Appendix E

Construction Site Stormwater Activities

Part V-Construction Observation and Inspection Requirements

City of Bend, Oregon

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Contents

Abbreviations and Acronyms

ANSI	American National Standards Institute
AWWA	American Water Works Association
CAgT	Certified Aggregate Technician
CAT-I	Certified Asphalt Technician I
CAT-II	Certified Asphalt Technician II
CCT	Concrete Control Technician
CDT	Certified Density Technician
CEBT	Certified Embankment and Base Technician
CIP	Capital Improvement Project
City	City of Bend, Oregon
CMDT	Certified Mix Design Technician
CSTT	Concrete Strength Testing Technician
ESCP	Erosion and Sediment Control Plan
MFTP	Manual of Field Test Procedures (ODOT)
MUTCD	Manual of Uniform Traffic Control Devices
ODOT	Oregon Department of Transportation
OSS	Oregon Standard Specifications
PFIA	Public Facilities Improvement Agreement
QCT	Quality Control Technician
PVC	Polyvinyl chloride

1. Introduction

1.1 Purpose

The purpose of this document is to provide clear expectations for Contractors, Developers, Engineers of Record and City staff engaged in construction of public infrastructure that will be accepted for ownership and maintenance by the City.

1.2 Definitions

Certified Test Technician – A test technician certified by ODOT as a Certified Aggregate Technician (CAgT), Certified Embankment and Base Technician (CEBT), Certified Density Technician (CDT), Certified Asphalt Technician I (CAT-I), Certified Asphalt Technician II (CAT-II), Certified Mix Design Technician (CMDT), or Quality Control Technician (QCT), Concrete Control Technician (CCT), Concrete Strength Testing Technician (CSTT) or approved other.

City Inspector – The person observing construction on behalf of the City to verify that the project is constructed in accordance with the approved construction documents and City of Bend Standards and Specifications. The City Inspector may be an employee of the City or may work for an entity contracting with the City to provide construction inspection services.

Contract Documents – For public improvement projects, Contract Documents are the contract between the City and the entity constructing the public improvements. For private development projects that include public improvements, the Contract Documents include, but are not limited to, the Public Improvement Facilities Agreement (PFIA), approved infrastructure plans, and the City of Bend Standards and Specifications.

Contractor – The entity constructing the work.

Engineer of Record or EOR – The licensed professional engineer providing professional engineering services. The Engineer of Record may be under contract with the City or a Developer, or other third party (i.e., franchised utility).

Developer – The entity that is paying for financing and constructing a utility, street, road, or other facility that will be owned and maintained by the City.

Private Development Project – A project owned and constructed by a private entity that includes public infrastructure to be transferred to the City for perpetual operations and maintenance (commonly water, sewer, stormwater, and street facilities).

Resident Project Representative or RPR – The authorized representative under the direction of the Engineer of Record assigned to the project to assist the Engineer of Record.

2. Inspection Authority and Requirements

2.1 General

The Public Facilities Improvement Agreement (PFIA) for private development projects must include provisions governing the structure of the City's inspection authority. For Development projects, unless otherwise indicated the PFIA, the Engineer of Record and their Resident Project Representative are authorized to observe construction to verify that materials, methods, and workmanship used by the Contractor to meet the requirements of the approved engineered specifications and construction documents.

2.2 Authority of the City

City Inspectors are authorized to represent the City Engineer to perform the following:

- Inspect work performed and materials furnished including, without limitation, the preparation, fabrication, or manufacture of materials to be used.
- Orally reject defective materials or work and confirm such rejection in writing.
- By oral order, temporarily suspend the work for improper prosecution pending the City Engineer's decision.
- Exercise additional delegated authority.

City Inspectors are not authorized to:

- Address apparent Contractor safety concerns (unless as otherwise stated).
- Accept work or materials except as delegated by the City Engineer.
- Alter or waive provisions of the Contract Documents.
- Give instructions or advice inconsistent with the approved Contract Documents.

The City Engineer, or authorized representative, and City Inspectors are authorized to visit public improvement construction sites to observe the progress and quality of Contractor's work. These inspections are not intended to be the sole inspection services provided for a private development project and are not meant to be exhaustive. The EOR shall provide construction inspection services.

The City Engineer shall designate a City Inspector as the primary point of contact for the City during the construction period. All initial inquires, clarifications, documentation and communications shall be coordinated through the designated City Inspector. The City Inspector shall coordinate with the City Engineer and other City Departments as needed throughout the construction period.

2.3 Role of the Engineer of Record

For private development projects, the EOR is the person responsible for the design of the public improvements in accordance with the Bend Standards and Specifications. The EOR is required to

provide construction phase services during the construction period of the project. These services include but are not limited to:

1. Pre-Construction Meeting – Attend and participate in the City's mandatory pre-construction meeting prior to commencement of any work on the site.

2. Schedules – Review Contractor schedules to determine applicability of the schedule to the major project milestones and critical path elements as required by the Contract Documents and Contractor's construction timeline. Any discrepancies or issues that would adversely affect the quality of work as defined in the Contract Documents or have a significant impact on existing City facilities shall be immediately reported to the City Inspector for evaluation and final determination.

3. Maintain a project log book of site visit reports containing the following applicable information:

    a. Names and contact information for all Contractors, subcontractors, and major suppliers of materials and equipment.

    b. Site development permit number.

    c. Date and time (arrival and departure) of site visits.

    d. Weather conditions, including temperature.

    e. A description of construction activities and equipment on site.

    f. Statements of directions to change plans, specifications, stop work, reject materials, or other work quality actions.

    g. Public agency contacts which result in plan changes or other significant actions.

    h. Perceived problems and action taken.

    i. Final and staged inspections.

    j. Specific Observations to provide additional detail as in the case of observing testing procedures.

    k. General remarks including citizen contact or complaints.

    l. Information on the Erosion and Sediment Control Best Management Practices and status of applicable inspection reports.

    m. Digital Photo Log of Construction Activities.

