	182000	182000	< 24	< 24	< 24	< 24	< 24	< 24	< 24	< 24	< 24	< 24	< 24	< 24	< 24	< 24	< 24	< 24	< 24	< 24
Vinyl Chloride	ug/kg	0.1	67	2030	<17	<17	<17	<17	<17	<17	<17	<17	<17	<17	<17	<17	<17	<17	<17	<17	<17	<17
Total Xylenes	ug/kg	3940	258000	258000	<33	<33	<33	<33	<33	<33	<33	<33	95 J	<33	<33	<33	<33	16.8 J	38 J	<33	<33	<33
PAHs																						
Acenaphthene	ug/kg	NS	3440000	33000000	149	18 J	< 850	< 17	< 170	271 J	< 17	< 17	< 17	< 17	< 170	< 170	< 17	< 340	< 170	< 17	< 17	< 17
Acenaphthylene	ug/kg	NS	NS	NS	74.3	27 J	1720 J	< 12	< 120	< 120	< 12	< 12	16.6 J	< 12	< 120	< 120	< 12	< 240	< 120	< 12	< 12	< 12
Anthracene	ug/kg	196744.2	17200000	100000000	490	68	1940 J	< 14	< 140	< 140	< 14	< 14	42 J	< 14	< 140	< 140	< 14	< 280	147 J	< 14	< 14	26.8 J
Benzo(a)anthracene	ug/kg	NS	148	2110	770	114	[7500]	18 J	< 150	241 J	< 15	< 15	60	< 15	< 150	620	< 15	< 300	< 150	< 15	< 15	123
Benzo(a)pyrene	ug/kg	470	15	211	[605]	115	[6850]	18 J	< 70	[228 J]	< 7	< 7	49	< 7	< 70	[670]	< 7	< 140	< 70	7.9 J	10.1 J	108
Benzo(b)fluoranthene	ug/kg	480	148	2110	736	143	[9930]	26 J	< 100	289 J	< 10	< 10	66	< 10	< 100	990	< 10	< 200	< 100	10.8 J	15.7 J	148
Benzo(g,h,i)perylene	ug/kg	NS	NS	NS	285	57	2660	< 11	< 110	< 110	< 11	< 11	47	< 11	< 110	480	< 11	< 220	< 110	< 11	< 11	92
Benzo(k)fluoranthene	ug/kg	NS	1480	21100	307	60	3240	< 16	< 160	194 J	< 16	< 16	28.5 J	< 16	< 160	370 J	< 16	< 320	< 160	< 16	< 16	56
Chrysene	ug/kg	145.1	14800	211000	739	132	7570	21 J	< 120	350 J	< 12	< 12	61	< 12	< 120	650	< 12	< 240	< 120	< 12	< 12	117
Dibenzo(a,h)anthracene	ug/kg	NS	15	211	83	18 J	933 J	< 16	< 160	< 160	< 16	< 16	< 16	< 16	< 160	< 160	< 16	< 320	< 160	< 16	< 16	20.2 J
Fluoranthene	ug/kg	88817.9	2290000	22000000	22 J	237	12700	35 J	< 120	680	< 12	< 12	99	< 12	< 120	1230	< 12	< 240	360 J	14.7 J	23.6 J	211
Fluorene	ug/kg	14814.8	2290000	22000000	279	37 J	< 1150	< 23	< 230	284 J	< 23	< 23	< 23	< 23	< 230	< 230	< 23	< 460	< 230	< 23	< 23	< 23
Indeno(1,2,3-cd)pyrene	ug/kg	NS	148	2110	321	62	3130	< 16	< 160	< 160	< 16	< 16	32 J	< 16	< 160	380 J	< 16	< 320	< 160	< 16	< 16	55
1-Methyl naphthalene	ug/kg	NS	15600	53100	86.4	< 27	< 1350	< 27	< 270	460 J	< 27	< 27	130	< 27	< 270	< 270	< 27	< 540	< 270	< 27	< 27	< 27
2-Methyl naphthalene	ug/kg	NS	229000	368000	71.5	< 17	< 850	< 17	< 170	276 J	< 17	< 17	169	< 17	< 170	600	< 17	< 340	< 170	< 17	< 17	< 17
Naphthalene	ug/kg	658.7	5150	26000	65.6	< 13	< 650	< 13	< 130	530	< 13	< 13	103	< 13	< 130	580	< 13	< 260	< 130	< 13	< 13	< 13
Phenanthrene	ug/kg	NS	NS	NS	1120	167	3330	17 J	< 90	1140	< 9	< 9	133	< 9	< 90	410	< 9	< 180	690	< 9	15.7 J	100
Pyrene	ug/kg	54472.5	1720000	16500000	30 J	195	11300	31 J	< 150	570	< 15	< 15	117	< 15	< 150	1330	< 15	< 300	310 J	< 15	21.3 J	196
Additional SVOCs																						
2,4-Dimethylphenol	ug/kg	NS	1220000	12300000	< 13	< 13	< 650	< 13	< 130	440	< 13	< 13	< 13	< 13	< 130	< 130	< 13	< 260	142 J	< 13	< 13	< 13
Bis(2-chloroethoxy)methan	ug/kg	NS	183000	1850000	< 14	< 14	< 700	< 14	< 140	< 140	< 14	< 14	< 14	< 14	233 J	< 140	< 14	< 280	< 140	< 14	< 14	< 14
Dibenzofuran	ug/kg	NS	78200	1020000	145	17 J	< 750	< 15	< 150	181 J	< 15	< 15	26.9 J	< 15	< 150	< 150	< 15	< 300	< 150	< 15	< 15	< 15
Diphenylamine	ug/kg	NS	1530000	15400000	< 21	< 21	< 1050	< 21	< 210	< 210	< 21	< 21	< 21	< 21	< 210	< 210	< 21	< 420	< 210	< 21	< 21	< 21
Isophorone	ug/kg	NS	512000	1810000	< 13	< 13	< 650	< 13	< 130	< 130	< 13	< 13	< 13	< 13	< 130	242 J	< 13	< 260	< 130	< 13	< 13	< 13
Phenol	ug/kg	2299.8	18300000	100000000	< 9	< 9	< 450	< 9	< 90	90 J	< 9	< 9	< 9	< 9	< 90	< 90	< 9	< 180	< 90	< 9	< 9	< 9
PCBs:																						
PCB 1254	mg/kg	NS	0.222	0.744	NA	NA	NA	NA	<0.00376	<0.00376	<0.00376	<0.00376	0.025	<0.00376	NA	NA	NA	<0.00376	<0.00376	NA	NA	<0.00376
Petroleun Hydrocarbons:																						
Diesel Range Organics	mg/kg	NS	NS	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Table 2
Pre-Remedial Soil Analytical Table
Century City Lot 1 Area A1, Lot 2 Area A2 and B1, Lot 3 Area A
3945 North 31st Street, 2725 and 3055 West Hopkins Street, Milwaukee, Wisconsin
Project Reference 14161

Compound	Units	Groundwater Pathway RCL [4]	Non-Industrial Direct Contact RCL [8]	Industrial Direct Contract RCL [6]	DCD-SB21		DCD-SB22		DCD-SB24		DCD-SB25		DCD-SB27		DCD-SB236		DCD-SB237	
					1-3	6-8	1-3	8-10	1-2	11-13	3-4	12-14	1-2	12-14	1-3	4-5	2-4	4-6
					10/7/09	10/7/09	10/7/09	10/7/09	10/7/09	10/7/09	10/8/09	10/15/09	10/8/09	10/15/09	3/17/10	3/17/10	3/17/10	3/17/10
Metals:																		
Aluminum	mg/kg	601.2903	77500	100000	7000	25000	7000	23000	4400	5000	2800	17000	3600	7000	NA	NA	NA	NA
Antimony	mg/kg	0.542	31.3	409	0.44 J	0.52 J	<0.33	1.7	0.52 J	2 J	<0.33	<0.33	0.65 J	<0.33	NA	NA	NA	NA
Arsenic	mg/kg	0.584	0.39	1.59	[14]	<1.6	<1.6	<1.6	<1.6	<1.6	<1.6	[2.9]	1.5	[3.4]	[16]	[2.7]	[5.5]	[8.7]
Barium	mg/kg	164.8	15300	100000	67	140	91	89	21	46	11	84	18	40	140	29	120	160
Beryllium	mg/kg	6.32	156	2010	0.6	1	0.29	0.97	0.2	0.26	0.061 J	0.96	0.12	0.53	NA	NA	NA	NA
Cadmium	mg/kg	0.752	70.2	803	0.64	0.27 J	0.28 J	0.27 J	0.18 J	0.33	0.047 J	0.25 J	<0.04	0.35	4	0.18 J	0.27 J	<0.04
Calcium	mg/kg	NS	NS	NS	92000	66000	110000	62000	110000	110000	110000	110000	120000	120000	NA	NA	NA	NA
Chromium	mg/kg	360000	NS	NS	11	36	10	33	7	16	4.7	24	6	11	49	8.5	25	39
Cobalt	mg/kg	3.6239	23.4	304	8	11	3.7	14	2.9	3.8	2	13	4.7	6.9	NA	NA	NA	NA
Copper	mg/kg	91.6	3130	40900	21	31	14	31	9.1	31	6.3	23	12	15	NA	NA	NA	NA
Iron	mg/kg	NS	54800	100000	17000	25000	12000	24000	7000	13000	5000	18000	6300	12000	NA	NA	NA	NA
Lead	mg/kg	27	400	800	37	8.9	31	11	1.9	57 J	2.2	8.9	4.2 J	5.7	260	41	27	19
Magnesium	mg/kg	NS	NS	NS	24000	36000	30000	33000	63000	55000	48000	38000	44000	58000	NA	NA	NA	NA
Manganese	mg/kg	39.1304	1830	22900	310	450	240	640	210	320	210	550	220	700	NA	NA	NA	NA
Mercury	mg/kg	0.208	3.13	3.13	0.044	0.021 J	0.023	0.027	0.011 J	0.059	0.011 J	0.017 J	0.0057 J	0.0067 J	0.077	0.0049 J	0.039	0.036
Nickel	mg/kg	13.0033	NS	NS	13	31	6.8	34	6.5	11	5.4	29	6.4	17	NA	NA	NA	NA
Potassium	mg/kg	NS	NS	NS	1200	6200	1300	5900	950	1100 J	900	4900	1000	2400	NA	NA	NA	NA
Selenium	mg/kg	0.52	391	5110	2	4.3	0.57 J	4.6	<0.32	1.4	<0.32	<0.32	<0.32	<0.32	<3.2	<1.6	<1.6	<1.6
Silver	mg/kg	0.8497	391	5110	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	<0.33	<0.16	<0.16	<0.16
Sodium	mg/kg	NS	NS	NS	860	1200	840	1300	360	410	260	710	360	590	NA	NA	NA	NA
Thalium	mg/kg	0.284	0.782	10.2	<2	<2	<2	<2	<20	<20	<0.4	<2	<0.4	<0.4	NA	NA	NA	NA
Vanadium	mg/kg	NS	393	5110	19	48	14	51	15	17	10	38	14	19	NA	NA	NA	NA
Zinc	mg/kg	NS	23500	100000	200	50	66	51	14	74	23	56	30	45	NA	NA	NA	NA
VOCs																		
Benzene	ug/kg	5.5	1490	7410	42 J	< 20	< 20	< 20	<20	<20	<20	<20	<20	<20	<35	<35	<35	<35
tert-Butylbenzene	ug/kg	NS	183000	183000	< 23	< 23	< 23	< 23	< 23	< 23	< 23	< 23	< 23	< 23	<41	<41	<41	<41
sec-Butylbenzene	ug/kg	NS	145000	145000	52 J	< 25	< 25	< 25	<25	<25	<25	<25	<25	<25	<35	<35	<35	<35
n-Butylbenzene	ug/kg	NS	108000	108000	153	< 35	< 35	< 35	<35	<35	<35	<35	<35	<35	<46	<46	<46	<46
Carbon Tetrachloride	ug/kg	3.9	854	4250	< 21	< 21	< 21	< 21	<21	<21	<21	<21	<21	<21	<28	<28	<28	<28
1,1-Dichloroethane	ug/kg	483.6	4720	23700	<22	<22	<22	<22	<22	<22	<22	<22	<22	<22	<45	53 J	125 J	<45
cis-1,2-Dichloroethene	ug/kg	41.2	156000	2040000	<24	<24	<24	<24	<24	<24	<24	330	<24	<24	510	2690	<44	<44
trans-1,2 Dichloroethene	ug/kg	58.8	211000	976000	<29	<29	<29	<29	<29	<29	<29	<29	<29	<29	<43	350	<43	<43
Ethylbenzene	ug/kg	1570	7470	37000	173	< 16	< 16	< 16	<16	37 J	<16	<16	<16	<16	<56	<56	<56	<56
Isopropylbenzene	ug/kg	NS	NS	NS	94 J	< 30	< 30	< 30	<30	<30	<30	<30	<30	<30	<39	<39	<39	<39
p-Isopropyltoluene	ug/kg	NS	162000	162000	71 J	< 30	< 30	< 30	<30	<30	<30	<30	<30	<30	<43	<43	<43	<43
Naphthalene	ug/kg	658.7	5150	26000	490	< 117	< 117	< 117	<117	<117	<117	<117	<117	<117	<53	60 J	<53	<53
n-Propylbenzene	ug/kg	NS	264000	264000	104	< 29	< 29	< 29	<29	<29	<29	<29	<29	<29	<44	<44	<44	<44
Toluene	ug/kg	1107.2	818000	818000	188	< 23	28.9 J	< 23	<23	<23	<23	<23	<23	<23	<51	71 J	<51	<51
Trichloroethene (TCE)	ug/kg	3.6	644	8810	< 20	< 20	< 20	< 20	<29	<29	<29	<29	<20	<20	[3400]	[4400]	<50	<50
1,2,4-Trimethylbenzene	ug/kg	1379.3	89800	219000	400	< 20	< 20	< 20	<20	23.3 J	<20	<20	<20	<20	<73	<73	<73	<73
1,3,5-Trimethylbenzene	ug/kg	1379.3	182000	182000	232	< 24	< 24	< 24	<24	<24	<24	<24	<24	<24	<57	<57	<57	<57
Vinyl Chloride	ug/kg	0.1	67	2030	<17	<17	<17	<17	<17	<17	<17	27.7 J	<17	<17	<33	<33	<33	<33
Total Xylenes	ug/kg	3940	258000	258000	585	<33	50.7 J	<33	<33	140 J	<33	<33	<33	<33	<73	<73	<73	<73
PAHs																		
Acenaphthene	ug/kg	NS	3440000	33000000	171 J	< 17	< 170	< 17	<17	154 J	<17	<17	<17	<17	16.4 J	16.9 J	<15.2	<15.2
Acenaphthylene	ug/kg	NS	NS	NS	< 60	< 12	155 J	< 12	<12	<60	<12	25.4 J	<12	<12	73	269	8.2 J	7.2 J
Anthracene	ug/kg	196744.2	17200000	100000000	650	< 14	167 J	< 14	<14	380	<14	27 J	<14	<14	110	126	<6.4	<6.4
Benzo(a)anthracene	ug/kg	NS	148	2110	1530	< 15	960	< 15	<15	1470	<15	23.1 J	<15	<15	279	231	17.7 J	<12.9
Benzo(a)pyrene	ug/kg	470	15	211	[1200]	< 7	[950]	< 7	<7	[950]	<7	10.4 J	<7	<7	[234]	[252]	10.7 J	<4.7
Benzo(b)fluoranthene	ug/kg	480	148	2110	1590	< 10	1260	< 10	<10	1310	<10	13.9 J	<10	<10	340	255	16.3 J	<6.5
Benzo(g,h,i)perylene	ug/kg	NS	NS	NS	750	< 11	720	< 11	<11	460	<11	<11	<11	<11	173	132	8 J	<7.7
Benzo(k)fluoranthene	ug/kg	NS	1480	21100	690	< 16	560	< 16	<16	550	<16	<16	<16	<16	112	95	<9.8	<9.8
Chrysene	ug/kg	145.1	14800	211000	1430	< 12	950	< 12	<12	1410	<12	12.7 J	<12	<12	264	236	12.2 J	<8.9
Dibenzo(a,h)anthracene	ug/kg	NS	15	211	191 J	< 16	< 160	< 16	<16	147 J	<16	<16	<16	<16	39	34	<5.5	<5.5
Fluoranthene	ug/kg	88817.9	2290000	22000000	3200	< 12	1850	< 12	<12	2960	<12	<30.1 U	<12	<12	540	287	21.6 J	<9.2
Fluorene	ug/kg	14814.8	2290000	22000000	175 J	< 23	< 230	< 23	<23	<115	<23	40 J	<23	<23	53	30.3	<5.6	<5.6
Indeno(1,2,3-cd)pyrene	ug/kg	NS	148	2110	630	< 16	540	< 16	<16	440	<16	<16	<16	<16	147	107	<7.8	<7.8
1-Methyl naphthalene	ug/kg	NS	15600	53100	< 135	< 27	< 270	< 27	<27	<135	<27	31.2 J	<27	<27	71	211	<15	<15
2-Methyl naphthalene	ug/kg	NS	229000	368000	117 J	< 17	< 170	< 17	<17	<85	<17	44 J	<17	<17	97	218	<9.7	<9.6
Naphthalene	ug/kg	658.7	5150	26000	101 J	< 13	< 130	< 13	<13	<65	<13	24.3 J	<13	<13	55	108	<16.2	<16.2
Phenanthrene	ug/kg	NS	NS	NS	2110	< 9	480	< 9	<9	520	<9	60	<9	<9	400	257	13.6 J	<10.6
Pyrene	ug/kg	54472.5	1720000	16500000	2760	< 15	1590	< 15	<15	2440	<15	21.2 J	<15	<15	450	420	17.6 J	<7.7
Additional SVOCs																		
2,4-Dimethylphenol	ug/kg	NS	1220000	12300000	< 65	< 13	< 130	< 13	<13	<65	<13	<13	<13	<13	NA	NA	NA	NA
Bis(2-chloroethoxy)methan	ug/kg	NS	183000	1850000	< 70	< 14	< 140	< 14	< 14	<70	< 14	< 14	< 14	< 14	NA	NA	NA	NA
Dibenzofuran	ug/kg	NS	78200	1020000	78 J	< 15	< 150	< 15	<15	<75	<15	15 J	<15	<15	NA	NA	NA	NA
Diphenylamine	ug/kg	NS	1530000	15400000	< 105	< 21	< 210	< 21	< 21	<105	< 21	< 21	< 21	< 21	NA	NA	NA	NA
Isophorone	ug/kg	NS	512000	1810000	< 65	< 13	< 130	< 13	< 13	<65	< 13	< 13	< 13	< 13	NA	NA	NA	NA
Phenol	ug/kg	2299.8	18300000	100000000	< 45	< 9	< 90	< 9	<9	<45	<9	<9	<9	<9	NA	NA	NA	NA
PCBs:																		
PCB 1254	mg/kg	NS	0.222	0.744	NA	<0.00376	<0.00376	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Petroleun Hydrocarbons:																		
Diesel Range Organics	mg/kg	NS	NS	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	216	154	35.5	18.6

Table 2
Pre-Remedial Soil Analytical Table
Century City Lot 1 Area A1, Lot 2 Area A2 and B1, Lot 3 Area A
3945 North 31st Street, 2725 and 3055 West Hopkins Street, Milwaukee, Wisconsin
Project Reference 14161

Compound	Units	Groundwater Pathway RCL [4]	Non-Industrial Direct Contact RCL [8]	Industrial Direct Contract RCL [6]	DCD-SB241			DCD-SB242		DCD-SB243		DCD-SB247		DCD-SB248		DCD-SB249	DCD-SB250	
					1-3	1-3 DUP	4-6	1-3	4-6	1-2	5-7	1-3	8-10	1-3	4-6	1-3	1-3	4-6
					3/17/10	3/17/10	3/17/10	3/17/10	3/17/10	3/16/10	3/16/10	3/16/10	3/16/10	3/12/10	3/12/10	3/12/10	3/12/10	3/12/10
Metals:																		
Aluminum	mg/kg	601.2903	77500	100000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Antimony	mg/kg	0.542	31.3	409	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic	mg/kg	0.584	0.39	1.59	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Barium	mg/kg	164.8	15300	100000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Beryllium	mg/kg	6.32	156	2010	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	mg/kg	0.752	70.2	803	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Calcium	mg/kg	NS	NS	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	mg/kg	360000	NS	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cobalt	mg/kg	3.6239	23.4	304	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper	mg/kg	91.6	3130	40900	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Iron	mg/kg	NS	54800	100000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead	mg/kg	27	400	800	7.1	5.9	74	45	[2300]	12	21	89	4.9	8.8	66	320	NA	NA
Magnesium	mg/kg	NS	NS	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese	mg/kg	39.1304	1830	22900	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mercury	mg/kg	0.208	3.13	3.13	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	mg/kg	13.0033	NS	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Potassium	mg/kg	NS	NS	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Selenium	mg/kg	0.52	391	5110	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Silver	mg/kg	0.8497	391	5110	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sodium	mg/kg	NS	NS	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Thalium	mg/kg	0.284	0.782	10.2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vanadium	mg/kg	NS	393	5110	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	mg/kg	NS	23500	100000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
VOCs																		
Benzene	ug/kg	5.5	1490	7410	<35	<35	<35	<35	<35	< 35	< 35	< 35	< 35	< 35	< 35	NA	< 35	< 35
tert-Butylbenzene	ug/kg	NS	183000	183000	<41	<41	<41	<41	<41	<41	<41	<41	<41	< 41	< 41	NA	< 41	< 41
sec-Butylbenzene	ug/kg	NS	145000	145000	<35	<35	<35	<35	<35	< 35	< 35	<35	<35	< 35	< 35	NA	< 35	< 35
n-Butylbenzene	ug/kg	NS	108000	108000	<46	<46	<46	<46	<46	< 46	< 46	<46	<46	< 46	< 46	NA	< 46	< 46
Carbon Tetrachloride	ug/kg	3.9	854	4250	<28	<28	<28	<28	<28	< 28	< 28	<28	<28	< 28	175	NA	< 28	< 28
1,1-Dichloroethane	ug/kg	483.6	4720	23700	<45	<45	<45	<45	<45	<45	<45	<45	<45	<45	<45	NA	<45	<45
cis-1,2-Dichloroethene	ug/kg	41.2	156000	2040000	<44	<44	<44	<44	370	<44	<44	<44	<44	<44	<44	NA	<44	<44
trans-1,2 Dichloroethene	ug/kg	58.8	211000	976000	<43	<43	<43	<43	243	<43	<43	<43	<43	<43	<43	NA	<43	<43
Ethylbenzene	ug/kg	1570	7470	37000	<56	<56	<56	<56	<56	< 56	< 56	62 J	<56	< 56	< 56	NA	< 56	< 56
Isopropylbenzene	ug/kg	NS	NS	NS	<39	<39	<39	<39	<39	< 39	< 39	<39	<39	< 39	< 39	NA	< 39	< 39
p-Isopropyltoluene	ug/kg	NS	162000	162000	<43	<43	67 J	<43	<43	< 43	< 43	<43	<43	< 43	< 43	NA	< 43	< 43
Naphthalene	ug/kg	658.7	5150	26000	<53	<53	1840	<53	97 J	< 53	< 53	289	<53	< 53	136 J	NA	< 53	< 53
n-Propylbenzene	ug/kg	NS	264000	264000	<44	<44	<44	<44	<44	< 44	< 44	51 J	<44	< 44	< 44	NA	< 44	< 44
Toluene	ug/kg	1107.2	818000	818000	<51	<51	<51	<51	<51	< 51	< 51	<51	<51	< 51	81 J	NA	< 51	< 51
Trichloroethene (TCE)	ug/kg	3.6	644	8810	<50	<50	<50	1350	166	< 50	< 50	<50	<50	< 50	< 50	NA	< 50	< 50
1,2,4-Trimethylbenzene	ug/kg	1379.3	89800	219000	<73	<73	133 J	<73	<73	< 73	< 73	239	<73	< 73	< 73	NA	< 73	< 73
1,3,5-Trimethylbenzene	ug/kg	1379.3	182000	182000	<57	<57	57 J	<57	<57	< 57	< 57	82 J	<57	< 57	< 57	NA	< 57	< 57
Vinyl Chloride	ug/kg	0.1	67	2030	<33	<33	<33	<33	340	<33	<33	<33	<33	<33	<33	<33	<33	<33
Total Xylenes	ug/kg	3940	258000	258000	<73	<73	<73	<73	<73	<73	<73	<73	<73	<73	208	NA	<73	<73
PAHs																		
Acenaphthene	ug/kg	NS	3440000	33000000	<15.2	<15.2	14000	<15.2	288	< 15.2	< 15.2	33 J	91	< 15.2	28 J	< 15.2	< 15.2	< 15.2
Acenaphthylene	ug/kg	NS	NS	NS	<5.1	8.5 J	5800	29.1	1400	5.8 J	< 5.1	36	40	< 5.1	18.9	96	< 5.1	< 5.1
Anthracene	ug/kg	196744.2	17200000	100000000	<6.4	<6.4	40000	27.4	3400	< 6.4	< 6.4	118	470	< 6.4	21.8	83	< 6.4	< 6.4
Benzo(a)anthracene	ug/kg	NS	148	2110	<12.9	13.4 J	[51000]	86	[6400]	< 12.9	18.5 J	202	1030	23.6 J	81	274	< 12.9	15.4 J
Benzo(a)pyrene	ug/kg	470	15	211	<4.7	<4.7	[26800]	99	[3800]	< 4.7	10.9 J	164	[840]	18.8	76	[256]	< 4.7	8 J
Benzo(b)fluoranthene	ug/kg	480	148	2110	<6.5	<6.5	[34000]	127	[5500]	< 6.5	16.8 J	296	1090	24.9	103	350	< 6.5	9.1 J
Benzo(g,h,i)perylene	ug/kg	NS	NS	NS	<7.7	<7.7	8100	235	1750	< 7.7	8.5 J	108	400	20 J	51	154	< 7.7	< 7.7
Benzo(k)fluoranthene	ug/kg	NS	1480	21100	<9.8	<9.8	12000	52	1820	< 9.8	< 9.8	75	350	< 9.8	35	105	< 9.8	< 9.8
Chrysene	ug/kg	145.1	14800	211000	<8.9	<9.8	34000	70	4500	< 8.9	10.8 J	231	890	24.3 J	83	242	< 8.9	< 8.9
Dibenzo(a,h)anthracene	ug/kg	NS	15	211	<5.5	<5.5	[3200]	16.8 J	[560]	< 5.5	< 5.5	29.9	117	< 5.5	10.4 J	38	< 5.5	< 5.5
Fluoranthene	ug/kg	88817.9	2290000	22000000	<9.2	<9.2	108000	121	10900	< 9.2	24.7 J	480	2240	32	146	460	< 9.2	21.2 J
Fluorene	ug/kg	14814.8	2290000	22000000	<5.6	<5.6	45000	7.7 J	1650	< 5.6	< 5.6	35	145	< 5.6	22.2	34	< 5.6	< 5.6
Indeno(1,2,3-cd)pyrene	ug/kg	NS	148	2110	<7.8	<7.8	[9800]	81	1840	< 7.8	< 7.8	98	410	13.4 J	44	145	< 7.8	< 7.8
1-Methyl naphthalene	ug/kg	NS	15600	53100	<15	<15	23000	18.8 J	410	< 15	< 15	167	70	< 15	95	< 15	< 15	< 15
2-Methyl naphthalene	ug/kg	NS	229000	368000	<9.7	<9.7	22500	16.8 J	500	< 9.7	< 9.7	206	95	< 9.7	104	< 9.7	< 9.7	< 9.7
Naphthalene	ug/kg	658.7	5150	26000	<16.2	<16.2	6500	<16.2	300	< 16.2	< 16.2	134	87	< 16.2	69	< 16.2	< 16.2	< 16.2
Phenanthrene	ug/kg	NS	NS	NS	<10.6	<10.6	117000	58	7000	< 10.6	18.3 J	480	1080	14 J	123	246	< 10.6	17.2 J
Pyrene	ug/kg	54472.5	1720000	16500000	<7.7	<7.7	77000	112	7800	< 7.7	21.2 J	390	1700	31.3	132	360	< 7.7	19.1 J
Additional SVOCs																		
2,4-Dimethylphenol	ug/kg	NS	1220000	12300000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bis(2-chloroethoxy)methan	ug/kg	NS	183000	1850000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenzofuran	ug/kg	NS	78200	1020000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Diphenylamine	ug/kg	NS	1530000	15400000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Isophorone	ug/kg	NS	512000	1810000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phenol	ug/kg	2299.8	18300000	100000000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCBs:																		
PCB 1254	mg/kg	NS	0.222	0.744	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Petroleun Hydrocarbons:																		
Diesel Range Organics	mg/kg	NS	NS	NS	<10	<10	9440	201 J	817	< 10	12.2	88.4	56.1	24.8	15.8	114	< 10	< 10

Table 2
Pre-Remedial Soil Analytical Table
Century City Lot 1 Area A1, Lot 2 Area A2 and B1, Lot 3 Area A
3945 North 31st Street, 2725 and 3055 West Hopkins Street, Milwaukee, Wisconsin
Project Reference 14161

Compound	Units	Groundwater Pathway RCL [4]	Non-Industrial Direct Contact RCL [8]	Industrial Direct Contract RCL [8]	DCD-SB251	DCD-SB252	DCD-SB253	DCD-SB254	DCD-SB255	DCD-SB256	DCD-SB279			DCD-SB280		DCD-SB281 *removed*		DCD-SB282		DCD-SB283	
					2-4	1-3	2-4	0-1	1-3	1-3	1-2	1-2 DUP	6-7	2-3	6-7	1-2	6-7	3-4	6-7	2-3	6-7
					3/12/10	3/12/10	3/16/10	3/16/10	3/16/10	3/16/10	7/1/11	7/1/11	7/1/11	7/1/11	7/1/11	7/1/11	7/1/11	7/1/11	7/1/11	7/1/11	7/1/11
Metals:																					
Aluminum	mg/kg	601.2903	77500	100000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Antimony	mg/kg	0.542	31.3	409	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic	mg/kg	0.584	0.39	1.59	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Barium	mg/kg	164.8	15300	100000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Beryllium	mg/kg	6.32	156	2010	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	mg/kg	0.752	70.2	803	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Calcium	mg/kg	NS	NS	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	mg/kg	360000	NS	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cobalt	mg/kg	3.6239	23.4	304	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper	mg/kg	91.6	3130	40900	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Iron	mg/kg	NS	54800	100000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead	mg/kg	27	400	800	13	24	22	130	24	210	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Magnesium	mg/kg	NS	NS	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese	mg/kg	39.1304	1830	22900	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mercury	mg/kg	0.208	3.13	3.13	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	mg/kg	13.0033	NS	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Potassium	mg/kg	NS	NS	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Selenium	mg/kg	0.52	391	5110	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Silver	mg/kg	0.8497	391	5110	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sodium	mg/kg	NS	NS	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Thalium	mg/kg	0.284	0.782	10.2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vanadium	mg/kg	NS	393	5110	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	mg/kg	NS	23500	100000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
VOCs																					
Benzene	ug/kg	5.5	1490	7410	NA	NA	NA	NA	NA	NA	<8.9	<8.9	<8.9	<8.9	<8.9	<8.9	<8.9	<8.9	<8.9	<8.9	<8.9
tert-Butylbenzene	ug/kg	NS	183000	183000	NA	NA	NA	NA	NA	NA	<54	<54	<54	<54	<54	<54	<54	<54	<54	<54	<54
sec-Butylbenzene	ug/kg	NS	145000	145000	NA	NA	NA	NA	NA	NA	<51	<51	<51	<51	<51	<51	<51	<51	<51	<51	<51
n-Butylbenzene	ug/kg	NS	108000	108000	NA	NA	NA	NA	NA	NA	<48	<48	<48	<48	<48	<48	<48	<48	<48	<48	<48
Carbon Tetrachloride	ug/kg	3.9	854	4250	NA	NA	NA	NA	NA	NA	<12	<12	<12	<12	<12	<12	<12	<12	<12	<12	<12
1,1-Dichloroethane	ug/kg	483.6	4720	23700	NA	NA	NA	NA	NA	NA	<11	<11	<11	<11	<11	<11	<11	293	<11	<11	<11
cis-1,2-Dichloroethene	ug/kg	41.2	156000	2040000	NA	NA	NA	NA	NA	NA	<14	<14	<14	<14	<14	<14	<14	500	1880	<14	<14
trans-1,2 Dichloroethene	ug/kg	58.8	211000	976000	NA	NA	NA	NA	NA	NA	<22	<22	<22	<22	<22	<22	<22	840	<22	<22	<22
Ethylbenzene	ug/kg	1570	7470	37000	NA	NA	NA	NA	NA	NA	<55	<55	<55	<55	<55	<55	<55	<55	<55	<55	<55
Isopropylbenzene	ug/kg	NS	NS	NS	NA	NA	NA	NA	NA	NA	<53	<53	<53	<53	<53	<53	<53	<53	<53	<53	<53
p-Isopropyltoluene	ug/kg	NS	162000	162000	NA	NA	NA	NA	NA	NA	<45	<45	<45	<45	<45	<45	<45	<45	<45	<45	<45
Naphthalene	ug/kg	658.7	5150	26000	NA	NA	NA	NA	NA	NA	420	<107	<107	<107	<107	<107	<107	<107	<107	<107	<107
n-Propylbenzene	ug/kg	NS	264000	264000	NA	NA	NA	NA	NA	NA	<53	<53	<53	<53	<53	<53	<53	<53	<53	<53	<53
Toluene	ug/kg	1107.2	818000	818000	NA	NA	NA	NA	NA	NA	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50
Trichloroethene (TCE)	ug/kg	3.6	644	8810	NA	NA	NA	NA	NA	NA	<17	<17	<17	<17	<17	<17	<17	126	1400	<17	<17
1,2,4-Trimethylbenzene	ug/kg	1379.3	89800	219000	NA	NA	NA	NA	NA	NA	<80	<80	<80	<80	<80	<80	<80	<80	<80	<80	<80
1,3,5-Trimethylbenzene	ug/kg	1379.3	182000	182000	NA	NA	NA	NA	NA	NA	<48	<48	<48	<48	<48	<48	<48	<48	<48	<48	<48
Vinyl Chloride	ug/kg	0.1	67	2030	NA	NA	NA	NA	NA	NA	<16	<16	<16	<16	<16	<16	<16	21.2 J	56	<16	<16
Total Xylenes	ug/kg	3940	258000	258000	NA	NA	NA	NA	NA	NA	<86	<86	<86	<86	<86	<86	<86	<86	<86	<86	<86
PAHs																					
Acenaphthene	ug/kg	NS	3440000	33000000	< 15.2	< 15.2	< 15.2	< 152	20.1 J	153	1570 J	460 J	25.1 J	<9.7	<9.7	<9.7	<9.7	<9.7	<9.7	127	<9.7
Acenaphthylene	ug/kg	NS	NS	NS	< 5.1	< 5.1	< 5.1	91 J	24.1	350	3900 J	650 J	19.2 J	<8.4	<8.4	<8.4	<8.4	<8.4	<8.4	33	<8.4
Anthracene	ug/kg	196744.2	17200000	100000000	< 6.4	24.8	< 6.4	142 J	134	1010	8500 J	1480 J	30.5 J	<10.2	<10.2	<10.2	<10.2	<10.2	<10.2	810 J	<10.2
Benzo(a)anthracene	ug/kg	NS	148	2110	< 12.9	45	< 12.9	530	890	[2800]	[7400 J]	990 J	14.7 J	<14.6	<14.6	<14.6	<14.6	47 J	<14.6	1950 J	<14.6
Benzo(a)pyrene	ug/kg	470	15	211	< 4.7	31	< 4.7	[570]	[990]	[2750]	[3500 J]	[500 J]	<16.6	<16.6	<16.6	<16.6	<16.6	38 J	<16.6	[1810 J]	<16.6
Benzo(b)fluoranthene	ug/kg	480	148	2110	< 6.5	38	< 6.5	690	1310	[3500]	[4900 J]	690 J	<16.7	<16.7	<16.7	<16.7	<16.7	65	<16.7	2090 J	<16.7
Benzo(g,h,i)perylene	ug/kg	NS	NS	NS	< 7.7	18.7 J	< 7.7	390	620	1560	1280 J	148 J	<8.2	<8.2	<8.2	<8.2	<8.2	30.8	<8.2	1120	<8.2
Benzo(k)fluoranthene	ug/kg	NS	1480	21100	< 9.8	15.4 J	< 9.8	219 J	410	1100	1430 J	211 J	<16.1	<16.1	<16.1	<16.1	<16.1	21 J	<16.1	710	<16.1
Chrysene	ug/kg	145.1	14800	211000	< 8.9	35	< 8.9	490	880	2450	4400 J	600 J	<9.2	<9.2	<9.2	<9.2	<9.2	54	<9.2	1880	<9.2
Dibenzo(a,h)anthracene	ug/kg	NS	15	211	< 5.5	< 5.5	< 5.5	89 J	151	[430]	[500 J]	65 J	<10.5	<10.5	<10.5	<10.5	<10.5	<10.5	<10.5	180	<10.5
Fluoranthene	ug/kg	88817.9	2290000	22000000	< 9.2	86	< 9.2	760	1630	5300	14600 J	2090 J	12.3 J	<9.8	15.4 J	<9.8	<9.8	89	<9.8	3900	<9.8
Fluorene	ug/kg	14814.8	2290000	22000000	< 5.6	8.4 J	< 5.6	< 56	19.2	295	9200 J	2050 J	97	<10.7	<10.7	<10.7	<10.7	<10.7	<10.7	131	<10.7
Indeno(1,2,3-cd)pyrene	ug/kg	NS	148	2110	< 7.8	15.7 J	< 7.8	330	580	1510	1480 J	183 J	<9.5	<9.5	<9.5	<9.5	<9.5	22 J	<9.5	890	<9.5
1-Methyl naphthalene	ug/kg	NS	15600	53100	< 15	< 15	< 15	< 150	< 15	230	5300 J	1410 J	20.9 J	<17.9	<17.9	<17.9	<17.9	20.7 J	<17.9	<17.9	<17.9
2-Methyl naphthalene	ug/kg	NS	229000	368000	< 9.7	< 9.7	< 9.7	< 97	9.8 J	235	5700 J	1570 J	11.5 J	<9.6	<9.6	<9.6	<9.6	20.4 J	<9.6	13 J	<9.6
Naphthalene	ug/kg	658.7	5150	26000	< 16.2	< 16.2	< 16.2	< 162	< 16.2	142	2610 J	750 J	<10.8	<10.8	<10.8	<10.8	<10.8	21.3 J	<10.8	22.4 J	<10.8
Phenanthrene	ug/kg	NS	NS	NS	< 10.6	81	< 10.6	312 J	320	2220	18500 J	3600 J	71	<9.8	18.4 J	<9.8	<9.8	66	<9.8	2300	<9.8
Pyrene	ug/kg	54472.5	1720000	16500000	< 7.7	82	< 7.7	660	1350	4300	10300 J	1500 J	<9.5	<9.5	<9.5	<9.5	<9.5	77	<9.5	4200	<9.5
Additional SVOCs																					
2,4-Dimethylphenol	ug/kg	NS	1220000	12300000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bis(2-chloroethoxy)methan	ug/kg	NS	183000	1850000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenzofuran	ug/kg	NS	78200	1020000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Diphenylamine	ug/kg	NS	1530000	15400000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Isophorone	ug/kg	NS	512000	1810000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phenol	ug/kg	2299.8	18300000	100000000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCBs:																					
PCB 1254	mg/kg	NS	0.222	0.744	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Petroleun Hydrocarbons:																					
Diesel Range Organics	mg/kg	NS	NS	NS	< 10	< 10	< 10	179 J	33.9	193	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Table 2
Pre-Remedial Soil Analytical Table
Century City Lot 1 Area A1, Lot 2 Area A2 and B1, Lot 3 Area A
3945 North 31st Street, 2725 and 3055 West Hopkins Street, Milwaukee, Wisconsin
Project Reference 14161

Notes:
1. Unsaturated/smear zone versus saturated soil conditions based on: (1) measured water levels in adjacent/nearby monitoring wells, (2) soil moisture conditions recorded on soil boring logs, and/or (3) soil moisture contents reported on laboratory analytical reports.
2. Analytical units: µg/kg = micrograms per kilogram (equivalent to parts per billion, ppb)
mg/kg = milligrams per kilogram (equivalent to parts per million, ppm)
3. NA = not analyzed
4. ND = Non-detect
5. Groundwater Pathway RCL = Residual Contaminant Level for protection of groundwater as described in NR 720.10. Current RCLs based on WDNR's RCL Spreadsheet (dated December 2013) as referenced in WDNR guidance document PUB-RR-890 "Soil Residual Contaminant Level Determinations Using the US EPA Regional Screening Level Web Calculator", dated January 23, 2014.

6. Non-Industrial Direct Contact RCL = Residual Contaminant Level for protection of direct contact at a non-industrial property as described in NR 720.12. Current RCLs based on WDNR's RCL Spreadsheet (dated December 2013) with default input parameters as referenced in WDNR guidance document PUB-RR-890 "Soil Residual Contaminant Level Determinations Using the US EPA Regional Screening Level Web Calculator", dated January 23, 2014.

7. Industrial Direct Contact RCL = Residual Contaminant Level for protection of direct contact at an industrial property as described in NR 720.12. Current RCLs based on WDNR's RCL Spreadsheet (dated December 2013) with default input parameters as referenced in WDNR guidance document PUB-RR-890 "Soil Residual Contaminant Level Determinations Using the US EPA Regional Screening Level Web Calculator", dated January 23, 2014.
8. NS = no standard established
9. Laboratory flags: "J" = Analyte detected between Limit of Detection and Limit of Quantitation
"R" = Rejected
"U" = Qualified non-detect due to laboratory or field contamination
10. Exceedances: **BOLD** = Concentration exceeds Groundwater Pathway RCL (unsaturated soil samples only)
[ ] = Concentration exceeds Industrial Direct Contact RCL (shallow, unsaturated soil samples only)

Table 3
Groundwater Analytical Data
Century City Lot 1 Area A1, Lot 2 Area A2 and B1, Lot 3 Area A
3945 North 31st Street, 2725 and 3055 West Hopkins Street, Milwaukee, Wisconsin
Sigma Project No. 14161

Well Location:		DCD-MW1	MW-1		PER MW-4 (Off-site)					PER MW-5			PER MW-6			NR 140 ES	NR 140 PAL
Date:		11/17/09	11/20/09	6/16/11	9/13/12	1/23/13	DUP 1/23/13	6/24/13	12/16/13	9/12/12	1/23/13	6/24/13	9/12/12	6/24/13	12/17/13		
Water Elevation* (feet MSL):																	
PVOCs & Detected VOCs																	
Benzene	µg/L	<0.41	<0.41	NA	<0.5	<0.5	<0.5	<0.24	<0.24	<0.5	<0.5	0.41 J	<0.5	<0.24	<0.24	5	0.5
Bromobenzene	µg/L	<0.43	<0.43	NA	<0.74	<0.74	<0.74	<0.32	<0.32	<0.74	<0.74	<0.32	<0.74	<0.32	<0.32	NS	NS
Bromodichloromethane	µg/L	<0.41	<0.41	NA	<0.68	<0.68	<0.68	<0.37	<0.37	<0.68	<0.68	<0.37	<0.68	<0.37	<0.37	0.6	0.06
Bromoform	µg/L	<0.46	<0.46	NA	<0.43	<0.43	<0.43	<0.35	<0.35	<0.43	<0.43	<0.35	<0.43	<0.35	<0.35	4.4	0.44
tert-Butylbenzene	µg/L	<0.46	<0.46	NA	<0.71	<0.71	<0.71	<0.36	<0.36	<0.71	<0.71	<0.36	<0.71	<0.36	<0.36	NS	NS
sec-Butylbenzene	µg/L	<0.43	<0.43	NA	<1	<1	<1	<0.33	<0.33	<1	<1	<0.33	<1	<0.33	<0.33	NS	NS
n-Butylbenzene	µg/L	<1.5	<1.5	NA	<0.9	<0.9	<0.9	<0.35	<0.35	<0.9	<0.9	<0.35	<0.9	<0.35	<0.35	NS	NS
Carbon Tetrachloride	µg/L	<0.43	<0.43	NA	<0.47	<0.47	<0.47	<0.33	<0.33	<0.47	<0.47	<0.33	<0.47	<0.33	<0.33	5	0.5
Chlorobenzene	µg/L	<0.39	<0.39	NA	<0.51	<0.51	<0.51	<0.24	<0.24	<0.51	<0.51	<0.24	<0.51	<0.24	<0.24	NS	NS
Chloroethane	µg/L	<1.5	<1.5	NA	<1.4	<1.4	<1.4	<0.63	<0.63	<1.4	<1.4	<0.63	<1.4	<0.63	<0.63	400	80
Chloroform	µg/L	<0.48	<0.48	NA	<0.49	<0.49	<0.49	<0.28	<0.28	<0.49	<0.49	<0.28	<0.49	<0.28	<0.28	6	0.6
Chloromethane	µg/L	<0.5	<0.5	NA	<1.9	<1.9	<1.9	<0.81	<0.81	<1.9	<1.9	<0.81	<1.9	<0.81	<0.81	30	3
2-Chlorotoluene	µg/L	<0.37	<0.37	NA	<0.7	<0.7	<0.7	<0.21	<0.21	<0.7	<0.7	<0.21	<0.7	<0.21	<0.21	NS	NS
4-Chlorotoluene	µg/L	<0.63	<0.63	NA	<0.44	<0.44	<0.44	<0.21	<0.21	<0.44	<0.44	<0.21	<0.44	<0.21	<0.21	NS	NS
1,2-Dibromo-3-Chloropropane	µg/L	<2	<2	NA	<2.8	<2.8	<2.8	<0.88	<0.88	<2.8	<2.8	<0.88	<2.8	<0.88	<0.88	0.2	0.02
Dibromochloromethane	µg/L	<0.76	<0.76	NA	<0.55	<0.55	<0.55	<0.22	<0.22	<0.55	<0.55	<0.22	<0.55	<0.22	<0.22	60	6
1,4-Dichlorobenzene	µg/L	<0.77	<0.77	NA	<0.98	<0.98	<0.98	<0.3	<0.3	<0.98	<0.98	<0.3	<0.98	<0.3	<0.3	75	15
1,3-Dichlorobenzene	µg/L	<0.34	<0.34	NA	<0.87	<0.87	<0.87	<0.28	<0.28	<0.87	<0.87	<0.28	<0.87	<0.28	<0.28	600	120
1,2-Dichlorobenzene	µg/L	<0.66	<0.66	NA	<0.76	<0.76	<0.76	<0.36	<0.36	<0.76	<0.76	<0.36	<0.76	<0.36	<0.36	600	60
Dichlorodifluoromethane	µg/L	<0.45	<0.45	NA	<1.8	<1.8	<1.8	<0.44	<0.44	<1.8	<1.8	<0.44	<1.8	<0.44	<0.44	1,000	200
1,2-Dichloroethane	µg/L	<0.43	<0.43	NA	<0.5	<0.5	<0.5	<0.41	<0.41	<0.5	<0.5	<0.41	<0.5	<0.41	<0.41	5	0.5
1,1-Dichloroethane	µg/L	<0.44	<0.44	NA	<0.98	<0.98	<0.98	<0.3	<0.3	<0.98	<0.98	<0.3	<0.98	<0.3	<0.3	850	85
1,1-Dichloroethene	µg/L	<0.47	<0.47	NA	<0.6	<0.6	<0.6	<0.4	<0.4	<0.6	<0.6	<0.4	<0.6	<0.4	<0.4	7	0.7
cis-1,2-Dichloroethene	µg/L	<0.68	<0.68	NA	<0.74	<0.74	<0.74	<0.38	<0.38	<0.74	<0.74	<0.38	<0.74	<0.38	<0.38	70	7
trans-1,2-Dichloroethene	µg/L	<0.61	<0.61	NA	<0.79	<0.79	<0.79	<0.35	<0.35	<0.79	<0.79	<0.35	<0.79	<0.35	<0.35	100	20
1,2-Dichloropropane	µg/L	<0.26	<0.26	NA	<0.4	<0.4	<0.4	<0.32	<0.32	<0.4	<0.4	***0.53J*****	<0.4	<0.32	<0.32	5	0.5
2,2-Dichloropropane	µg/L	<0.89	<0.89	NA	<1.9	<1.9	<1.9	<0.36	<0.36	<1.9	<1.9	<0.36	<1.9	<0.36	<0.36	NS	NS
1,3-Dichloropropane	µg/L	<0.49	<0.49	NA	<0.71	<0.71	<0.71	<0.33	<0.33	<0.71	<0.71	<0.33	<0.71	<0.33	<0.33	NS	NS
Di-isopropyl ether	µg/L	<0.32	<0.32	NA	<0.69	<0.69	<0.69	<0.23	<0.23	<0.69	<0.69	<0.23	<0.69	<0.23	<0.23	NS	NS
EDB (1,2-Dibromoethane)	µg/L	<0.52	<0.52	NA	<0.63	<0.63	<0.63	<0.44	<0.44	<0.63	<0.63	<0.44	<0.63	<0.44	<0.44	0.05	0.005
Ethylbenzene	µg/L	<0.87	<0.87	NA	<0.78	<0.78	<0.78	<0.55	<0.55	<0.78	0.93 J	1.73	<0.78	<0.55	<0.55	700	140
Hexachlorobutadiene	µg/L	<1.5	<1.5	NA	<2.2	<2.2	<2.2	<1.5	<1.5	<2.2	<2.2	<1.5	<2.2	<1.5	<1.5	NS	NS
Isopropylbenzene	µg/L	<0.39	<0.39	NA	<0.92	<0.92	<0.92	<0.3	<0.3	<0.92	<0.92	<0.3	<0.92	<0.3	<0.3	NS	NS
p-Isopropyltoluene	µg/L	<0.57	<0.57	NA	<0.92	<0.92	<0.92	<0.31	<0.31	<0.92	<0.92	<0.31	<0.92	<0.31	<0.31	NS	NS
Methylene Chloride	µg/L	<1.5	<1.5	NA	<1.1	<1.1	<1.1	<0.5	<0.5	<1.1	<1.1	<0.5	<1.1	<0.5	<0.5	5	0.5
Methyl-tert-butyl-ether	µg/L	<0.5	<0.5	NA	<0.8	<0.8	<0.8	<0.23	<0.23	<0.8	<0.8	<0.23	<0.8	<0.23	<0.23	60	12
Naphthalene	µg/L	<1.7	<1.7	NA	<2.1	<2.1	<2.1	<1.7	<1.7	<2.1	<2.1	<1.7	<2.1	<1.7	<1.7	100	10
n-Propylbenzene	µg/L	<0.33	<0.33	NA	<0.59	<0.59	<0.59	<0.25	<0.25	<0.59	<0.59	<0.25	<0.59	<0.25	<0.25	NS	NS
1,1,2,2-Tetrachloroethane	µg/L	<0.55	<0.55	NA	<0.53	<0.53	<0.53	<0.45	<0.45	<0.53	<0.53	<0.45	<0.53	<0.45	<0.45	0.2	0.02
1,1,1,2-Tetrachloroethane	µg/L	<0.54	<0.54	NA	<1	<1	<1	<0.33	<0.33	<1	<1	<0.33	<1	<0.33	<0.33	70	7
Tetrachloroethene	µg/L	<0.42	<0.42	NA	<0.44	<0.44	<0.44	<0.33	<0.33	<0.44	<0.44	<0.33	<0.44	<0.33	<0.33	5	0.5
Toluene	µg/L	<0.51	<0.51	NA	<0.53	<0.53	<0.53	<0.69	<0.69	<0.53	<0.53	<0.69	<0.53	<0.69	<0.69	1,000	200
1,2,4-Trichlorobenzene	µg/L	<2.1	<2.1	NA	<1.5	<1.5	<1.5	<0.98	<0.98	<1.5	<1.5	<0.98	<1.5	<0.98	<0.98	70	14
1,2,3-Trichlorobenzene	µg/L	<1.6	<1.6	NA	<1.3	<1.3	<1.3	<1.8	<1.8	<1.3	<1.3	<1.8	<1.3	<1.8	<1.8	NS	NS
1,1,1-Trichloroethane	µg/L	<0.46	<0.46	NA	<0.85	<0.85	<0.85	<0.33	<0.33	<0.85	<0.85	<0.33	<0.85	<0.33	<0.33	200	40
1,1,2-Trichloroethane	µg/L	<0.41	<0.41	NA	<0.47	<0.47	<0.47	<0.34	<0.34	<0.47	<0.47	<0.34	<0.47	<0.34	<0.34	5	0.5
Trichloroethene (TCE)	µg/L	<0.39	<0.39	NA	<0.47	<0.47	<0.47	<0.33	<0.33	<0.47	<0.47	<0.33	<0.47	<0.33	<0.33	5	0.5
Trichlorofluoromethane	µg/L	<0.72	<0.72	NA	<1.7	<1.7	<1.7	<0.71	<0.71	<1.7	<1.7	<0.71	<1.7	<0.71	<0.71	3,490	698
1,2,4-Trimethylbenzene	µg/L	<1.1	<1.1	NA	<0.8	<0.8	<0.8	<2.2	<2.2	<0.8	<0.8	<2.2	<0.8	<2.2	<2.2	NS	NS
1,3,5-Trimethylbenzene	µg/L	<1.5	<1.5	NA	<0.74	<0.74	<0.74	<1.4	<1.4	<0.74	<0.74	<1.4	<0.74	<1.4	<1.4	NS	NS
Total Trimethylbenzene	µg/L	<1.5	<1.5	NA	<0.8	<0.8	<0.8	<2.2	<2.2	<0.8	<0.8	<2.2	<0.8	<2.2	<2.2	480	96
Vinyl Chloride	µg/L	<0.2	<0.2	NA	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18	0.2	0.02
Xylenes, Total	µg/L	<1.6	<1.6	NA	<1.1	<1.1	<1.1	<0.69	<0.69	<1.1	<1.1	2.48 J	<1.1	<0.69	<0.69	10,000	1,000
PAHs																	
Acenaphthene	µg/L	<0.24	<0.24	8.5	<0.025	<0.025	<0.025	<0.021	<0.021	<0.025	<0.025	<0.021	<0.025	<0.021	<0.021	NS	NS
Acenaphthylene	µg/L	<0.23	<0.23	0.032 J	<0.019	<0.019	<0.019	<0.02	<0.02	<0.019	<0.019	<0.02	<0.019	<0.02	<0.02	NS	NS
Anthracene	µg/L	<0.35	<0.35	0.059	<0.018	<0.018	<0.018	<0.02	<0.02	<0.018	<0.018	<0.02	<0.018	<0.02	<0.02	3,000	600
Benzo(a)anthracene	µg/L	<1.01	<1.01	0.021 J	<0.024	<0.024	<0.024	<0.025	0.032 J	<0.024	<0.024	<0.025	<0.024	<0.025	0.052 J	NS	NS
Benzo(a)pyrene	µg/L	<0.35	<0.35	<0.011	<0.018	<0.018	<0.018	<0.018	***0.023 J*****	<0.018	<0.018	<0.018	<0.018	<0.018	***0.039 J*****	0.2	0.02
Benzo(b)fluoranthene	µg/L	<0.31	<0.31	<0.013	<0.02	<0.02	<0.02	<0.02	***0.021 J*****	<0.02	<0.02	<0.02	<0.02	<0.02	***0.064***	0.2	0.02
Benzo(ghi)perylene	µg/L	<0.47	<0.47	<0.015	<0.019	<0.019	<0.019	<0.023	<0.023	<0.019	<0.019	<0.023	<0.019	<0.023	0.031 J	NS	NS
Benzo(k)fluoranthene	µg/L	<0.52	<0.52	<0.015	<0.022	<0.022	<0.022	<0.027	<0.027	<0.022	<0.022	<0.027	<0.022	<0.027	0.028 J	NS	NS
Chrysene	µg/L	<0.32	<0.32	<0.013	<0.019	<0.019	<0.019	<0.018	<0.018	<0.019	<0.019	<0.018	<0.019	<0.018	***0.06***	0.2	0.02
Dibenzo(a,h)anthracene	µg/L	<0.3	<0.3	<0.016	<0.019	<0.019	<0.019	<0.023	<0.023	<0.019	<0.019	<0.023	<0.019	<0.023	<0.023	NS	NS
Fluoranthene	µg/L	<0.25	0.49 J	0.234	<0.022	<0.022	<0.022	<0.026	<0.026	<0.022	<0.022	<0.026	<0.022	0.03 J	0.057 J	400	80
Fluorene	µg/L	<0.39	0.66 J	0.162	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	400	80
Indeno(1,2,3-cd)pyrene	µg/L	<0.26	<0.26	<0.015	<0.018	<0.018	<0.018	<0.027	<0.027	<0.018	<0.018	<0.027	<0.018	<0.027	0.031 J	NS	NS
1-Methylnaphthalene	µg/L	<0.55	<0.55	0.36	<0.022	<0.022	<0.022	<0.019	<0.019	<0.022	<0.022	<0.019	<0.022	<0.019	<0.019	NS	NS
2-Methylnaphthalene	µg/L	<0.36	<0.36	<0.013	<0.024	<0.024	<0.024	<0.016	<0.016	<0.024	<0.024	<0.016	<0.024	<0.016	<0.016	NS	NS
Naphthalene	µg/L	<0.34	<0.34	0.195	0.039 J	<0.021	<0.021	<0.023	<0.023	0.025 J	<0.021	<0.023	<0.021	<0.023	<0.023	100	10
Phenanthrene	µg/L	<1.55	<1.55	0.025 J	<0.019	<0.019	<0.019	<0.018	<0.018	<0.019	<0.019	<0.018	<0.019	0.02 J	0.019 J	NS	NS
Pyrene	µg/L	<0.33	<0.33	0.137	<0.02	<0.02	<0.02	<0.025	<0.025	<0.02	<0.02	<0.025	<0.02	<0.025	0.049 J	250	50
Dissolved Metals																	
Arsenic	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	10	1
Barium	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2,000	400
Cadmium	µg/L	<0.16	<0.16	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5	0.5
Chromium	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	100	10
Lead	µg/L	<0.24	0.24	NA	<0.7	***2.4 J*****	***8.5***	<1.9	0.43 J	<0.7	***6***	***3.0 J*****	<0.7	***7.5***	0.48 J	15	1.5
Mercury	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2	0.2
Selenium	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	50	10
Silver	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	50	10

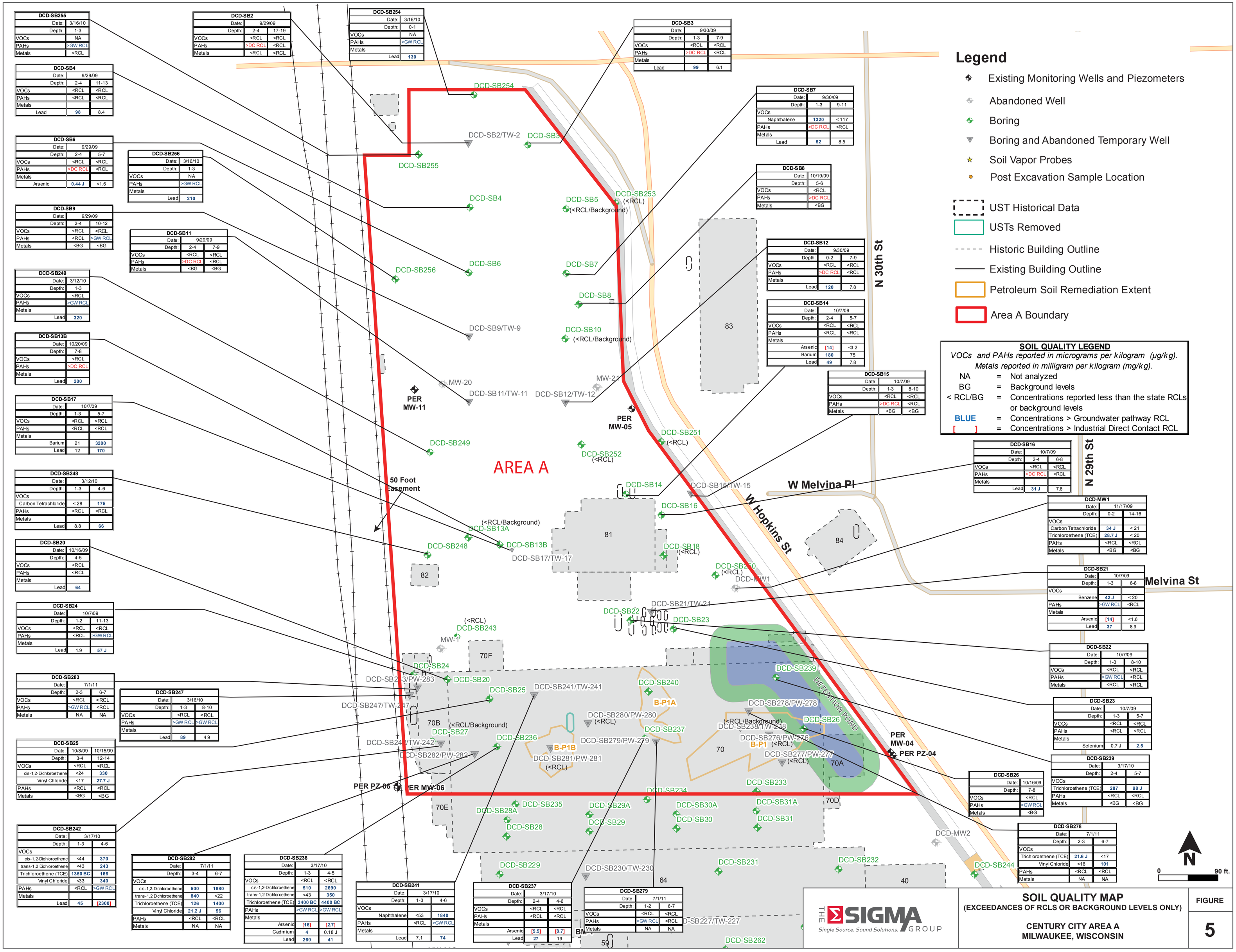
Table 3
Groundwater Analytical Data
Century City Lot 1 Area A1, Lot 2 Area A2 and B1, Lot 3 Area A
3945 North 31st Street, 2725 and 3055 West Hopkins Street, Milwaukee, Wisconsin
Sigma Project No. 14161

Well Location:		PER MW-11				MW-20	MW-21	PER PZ-4 (Off-site)					PER PZ-6			TW-2	TW-9	TW-11	NR 140 ES	NR 140 PAL
Date:		9/12/12	1/23/13	6/24/13	DUP 7/1/13	11/17/09	11/17/09	9/13/12	1/23/13	6/24/13	7/1/13	12/16/13	9/12/12	6/24/13	12/17/13	11/9/09	11/11/09	11/9/09		
Water Elevation* (feet MSL):																				
PVOCs & Detected VOCs																				
Benzene	µg/L	<0.5	<0.5	<0.24	<0.24	<0.41	<0.41	<0.5	<0.5	NA	<0.24	<0.24	<0.5	<0.24	<0.24	<0.41	<0.41	<0.41	5	0.5
Bromobenzene	µg/L	<0.74	<0.74	<0.32	<0.32	<0.43	<0.43	<0.74	<0.74	NA	<0.32	<0.32	<0.74	<0.32	<0.32	<0.43	<0.43	<0.43	NS	NS
Bromodichloromethane	µg/L	<0.68	<0.68	<0.37	<0.37	<0.41	<0.41	<0.68	<0.68	NA	<0.37	<0.37	<0.68	<0.37	<0.37	<0.41	<0.41	<0.41	0.6	0.06
Bromoform	µg/L	<0.43	<0.43	<0.35	<0.35	<0.46	<0.46	<0.43	<0.43	NA	<0.35	<0.35	<0.43	<0.35	<0.35	<0.46	<0.46	<0.46	4.4	0.44
tert-Butylbenzene	µg/L	<0.71	<0.71	<0.36	<0.36	<0.46	<0.46	<0.71	<0.71	NA	<0.36	<0.36	<0.71	<0.36	<0.36	<0.46	<0.46	<0.46	NS	NS
sec-Butylbenzene	µg/L	<1	<1	<0.33	<0.33	<0.43	<0.43	<1	<1	NA	<0.33	<0.33	<1	<0.33	<0.33	<0.43	<0.43	<0.43	NS	NS
n-Butylbenzene	µg/L	<0.9	<0.9	<0.35	<0.35	<1.5	<1.5	<0.9	<0.9	NA	<0.35	<0.35	<0.9	<0.35	<0.35	<1.5	<1.5	<1.5	NS	NS
Carbon Tetrachloride	µg/L	<0.47	<0.47	<0.33	<0.33	<0.43	<0.43	<0.47	<0.47	NA	<0.33	<0.33	<0.47	<0.33	<0.33	<0.43	<0.43	<0.43	5	0.5
Chlorobenzene	µg/L	<0.51	<0.51	<0.24	<0.24	<0.39	<0.39	<0.51	<0.51	NA	<0.24	<0.24	<0.51	<0.24	<0.24	<0.39	<0.39	<0.39	NS	NS
Chloroethane	µg/L	<1.4	<1.4	<0.63	<0.63	<1.5	<1.5	<1.4	<1.4	NA	<0.63	<0.63	<1.4	<0.63	<0.63	<1.5	<1.5	<1.5	400	80
Chloroform	µg/L	<0.49	<0.49	<0.28	<0.28	<0.48	<0.48	<0.49	<0.49	NA	<0.28	<0.28	<0.49	<0.28	<0.28	<0.48	<0.48	<0.48	6	0.6
Chloromethane	µg/L	<1.9	<1.9	<0.81	<0.81	<0.5	<0.5	<1.9	<1.9	NA	<0.81	<0.81	<1.9	<0.81	<0.81	<0.5	<0.5	<0.5	30	3
2-Chlorotoluene	µg/L	<0.7	<0.7	<0.21	<0.21	<0.37	<0.37	<0.7	<0.7	NA	<0.21	<0.21	<0.7	<0.21	<0.21	<0.37	<0.37	<0.37	NS	NS
4-Chlorotoluene	µg/L	<0.44	<0.44	<0.21	<0.21	<0.63	<0.63	<0.44	<0.44	NA	<0.21	<0.21	<0.44	<0.21	<0.21	<0.63	<0.63	<0.63	NS	NS
1,2-Dibromo-3-Chloropropane	µg/L	<2.8	<2.8	<0.88	<0.88	<2	<2	<2.8	<2.8	NA	<0.88	<0.88	<2.8	<0.88	<0.88	<2	<2	<2	0.2	0.02
Dibromochloromethane	µg/L	<0.55	<0.55	<0.22	<0.22	<0.76	<0.76	<0.55	<0.55	NA	<0.22	<0.22	<0.55	<0.22	<0.22	<0.76	<0.76	<0.76	60	6
1,4-Dichlorobenzene	µg/L	<0.98	<0.98	<0.3	<0.3	<0.77	<0.77	<0.98	<0.98	NA	<0.3	<0.3	<0.98	<0.3	<0.3	<0.77	<0.77	<0.77	75	15
1,3-Dichlorobenzene	µg/L	<0.87	<0.87	<0.28	<0.28	<0.34	<0.34	<0.87	<0.87	NA	<0.28	<0.28	<0.87	<0.28	<0.28	<0.34	<0.34	<0.34	600	120
1,2-Dichlorobenzene	µg/L	<0.76	<0.76	<0.36	<0.36	<0.66	<0.66	<0.76	<0.76	NA	<0.36	<0.36	<0.76	<0.36	<0.36	<0.66	<0.66	<0.66	600	60
Dichlorodifluoromethane	µg/L	<1.8	<1.8	<0.44	<0.44	<0.45	<0.45	<1.8	<1.8	NA	<0.44	<0.44	<1.8	<0.44	<0.44	<0.45	<0.45	<0.45	1,000	200
1,2-Dichloroethane	µg/L	<0.5	<0.5	<0.41	<0.41	<0.43	<0.43	<0.5	<0.5	NA	<0.41	<0.41	<0.5	<0.41	<0.41	<0.43	<0.43	<0.43	5	0.5
1,1-Dichloroethane	µg/L	<0.98	<0.98	<0.3	<0.3	4.6	4.6	<0.98	<0.98	NA	<0.3	<0.3	<0.98	<0.3	<0.3	<0.44	<0.44	<0.44	850	85
1,1-Dichloroethene	µg/L	<0.6	<0.6	<0.4	<0.4	<0.47	<0.47	<0.6	<0.6	NA	<0.4	<0.4	<0.6	<0.4	<0.4	<0.47	<0.47	<0.47	7	0.7
cis-1,2-Dichloroethene	µg/L	<0.74	<0.74	<0.38	<0.38	<0.68	<0.68	<0.74	<0.74	NA	<0.38	<0.38	<0.74	<0.38	<0.38	<0.68	<0.68	<0.68	70	7
trans-1,2-Dichloroethene	µg/L	<0.79	<0.79	<0.35	<0.35	<0.61	<0.61	<0.79	<0.79	NA	<0.35	<0.35	<0.79	<0.35	<0.35	<0.61	<0.61	<0.61	100	20
1,2-Dichloropropane	µg/L	<0.4	<0.4	<0.32	<0.32	<0.26	<0.26	<0.4	<0.4	NA	<0.32	<0.32	<0.4	<0.32	<0.32	<0.26	<0.26	<0.26	5	0.5
2,2-Dichloropropane	µg/L	<1.9	<1.9	<0.36	<0.36	<0.89	<0.89	<1.9	<1.9	NA	<0.36	<0.36	<1.9	<0.36	<0.36	<0.89	<0.89	<0.89	NS	NS
1,3-Dichloropropane	µg/L	<0.71	<0.71	<0.33	<0.33	<0.49	<0.49	<0.71	<0.71	NA	<0.33	<0.33	<0.71	<0.33	<0.33	<0.49	<0.49	<0.49	NS	NS
Di-isopropyl ether	µg/L	<0.69	<0.69	<0.23	<0.23	<0.32	<0.32	<0.69	<0.69	NA	<0.23	<0.23	<0.69	<0.23	<0.23	<0.32	<0.32	<0.32	NS	NS
EDB (1,2-Dibromoethane)	µg/L	<0.63	<0.63	<0.44	<0.44	<0.52	<0.52	<0.63	<0.63	NA	<0.44	<0.44	<0.63	<0.44	<0.44	<0.52	<0.52	<0.52	0.05	0.005
Ethylbenzene	µg/L	<0.78	<0.78	<0.55	<0.55	<0.87	<0.87	<0.78	<0.78	NA	<0.55	<0.55	<0.78	<0.55	<0.55	<0.87	<0.87	<0.87	700	140
Hexachlorobutadiene	µg/L	<2.2	<2.2	<1.5	<1.5	<1.5	<1.5	<2.2	<2.2	NA	<1.5	<1.5	<2.2	<1.5	<1.5	<1.5	<1.5	<1.5	NS	NS
Isopropylbenzene	µg/L	<0.92	<0.92	<0.3	<0.3	<0.39	<0.39	<0.92	<0.92	NA	<0.3	<0.3	<0.92	<0.3	<0.3	<0.39	<0.39	<0.39	NS	NS
p-Isopropyltoluene	µg/L	<0.92	<0.92	<0.31	<0.31	<0.57	<0.57	<0.92	<0.92	NA	<0.31	<0.31	<0.92	<0.31	<0.31	<0.57	<0.57	<0.57	NS	NS
Methylene Chloride	µg/L	<1.1	<1.1	<0.5	<0.5	<1.5	<1.5	<1.1	<1.1	NA	<0.5	<0.5	<1.1	<0.5	<0.5	<1.5	<1.5	<1.5	5	0.5
Methyl-tert-butyl-ether	µg/L	<0.8	<0.8	<0.23	<0.23	<0.5	<0.5	<0.8	<0.8	NA	<0.23	<0.23	<0.8	<0.23	<0.23	<0.5	<0.5	<0.5	60	12
Naphthalene	µg/L	<2.1	<2.1	<1.7	<1.7	<1.7	<1.7	<2.1	<2.1	NA	<1.7	<1.7	<2.1	<1.7	<1.7	<1.7	<1.7	<1.7	100	10
n-Propylbenzene	µg/L	<0.59	<0.59	<0.25	<0.25	<0.33	<0.33	<0.59	<0.59	NA	<0.25	<0.25	<0.59	<0.25	<0.25	<0.33	<0.33	<0.33	NS	NS
1,1,2,2-Tetrachloroethane	µg/L	<0.53	<0.53	<0.45	<0.45	<0.55	<0.55	<0.53	<0.53	NA	<0.45	<0.45	<0.53	<0.45	<0.45	<0.55	<0.55	<0.55	0.2	0.02
1,1,1,2-Tetrachloroethane	µg/L	<1	<1	<0.33	<0.33	<0.54	<0.54	<1	<1	NA	<0.33	<0.33	<1	<0.33	<0.33	<0.54	<0.54	<0.54	70	7
Tetrachloroethene	µg/L	<0.44	<0.44	<0.33	<0.33	<0.42	<0.42	<0.44	<0.44	NA	<0.33	<0.33	<0.44	<0.33	<0.33	<0.42	<0.42	<0.42	5	0.5
Toluene	µg/L	<0.53	<0.53	<0.69	<0.69	<0.51	<0.51	<0.53	<0.53	NA	<0.69	<0.69	<0.53	<0.69	<0.69	<0.51	<0.51	<0.51	1,000	200
1,2,4-Trichlorobenzene	µg/L	<1.5	<1.5	<0.98	<0.98	<2.1	<2.1	<1.5	<1.5	NA	<0.98	<0.98	<1.5	<0.98	<0.98	<2.1	<2.1	<2.1	70	14
1,2,3-Trichlorobenzene	µg/L	<1.3	<1.3	<1.8	<1.8	<1.6	<1.6	<1.3	<1.3	NA	<1.8	<1.8	<1.3	<1.8	<1.8	<1.6	<1.6	<1.6	NS	NS
1,1,1-Trichloroethane	µg/L	<0.85	<0.85	<0.33	<0.33	3.9	3.9	<0.85	<0.85	NA	<0.33	<0.33	<0.85	<0.33	<0.33	<0.46	<0.46	<0.46	200	40
1,1,2-Trichloroethane	µg/L	<0.47	<0.47	<0.34	<0.34	<0.41	<0.41	<0.47	<0.47	NA	<0.34	<0.34	<0.47	<0.34	<0.34	<0.41	<0.41	<0.41	5	0.5
Trichloroethene (TCE)	µg/L	<0.47	<0.47	<0.33	<0.33	<0.39	<0.39	<0.47	<0.47	NA	<0.33	<0.33	<0.47	<0.33	<0.33	<0.39	<0.39	<0.39	5	0.5
Trichlorofluoromethane	µg/L	<1.7	<1.7	<0.71	<0.71	<0.72	<0.72	<1.7	<1.7	NA	<0.71	<0.71	<1.7	<0.71	<0.71	<0.72	<0.72	<0.72	3,490	698
1,2,4-Trimethylbenzene	µg/L	<0.8	<0.8	<2.2	<2.2	<1.1	<1.1	<0.8	<0.8	NA	<2.2	<2.2	<0.8	<2.2	<2.2	<1.1	<1.1	<1.1	NS	NS
1,3,5-Trimethylbenzene	µg/L	<0.74	<0.74	<1.4	<1.4	<1.5	<1.5	<0.74	<0.74	NA	<1.4	<1.4	<0.74	<1.4	<1.4	<1.5	<1.5	<1.5	NS	NS
Total Trimethylbenzene	µg/L	<0.8	<0.8	<2.2	<2.2	<1.5	<1.5	<0.8	<0.8	NA	<2.2	<2.2	<0.8	<2.2	<2.2	<1.5	<1.5	<1.5	480	96
Vinyl Chloride	µg/L	<0.18	<0.18	<0.18	<0.18	<0.2	<0.2	<0.18	<0.18	NA	<0.18	<0.18	<0.18	<0.18	<0.18	<0.2	<0.2	<0.2	0.2	0.02
Xylenes, Total	µg/L	<1.1	<1.1	0.74 J	<0.69	<1.6	<1.6	<1.1	<1.1	NA	<0.69	<0.69	<1.1	<0.69	<0.69	<1.6	<1.6	<1.6	10,000	1,000
PAHs																				
Acenaphthene	µg/L	<0.025	<0.025	<0.021	NA	<0.24	<0.24	<0.025	<0.025	0.161	NA	<0.021	<0.025	<0.021	<0.021	<0.24	<0.24	<0.24	NS	NS
Acenaphthylene	µg/L	<0.019	<0.019	<0.02	NA	<0.23	<0.23	<0.019	<0.019	0.07	NA	<0.02	<0.019	<0.02	<0.02	<0.23	<0.23	<0.23	NS	NS
Anthracene	µg/L	<0.018	<0.018	<0.02	NA	<0.35	<0.35	<0.018	<0.018	0.203	NA	<0.02	<0.018	<0.02	0.021 J	0.59 J	<0.35	<0.35	3,000	600
Benzo(a)anthracene	µg/L	<0.024	<0.024	<0.025	NA	<1.01	<1.01	<0.024	<0.024	0.036 J	NA	***0.029 J*****	***0.026 J*****	<0.025	***0.036 J*****	<1.01	<1.01	<1.01	NS	NS
Benzo(a)pyrene	µg/L	<0.018	<0.018	<0.018	NA	<0.35	<0.35	<0.018	<0.018	<0.018	NA	***0.020 J*****	***0.018 J*****	<0.018	***0.026 J*****	**0.49 J****	<0.35	<0.35	0.2	0.02
Benzo(b)fluoranthene	µg/L	<0.02	<0.02	<0.02	NA	<0.31	<0.31	<0.02	<0.02	<0.02	NA	***0.024 J*****	***0.028 J*****	<0.02	***0.042 J*****	**0.6 J****	<0.31	<0.31	0.2	0.02
Benzo(ghi)perylene	µg/L	<0.019	<0.019	<0.023	NA	<0.47	<0.47	<0.019	<0.019	<0.023	NA	<0.023	<0.019	<0.023	0.028 J	<0.47	<0.47	<0.47	NS	NS
Benzo(k)fluoranthene	µg/L	<0.022	<0.022	<0.027	NA	<0.52	<0.52	<0.022	<0.022	<0.027	NA	<0.027	<0.022	<0.027	<0.027	<0.52	<0.52	<0.52	NS	NS
Chrysene	µg/L	<0.019	<0.019	<0.018	NA	<0.32	<0.32	<0.019	<0.019	<0.018	NA	<0.018	***0.024 J*****	<0.018	***0.033 J*****	<0.32	<0.32	<0.32	0.2	0.02
Dibenzo(a,h)anthracene	µg/L	<0.019	<0.019	<0.023	NA	<0.3	<0.3	<0.019	<0.019	<0.023	NA	<0.023	<0.019	<0.023	<0.023	<0.3	<0.3	<0.3	NS	NS
Fluoranthene	µg/L	<0.022	<0.022	<0.026	NA	<0.25	<0.25	<0.022	<0.022	0.164	NA	<0.026	0.044 J	0.059 J	0.042 J	1.51	<0.25	<0.25	400	80
Fluorene	µg/L	<0.02	<0.02	<0.02	NA	<0.39	<0.39	<0.02	<0.02	0.48	NA	<0.02	<0.02	<0.02	<0.02	<0.39	<0.39	<0.39	400	80
Indeno(1,2,3-cd)pyrene	µg/L	<0.018	<0.018	<0.027	NA	<0.26	<0.26	<0.018	<0.018	<0.027	NA	<0.027	<0.018	<0.027	<0.027	<0.26	<0.26	<0.26	NS	NS
1-Methylnaphthalene	µg/L	<0.022	<0.022	<0.019	NA	<0.55	<0.55	<0.022	<0.022	0.042 J	NA	<0.019	<0.022	<0.019	<0.019	<0.55	<0.55	<0.55	NS	NS
2-Methylnaphthalene	µg/L	<0.024	<0.024	<0.016	NA	<0.36	<0.36	<0.024	<0.024	0.033 J	NA	<0.016	<0.024	<0.016	<0.016	<0.36	<0.36	<0.36	NS	NS
Naphthalene	µg/L	<0.021	<0.021	<0.023	NA	<0.34	<0.34	0.048 J	<0.021	0.099	NA	<0.023	<0.021	<0.023	<0.023	<0.34	<0.34	<0.34	100	10
Phenanthrene	µg/L	<0.019	<0.019	<0.018	NA	<1.55	<1.55	0.02 J	<0.019	0.233	NA	<0.018	0.03 J	0.02 J	<0.018	<1.55	<1.55	<1.55	NS	NS
Pyrene	µg/L	<0.02	<0.02	<0.025	NA	<0.33	<0.33	<0.02	<0.02	0.119	NA	<0.025	0.037 J	0.082	0.062 J	1.03 J	<0.33	<0.33	250	50
Dissolved Metals																				
Arsenic	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	10	1
Barium	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2,000	400
Cadmium	µg/L	NA	NA	NA	NA	<0.16	<0.16	NA	NA	NA	NA	NA	NA	NA	NA	<0.16	<0.16	0.16 J	5	0.5
Chromium	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	100	10
Lead	µg/L	<0.7	***11***	***8.4***	NA	<0.24	<0.24	<0.7	***6.5***	***8.9***	NA	0.42 J	<0.7	***6.4***	0.93 J	<0.24	0.4	<0.24	15	1.5
Mercury	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2	0.2
Selenium	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	50	10
Silver	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	50	10

Table 3
Groundwater Analytical Data
Century City Lot 1 Area A1, Lot 2 Area A2 and B1, Lot 3 Area A
3945 North 31st Street, 2725 and 3055 West Hopkins Street, Milwaukee, Wisconsin
Sigma Project No. 14161

Well Location:		TW-12		TW-15	TW-17		TW-21	TW-241		TW-242		TW-247	NR 140 ES	NR 140 PAL
Date:		11/9/09	11/16/09	11/12/09	11/11/09	11/11/09 DUP	11/11/09	4/6/10	2/21/11	4/6/10	2/21/11	4/5/10		
Water Elevation* (feet MSL):														
PVOCs & Detected VOCs														
Benzene	µg/L	<0.41	NA	<0.41	<0.41	<0.41	<0.41	<0.38	<0.5	<0.38	<0.5	<0.38	5	0.5
Bromobenzene	µg/L	<0.43	NA	<0.43	<0.43	<0.43	<0.43	<1	<0.74	<1	<0.74	<1	NS	NS
Bromodichloromethane	µg/L	<0.41	NA	<0.41	<0.41	<0.41	<0.41	<0.64	<0.68	<0.64	<0.68	<0.64	0.6	0.06
Bromoform	µg/L	<0.46	NA	<0.46	<0.46	<0.46	<0.46	<0.39	<0.43	<0.39	<0.43	<0.39	4.4	0.44
tert-Butylbenzene	µg/L	<0.46	NA	<0.46	0.76 J	0.72 J	<0.46	<0.55	<0.71	<0.55	<0.71	<0.55	NS	NS
sec-Butylbenzene	µg/L	<0.43	NA	<0.43	3.06	2.97	<0.43	<0.59	<1	<0.59	<1	<0.59	NS	NS
n-Butylbenzene	µg/L	<1.5	NA	<1.5	1.86 J	1.69 J	<1.5	<0.94	<0.9	<0.94	<0.9	<0.94	NS	NS
Carbon Tetrachloride	µg/L	<0.43	NA	<0.43	<0.43	<0.43	<0.43	<0.25	<0.47	<0.25	<0.47	<0.25	5	0.5
Chlorobenzene	µg/L	<0.39	NA	<0.39	<0.39	<0.39	<0.39	<0.91	<0.51	<0.91	<0.51	<0.91	NS	NS
Chloroethane	µg/L	<1.5	NA	<1.5	<1.5	<1.5	<1.5	<0.67	<1.4	<0.67	<1.4	<0.67	400	80
Chloroform	µg/L	<0.48	NA	<0.48	<0.48	<0.48	<0.48	<0.32	<0.49	<0.32	<0.49	<0.32	6	0.6
Chloromethane	µg/L	<0.5	NA	<0.5	<0.5	<0.5	<0.5	<1.2	<1.9	<1.2	<1.9	<1.2	30	3
2-Chlorotoluene	µg/L	<0.37	NA	<0.37	<0.37	<0.37	<0.37	<0.51	<0.7	<0.51	<0.7	<0.51	NS	NS
4-Chlorotoluene	µg/L	<0.63	NA	<0.63	<0.63	<0.63	<0.63	<0.74	<0.44	<0.74	<0.44	<0.74	NS	NS
1,2-Dibromo-3-Chloropropane	µg/L	<2	NA	<2	<2	<2	<2	<1.9	<2.8	<1.9	<2.8	<1.9	0.2	0.02
Dibromochloromethane	µg/L	<0.76	NA	<0.76	<0.76	<0.76	<0.76	<0.7	<0.55	<0.7	<0.55	<0.7	60	6
1,4-Dichlorobenzene	µg/L	<0.77	NA	<0.77	<0.77	<0.77	<0.77	<0.95	<0.98	<0.95	<0.98	<0.95	75	15
1,3-Dichlorobenzene	µg/L	<0.34	NA	<0.34	<0.34	<0.34	<0.34	<0.79	<0.87	<0.79	<0.87	<0.79	600	120
1,2-Dichlorobenzene	µg/L	<0.66	NA	<0.66	<0.66	<0.66	<0.66	<0.84	<0.76	<0.84	<0.76	<0.84	600	60
Dichlorodifluoromethane	µg/L	<0.45	NA	<0.45	<0.45	<0.45	<0.45	<0.70	<1.8	<0.70	<1.8	<0.70	1,000	200
1,2-Dichloroethane	µg/L	<0.43	NA	<0.43	<0.43	<0.43	<0.43	<0.38	<0.5	<0.38	<0.5	<0.38	5	0.5
1,1-Dichloroethane	µg/L	<0.44	NA	<0.44	<0.44	<0.44	4.6	<0.69	<0.98	<0.69	<0.98	<0.69	850	85
1,1-Dichloroethene	µg/L	<0.47	NA	<0.47	<0.47	<0.47	<0.47	<0.7	<0.6	<0.7	<0.6	<0.7	7	0.7
cis-1,2-Dichloroethene	µg/L	<0.68	NA	<0.68	<0.68	<0.68	<0.68	<0.78	1.35 J	6.2	5.2	<0.78	70	7
trans-1,2-Dichloroethene	µg/L	<0.61	NA	<0.61	<0.61	<0.61	<0.61	<1.3	<0.79	<1.3	0.82 J	<1.3	100	20
1,2-Dichloropropane	µg/L	<0.26	NA	<0.26	<0.26	<0.26	<0.26	<0.34	<0.4	<0.34	<0.4	<0.34	5	0.5
2,2-Dichloropropane	µg/L	<0.89	NA	<0.89	<0.89	<0.89	<0.89	<0.46	<1.9	<0.46	<1.9	<0.46	NS	NS
1,3-Dichloropropane	µg/L	<0.49	NA	<0.49	<0.49	<0.49	<0.49	<0.97	<0.71	<0.97	<0.71	<0.97	NS	NS
Di-isopropyl ether	µg/L	<0.32	NA	<0.32	<0.32	<0.32	<0.32	<0.70	<0.69	<0.70	<0.69	<0.70	NS	NS
EDB (1,2-Dibromoethane)	µg/L	<0.52	NA	<0.52	<0.52	<0.52	<0.52	<0.95	<0.63	<0.95	<0.63	<0.95	0.05	0.005
Ethylbenzene	µg/L	<0.87	NA	<0.87	<0.87	<0.87	<0.87	<0.55	<0.78	<0.55	<0.78	<0.55	700	140
Hexachlorobutadiene	µg/L	<1.5	NA	<1.5	<1.5	<1.5	<1.5	<1.8	<2.2	<1.8	<2.2	<1.8	NS	NS
Isopropylbenzene	µg/L	<0.39	NA	<0.39	7.7	7.6	<0.39	<0.71	<0.92	<0.71	<0.92	<0.71	NS	NS
p-Isopropyltoluene	µg/L	<0.57	NA	<0.57	<0.57	<0.57	<0.57	<0.91	<0.92	<0.91	<0.92	<0.91	NS	NS
Methylene Chloride	µg/L	<1.5	NA	<1.5	<1.5	<1.5	<1.5	<0.47	<1.1	<0.47	<1.1	<0.47	5	0.5
Methyl-tert-butyl-ether	µg/L	<0.5	NA	<0.5	<0.5	<0.5	<0.5	<0.25	<0.8	<0.25	<0.8	<0.25	60	12
Naphthalene	µg/L	<1.7	NA	<1.7	2.32 J	2.28 J	<1.7	<2.4	<2.1	<2.4	<2.1	<2.4	100	10
n-Propylbenzene	µg/L	<0.33	NA	<0.33	10.2	10.1	<0.33	<0.67	<0.59	<0.67	<0.59	<0.67	NS	NS
1,1,2,2-Tetrachloroethane	µg/L	<0.55	NA	<0.55	<0.55	<0.55	<0.55	<0.5	<0.53	<0.5	<0.53	<0.5	0.2	0.02
1,1,1,2-Tetrachloroethane	µg/L	<0.54	NA	<0.54	<0.54	<0.54	<0.54	<0.7	<1	<0.7	<1	<0.7	70	7
Tetrachloroethene	µg/L	<0.42	NA	<0.42	<0.42	<0.42	<0.42	<0.43	<0.44	<0.43	<0.44	<0.43	5	0.5
Toluene	µg/L	<0.51	NA	<0.51	<0.51	<0.51	<0.51	<0.72	<0.53	<0.72	<0.53	<0.72	1,000	200
1,2,4-Trichlorobenzene	µg/L	<2.1	NA	<2.1	<2.1	<2.1	<2.1	<1.5	<1.5	<1.5	<1.5	<1.5	70	14
1,2,3-Trichlorobenzene	µg/L	<1.6	NA	<1.6	<1.6	<1.6	<1.6	<2.8	<1.3	<2.8	<1.3	<2.8	NS	NS
1,1,1-Trichloroethane	µg/L	<0.46	NA	<0.46	<0.46	<0.46	3.9	<0.53	<0.85	<0.53	<0.85	<0.53	200	40
1,1,2-Trichloroethane	µg/L	<0.41	NA	<0.41	<0.41	<0.41	<0.41	<0.47	<0.47	<0.47	<0.47	<0.47	5	0.5
Trichloroethene (TCE)	µg/L	<0.39	NA	<0.39	<0.39	<0.39	<0.39	<0.39	<0.47	**18.3**	**20.2**	<0.39	5	0.5
Trichlorofluoromethane	µg/L	<0.72	NA	<0.72	<0.72	<0.72	<0.72	<0.56	<1.7	<0.56	<1.7	<0.56	3,490	698
1,2,4-Trimethylbenzene	µg/L	<1.1	NA	<1.1	1.67 J	1.57 J	<1.1	<0.65	<0.8	<0.65	<0.8	<0.65	NS	NS
1,3,5-Trimethylbenzene	µg/L	<1.5	NA	<1.5	<1.5	<1.5	<1.5	<0.55	<0.74	<0.55	<0.74	<0.55	NS	NS
Total Trimethylbenzene	µg/L	<1.5	NA	<1.5	1.67	1.57	<1.5	<1.20	<0.8	<1.20	<0.8	<1.20	480	96
Vinyl Chloride	µg/L	<0.2	NA	<0.2	<0.2	<0.2	<0.2	**6.4**	**4.1**	**10**	**5**	<0.19	0.2	0.02
Xylenes, Total	µg/L	<1.6	NA	<1.6	<1.6	<1.6	<1.6	<1.62	<1.1	<1.62	<1.1	<1.62	10,000	1,000
PAHs														
Acenaphthene	µg/L	NA	<0.24	<0.24	<0.24	<0.24	<0.24	0.55	0.255	0.022 J	<0.01	0.6	NS	NS
Acenaphthylene	µg/L	NA	<0.23	<0.23	<0.23	<0.23	<0.23	0.032 J	0.029 J	0.017 J	<0.014	3.7	NS	NS
Anthracene	µg/L	NA	<0.35	<0.35	<0.35	<0.35	<0.35	0.252	0.165	0.019 J	0.015 J	0.74	3,000	600
Benzo(a)anthracene	µg/L	NA	<1.01	<1.01	<1.01	<1.01	<1.01	0.06	0.078	0.017 J	<0.014	0.102	NS	NS
Benzo(a)pyrene	µg/L	NA	<0.35	<0.35	<0.35	<0.35	<0.35	<0.016	***0.036***	<0.016	<0.011	***0.054***	0.2	0.02
Benzo(b)fluoranthene	µg/L	NA	<0.31	<0.31	<0.31	<0.31	<0.31	0.018 J	***0.046***	<0.017	<0.013	***0.076***	0.2	0.02
Benzo(ghi)perylene	µg/L	NA	<0.47	<0.47	<0.47	<0.47	<0.47	<0.017	<0.015	<0.017	<0.015	0.026 J	NS	NS
Benzo(k)fluoranthene	µg/L	NA	<0.52	<0.52	<0.52	<0.52	<0.52	<0.029	0.017 J	<0.029	<0.015	<0.029	NS	NS
Chrysene	µg/L	NA	<0.32	<0.32	<0.32	<0.32	<0.32	0.03 J	***0.046***	<0.017	<0.013	***0.072***	0.2	0.02
Dibenzo(a,h)anthracene	µg/L	NA	<0.3	<0.3	<0.3	<0.3	<0.3	<0.016	<0.016	<0.016	<0.016	<0.016	NS	NS
Fluoranthene	µg/L	NA	<0.25	<0.25	<0.25	<0.25	<0.25	0.48	0.35	<0.019	<0.012	0.41	400	80
Fluorene	µg/L	NA	<0.39	<0.39	<0.39	<0.39	<0.39	0.61	0.5	<0.018	<0.008	2.49	400	80
Indeno(1,2,3-cd)pyrene	µg/L	NA	<0.26	<0.26	<0.26	<0.26	<0.26	<0.016	<0.015	<0.016	<0.015	0.025 J	NS	NS
1-Methylnaphthalene	µg/L	NA	<0.55	<0.55	0.56 J	<0.55	<0.55	0.36	0.183	0.027 J	<0.009	2.47	NS	NS
2-Methylnaphthalene	µg/L	NA	<0.36	<0.36	<0.36	<0.36	<0.36	0.189	0.015 J	<0.017	<0.013	0.72	NS	NS
Naphthalene	µg/L	NA	<0.34	<0.34	0.45 J	0.58 J	<0.34	0.125	0.051	<0.017	<0.015	0.8	100	10
Phenanthrene	µg/L	NA	<1.55	<1.55	<1.55	<1.55	<1.55	0.65	0.26	<0.019	<0.01	1.83	NS	NS
Pyrene	µg/L	NA	<0.33	<0.33	<0.33	<0.33	<0.33	0.292	0.258	0.041 J	0.014 J	0.241	250	50
Dissolved Metals														
Arsenic	µg/L	NA	NA	NA	NA	NA	NA	0.26 J	NA	***1.1***	NA	0.83 J	10	1
Barium	µg/L	NA	NA	NA	NA	NA	NA	66	NA	140 J	NA	49	2,000	400
Cadmium	µg/L	<0.16	NA	<0.16	<0.16	NA	<0.16	<0.16	NA	<0.16	NA	<0.16	5	0.5
Chromium	µg/L	NA	NA	NA	NA	NA	NA	<0.54	NA	<0.54	NA	<0.54	100	10
Lead	µg/L	<0.24	NA	<0.24	0.53 J	NA	0.35 J	<0.24	NA	<0.24	NA	<0.24	15	1.5
Mercury	µg/L	NA	NA	NA	NA	NA	NA	<0.017	NA	<0.017	NA	<0.017	2	0.2
Selenium	µg/L	NA	NA	NA	NA	NA	NA	<0.38	NA	2.9	NA	0.8 J	50	10
Silver	µg/L	NA	NA	NA	NA	NA	NA	<0.31	NA	0.51 J	NA	<0.31	50	10

Notes:
1 NR 140 ES = Wisconsin Administrative Code, Chapter NR 140 Enforcement Standard
2 NR 140 PAL = Wisconsin Administrative Code, Chapter NR 140 Preventive Action Limit
3 NS = no standard
4 µg/L = micrograms per liter (equivalent to parts per billion, ppb)
5 NA = Not Analyzed
6 Laboratory flags: "J" = Analyte detected between Limit of Detection and Limit of Quantitatio
7 Trip blank results: All VOCs reported below laboratory detection limits.
8 Equipment blank results: All VOCs reported below laboratory detection limits.
9 Exceedances: **BOLD** = Detected concentration greater than the NR 140 ES
ITALICS = Detected concentration greater than the NR 140 PAL
10 Special notes: * = monitoring well screen submerged below water table
** = not a statistically valid PAL exceedance per NR 140.14(3)(c)



Legend

- Existing Monitoring Wells and Piezometers
- Abandoned Well
- Boring
- Boring and Abandoned Temporary Well
- Soil Vapor Probes
- Post Excavation Sample Location
- UST Historical Data
- USTs Removed
- Historic Building Outline
- Existing Building Outline
- Petroleum Soil Remediation Extent
- Area A Boundary

SOIL QUALITY LEGEND

VOCs and PAHs reported in micrograms per kilogram (µg/kg).
Metals reported in milligram per kilogram (mg/kg).

NA	=	Not analyzed
BG	=	Background levels
< RCL/BG	=	Concentrations reported less than the state RCLs or background levels
BLUE	=	Concentrations > Groundwater pathway RCL
[ ]	=	Concentrations > Industrial Direct Contact RCL

DCD-SB255

Date:	3/16/10
Depth:	1-3
VOCs	NA
PAHs	>GW RCL
Metals	<RCL

DCD-SB2

Date:	9/29/09	
Depth:	2-4	17-19
VOCs	<RCL	<RCL
PAHs	>DC RCL	<RCL
Metals	<RCL	<RCL

DCD-SB254

Date:	3/16/10
Depth:	0-1
VOCs	NA
PAHs	>GW RCL
Metals	
Lead	130

DCD-SB3

Date:	9/30/09	
Depth:	1-3	7-9
VOCs	<RCL	<RCL
PAHs	>DC RCL	<RCL
Metals		
Lead	99	6.1

DCD-SB4

Date:	9/29/09	
Depth:	2-4	11-13
VOCs	<RCL	<RCL
PAHs	<RCL	<RCL
Metals		
Lead	98	8.4

DCD-SB7

Date:	9/30/09	
Depth:	1-3	9-11
VOCs		
Naphthalene	1320	< 117
PAHs	>DC RCL	<RCL
Metals		
Lead	52	8.5

DCD-SB6

Date:	9/29/09	
Depth:	2-4	5-7
VOCs	<RCL	<RCL
PAHs	>DC RCL	<RCL
Metals		
Arsenic	0.44 J	<1.6

DCD-SB256

Date:	3/16/10
Depth:	1-3
VOCs	NA
PAHs	>GW RCL
Metals	
Lead	210

DCD-SB8

Date:	10/19/09
Depth:	5-6
VOCs	<RCL
PAHs	>DC RCL
Metals	<BG

DCD-SB9

Date:	9/29/09	
Depth:	2-4	10-12
VOCs	<RCL	<RCL
PAHs	<RCL	>GW RCL
Metals	<BG	<BG

DCD-SB11

Date:	9/29/09	
Depth:	2-4	7-9
VOCs	<RCL	<RCL
PAHs	>DC RCL	<RCL
Metals	<BG	<BG

DCD-SB12

Date:	9/30/09	
Depth:	0-2	7-9
VOCs	<RCL	<RCL
PAHs	>DC RCL	<RCL
Metals		
Lead	120	7.8

DCD-SB249

Date:	3/12/10
Depth:	1-3
VOCs	<RCL
PAHs	>GW RCL
Metals	
Lead	320

DCD-SB14

Date:	10/7/09	
Depth:	2-4	5-7
VOCs	<RCL	<RCL
PAHs	<RCL	<RCL
Metals		
Arsenic	[14]	<3.2
Barium	180	75
Lead	49	7.8

DCD-SB13B

Date:	10/20/09
Depth:	7-8
VOCs	<RCL
PAHs	>DC RCL
Metals	
Lead	200

DCD-SB15

Date:	10/7/09	
Depth:	1-3	8-10
VOCs	<RCL	<RCL
PAHs	>DC RCL	<RCL
Metals	<BG	<BG

DCD-SB17

Date:	10/7/09	
Depth:	1-3	5-7
VOCs	<RCL	<RCL
PAHs	<RCL	<RCL
Metals		
Barium	21	3200
Lead	12	170

DCD-SB16

Date:	10/7/09	
Depth:	2-4	6-8
VOCs	<RCL	<RCL
PAHs	>DC RCL	<RCL
Metals		
Lead	31 J	7.8

DCD-SB248

Date:	3/12/10	
Depth:	1-3	4-6
VOCs		
Carbon Tetrachloride	< 28	175
PAHs	<RCL	<RCL
Metals		
Lead	8.8	66

DCD-MW1

Date:	11/17/09	
Depth:	0-2	14-16
VOCs		
Carbon Tetrachloride	34 J	< 21
Trichloroethene (TCE)	28.7 J	< 20
PAHs	<RCL	<RCL
Metals	<BG	<BG

DCD-SB20

Date:	10/16/09
Depth:	4-5
VOCs	<RCL
PAHs	<RCL
Metals	
Lead	64

DCD-SB21

Date:	10/7/09	
Depth:	1-3	6-8
VOCs		
Benzene	42 J	< 20
PAHs	>GW RCL	<RCL
Metals		
Arsenic	[14]	<1.6
Lead	37	8.9

DCD-SB24

Date:	10/7/09	
Depth:	1-2	11-13
VOCs	<RCL	<RCL
PAHs	<RCL	>GW RCL
Metals		
Lead	1.9	57 J

DCD-SB22

Date:	10/7/09	
Depth:	1-3	8-10
VOCs	<RCL	<RCL
PAHs	>GW RCL	<RCL
Metals	<RCL	<RCL

DCD-SB283

Date:	7/1/11	
Depth:	2-3	6-7
VOCs	<RCL	<RCL
PAHs	>GW RCL	<RCL
Metals	NA	NA

DCD-SB247

Date:	3/16/10	
Depth:	1-3	8-10
VOCs	<RCL	<RCL
PAHs	>GW RCL	>GW RCL
Metals		
Lead	89	4.9

DCD-SB23

Date:	10/7/09	
Depth:	1-3	5-7
VOCs	<RCL	<RCL
PAHs	<RCL	<RCL
Metals		
Selenium	0.7 J	2.5

DCD-SB25

Date:	10/8/09	10/15/09
Depth:	3-4	12-14
VOCs	<RCL	<RCL
cis-1,2-Dichloroethene	<24	330
Vinyl Chloride	<17	27.7 J
PAHs	<RCL	<RCL
Metals	<BG	<BG

DCD-SB239

Date:	3/17/10	
Depth:	2-4	5-7
VOCs		
Trichloroethene (TCE)	287	98 J
PAHs	<RCL	<RCL
Metals	<BG	<BG

DCD-SB26

Date:	10/16/09
Depth:	7-8
VOCs	<RCL
PAHs	>GW RCL
Metals	<BG

DCD-SB242

Date:	3/17/10	
Depth:	1-3	4-6
VOCs		
cis-1,2-Dichloroethene	<44	370
trans-1,2 Dichloroethene	<43	243
Trichloroethene (TCE)	1350 BC	166
Vinyl Chloride	<33	340
PAHs	<RCL	>GW RCL
Metals		
Lead	45	[2300]

DCD-SB282

Date:	7/1/11	
Depth:	3-4	6-7
VOCs		
cis-1,2-Dichloroethene	500	1880
trans-1,2 Dichloroethene	840	<22
Trichloroethene (TCE)	126	1400
Vinyl Chloride	21.2 J	56
PAHs	<RCL	<RCL
Metals	NA	NA

DCD-SB236

Date:	3/17/10	
Depth:	1-3	4-5
VOCs	<RCL	<RCL
cis-1,2-Dichloroethene	510	2690
trans-1,2 Dichloroethene	<43	350
Trichloroethene (TCE)	3400 BC	4400 BC
PAHs	>GW RCL	>GW RCL
Metals		
Arsenic	[16]	[2.7]
Cadmium	4	0.18 J
Lead	260	41

DCD-SB241

Date:	3/17/10	
Depth:	1-3	4-6
VOCs		
Naphthalene	<53	1840
PAHs	<RCL	>GW RCL
Metals		
Lead	7.1	74

DCD-SB237

Date:	3/17/10	
Depth:	2-4	4-6
VOCs	<RCL	<RCL
PAHs	<RCL	<RCL
Metals		
Arsenic	[5.5]	[8.7]
Lead	27	19

DCD-SB279

Date:	7/1/11	
Depth:	1-2	6-7
VOCs	<RCL	<RCL
PAHs	>GW RCL	<RCL
Metals	NA	NA

DCD-SB278

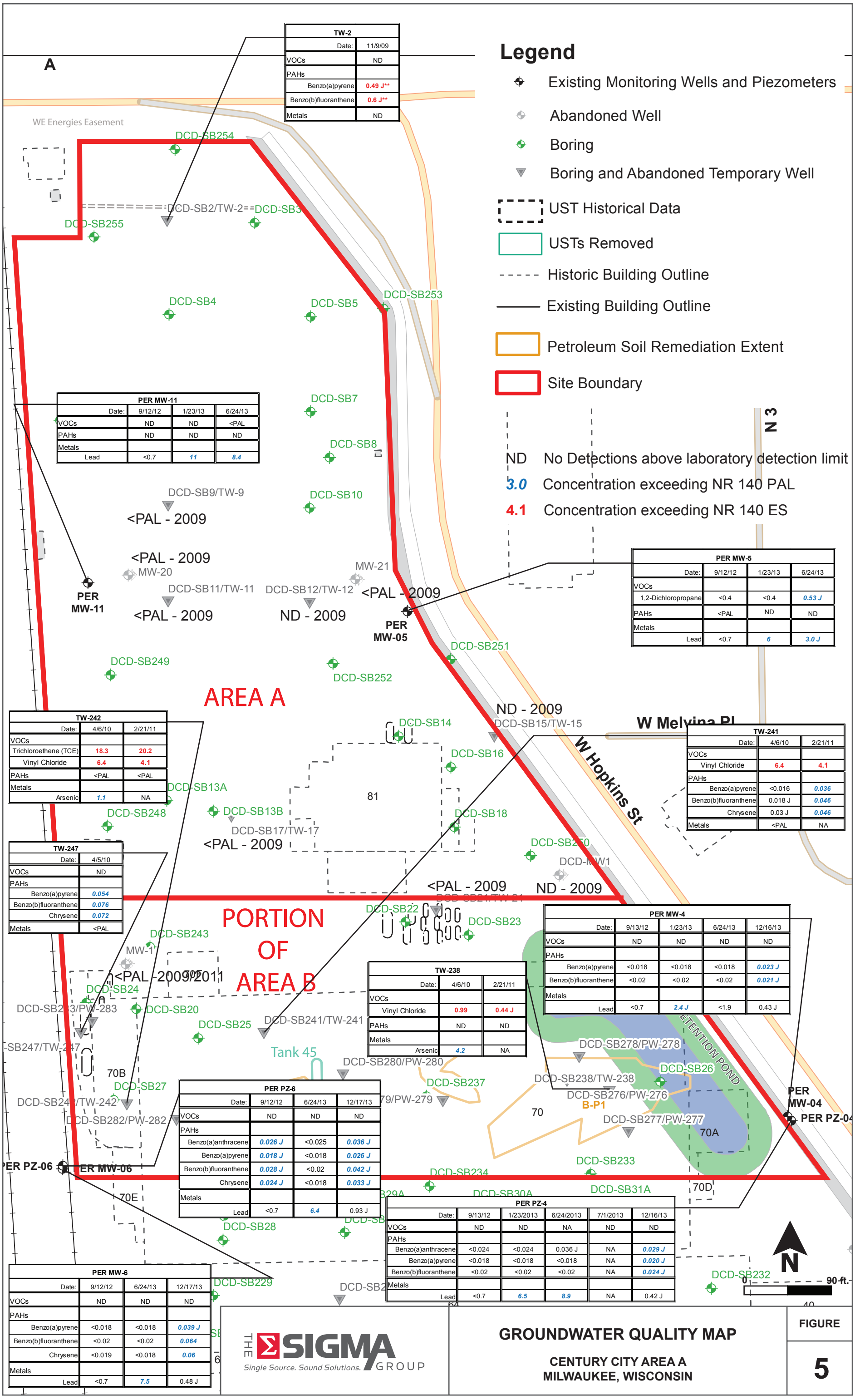
Date:	7/1/11	
Depth:	2-3	6-7
VOCs		
Trichloroethene (TCE)	21.6 J	<17
Vinyl Chloride	<16	101
PAHs	<RCL	<RCL
Metals	NA	NA

THE SIGMA GROUP
Single Source. Sound Solutions.

SOIL QUALITY MAP
(EXCEEDANCES OF RCLS OR BACKGROUND LEVELS ONLY)

CENTURY CITY AREA A
MILWAUKEE, WISCONSIN

FIGURE
5



Legend

- Existing Monitoring Wells and Piezometers
- Abandoned Well
- Boring
- Boring and Abandoned Temporary Well
- UST Historical Data
- USTs Removed
- Historic Building Outline
- Existing Building Outline
- Petroleum Soil Remediation Extent
- Site Boundary

ND No Detections above laboratory detection limit
3.0 Concentration exceeding NR 140 PAL
4.1 Concentration exceeding NR 140 ES

TW-2	
Date:	11/9/09
VOCs	ND
PAHs	
Benzo(a)pyrene	0.49 J**
Benzo(b)fluoranthene	0.6 J**
Metals	ND

PER MW-11			
Date:	9/12/12	1/23/13	6/24/13
VOCs	ND	ND	<PAL
PAHs	ND	ND	ND
Metals			
Lead	<0.7	*11*	*8.4*

PER MW-5			
Date:	9/12/12	1/23/13	6/24/13
VOCs			
1,2-Dichloropropane	<0.4	<0.4	*0.53 J*
PAHs	<PAL	ND	ND
Metals			
Lead	<0.7	*6*	*3.0 J*

TW-242		
Date:	4/6/10	2/21/11
VOCs		
Trichloroethene (TCE)	18.3	20.2
Vinyl Chloride	6.4	4.1
PAHs	<PAL	<PAL
Metals		
Arsenic	*1.1*	NA

TW-241		
Date:	4/6/10	2/21/11
VOCs		
Vinyl Chloride	6.4	4.1
PAHs		
Benzo(a)pyrene	<0.016	*0.036*
Benzo(b)fluoranthene	0.018 J	*0.046*
Chrysene	0.03 J	*0.046*
Metals	<PAL	NA

TW-247	
Date:	4/5/10
VOCs	ND
PAHs	
Benzo(a)pyrene	*0.054*
Benzo(b)fluoranthene	*0.076*
Chrysene	*0.072*
Metals	<PAL

PER MW-4				
Date:	9/13/12	1/23/13	6/24/13	12/16/13
VOCs	ND	ND	ND	ND
PAHs				
Benzo(a)pyrene	<0.018	<0.018	<0.018	*0.023 J*
Benzo(b)fluoranthene	<0.02	<0.02	<0.02	*0.021 J*
Metals				
Lead	<0.7	*2.4 J*	<1.9	0.43 J

TW-238		
Date:	4/6/10	2/21/11
VOCs		
Vinyl Chloride	0.99	0.44 J
PAHs	ND	ND
Metals		
Arsenic	*4.2*	NA

PER PZ-6			
Date:	9/12/12	6/24/13	12/17/13
VOCs	ND	ND	ND
PAHs			
Benzo(a)anthracene	*0.026 J*	<0.025	*0.036 J*
Benzo(a)pyrene	*0.018 J*	<0.018	*0.026 J*
Benzo(b)fluoranthene	*0.028 J*	<0.02	*0.042 J*
Chrysene	*0.024 J*	<0.018	*0.033 J*
Metals			
Lead	<0.7	*6.4*	0.93 J

PER PZ-4					
Date:	9/13/12	1/23/2013	6/24/2013	7/1/2013	12/16/13
VOCs	ND	ND	NA	ND	ND
PAHs					
Benzo(a)anthracene	<0.024	<0.024	0.036 J	NA	*0.029 J*
Benzo(a)pyrene	<0.018	<0.018	<0.018	NA	*0.020 J*
Benzo(b)fluoranthene	<0.02	<0.02	<0.02	NA	*0.024 J*
Metals					
Lead	<0.7	*6.5*	*8.9*	NA	0.42 J

PER MW-6			
Date:	9/12/12	6/24/13	12/17/13
VOCs	ND	ND	ND
PAHs			
Benzo(a)pyrene	<0.018	<0.018	*0.039 J*
Benzo(b)fluoranthene	<0.02	<0.02	*0.064*
Chrysene	<0.019	<0.018	*0.06*
Metals			
Lead	<0.7	*7.5*	0.48 J

THE SIGMA GROUP
Single Source. Sound Solutions.

GROUNDWATER QUALITY MAP

CENTURY CITY AREA A
MILWAUKEE, WISCONSIN

FIGURE
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