4. Site Visit Reporting – The EOR shall submit to the designated City Inspector a Monthly Project Status Report on the progress of construction. The report shall include copies of the Site Visit Reports and a summary of activities that were performed during that month, including but not limited to:

        a. Description of work performed

        b. Identify any construction or design issues.

        c. Document any approved field changes, change orders or design revisions.

d. Updated construction schedule

e. Summary of any public agency contacts

f. Summary of any citizen complaints or contacts.

The City may elect to require more frequent reporting based on the complexity and construction schedule of the project. If the reports become more than two weeks in arrears, or are significantly deficient as determined by the City, a stop work order may be posted on the project site.

5. Site Visits and Observation of Construction – Conduct on-site visits to observe the Contractor's work in progress to determine if the work is proceeding in general conformance with the Contract Documents. Visits to the site shall be conducted as the EOR deems necessary at intervals appropriate to the various stages of construction. The EOR shall coordinate with the designated City Inspector in advance of scheduled inspections, tests, and system start-ups that require City personnel to be in attendance. These required inspections shall be identified at the pre-construction meeting.

6. System Start Ups - Verify that tests, equipment, and systems start-ups, as well as operating and maintenance trainings are conducted with the appropriate City personnel. These requirements shall be identified at the pre-construction meeting.

7. Defective Work Notification – If during the course of construction, the EOR observes any work that is defective and does not meet the requirements of the approved Contract Documents, the EOR shall immediately notify the designated City Inspector to determine if any work shall be corrected, rejected, or should be uncovered for observations, or requires special testing, inspection, or approval of the City Engineer.

8. Clarifications and Interpretations – Issue necessary clarifications and interpretations as initiated by the Contractor in reference to the Contract Documents.

9. Modifications or Change Orders – Provide recommendations of approval or denial to the City Engineer of any project modifications or change orders that directly alter the Contract Documents.

10. Shop Drawings and Material Samples Submittals – Review and approve or recommend another action in respect to Shop Drawings and Material Samples that the Contractor is required to submit by the Contract Documents. The EOR is reviewing only for conformance with the information in the Contract Documents and for compatibility and intent with the proposed approved design. The EOR's approval or other action does not extend to the means, methods, techniques or construction procedures of the Contractor.

    The EOR shall review the following submittals as required but not limited to:

    - Drainage Structures (manholes and inlets) Shop Drawings
    - Work Containment Plans and Systems
    - Bridge Removal Plans
    - Shoring and Falsework Calculations and Drawings
    - Reinforcing Steel Shop Drawings
    - Prefabricated Steel Shop Drawings
    - Prefabricated Concrete Shop Drawings

- Concrete Mix Designs
- Pavement Designs
- Material Submittals and Certifications
- Pile and Driving Equipment submittal
- Bridge Rail and Protective Fencing Shop Drawings
- Retaining Wall Calculations and Drawings
- Drilled Shaft Submittals
- Lighting Pole and Traffic Signal Pole Submittals

11. Substitutes and "or equal" – Review and provide a recommendation to the City Engineer indicating the acceptability of Contractor's request for substitute or "as-equal" materials and equipment.

12. Special Inspections and Tests – Receive and review all certificates of special inspections and test results from an independent testing laboratory as required by the Contract Documents. The Engineer of Record shall be entitled to rely on the results of such tests for the purpose of determining that the certified results indicate compliance with the Contract Documents. The review does not constitute an independent evaluation that the methods for inspections and test results comply with the requirements of the Contract Documents.

13. Standard Documentation - Provide documentation using the most recent version of the City inspection forms to document all work. The EOR may require additional documentation as necessary to meet the needs of the design. The required documentation forms shall be determined at the pre-construction meeting

14. Project Files - Maintain orderly files for project correspondence, Contract Documents, site visit reports, work change directives, clarifications of Contract Documents, shop and sample submittals received from the contractor, and other Project-related documents

15. Final Acceptance Documentation – Coordinate with the Contractor, special inspectors, and independent testing laboratories to receive, compile, and review all required completion documents as required.

16. Substantial Completion – After notification from the Contractor that the project is in substantial completion with the Contract Documents, the EOR shall visit the project to determine if the work is substantially complete and that a Final Acceptance Request can be submitted to the City Engineer. If the work is not substantially complete, then the EOR shall provide an itemized punch list to the Contractor and the City Inspector that must be remedied prior to submitting the Final Acceptance Request to the City.

17. Final Acceptance Request – Upon receipt of the Final Acceptance Request from the EOR, the City Inspector shall schedule a final site visit to the project to determine if the completed work of the contractor is acceptable and can recommend in writing to the City Engineer that the work can be accepted by the City.

2.4 Role of the Resident Project Representative

The EOR may elect to provide a qualified RPR to assist the EOR in the progress and quality of the Contractor's Work. The RPR shall be designated as the EOR's representative at the project site, and shall act as directed by and under the direct supervision of the EOR. The existence of an RPR shall

not limit, extend, or modify the EOR's responsibilities or authority. The EOR shall verify that the RPR has competent work related experience appropriate for the requirements for each project. RPR's should have the appropriate following ODOT Inspector Certifications or equivalent and relevant experience:

- Certified Bridge Construction Inspector (CBCI)
- Certified Environmental Construction Inspector (CECI)
- Certified Traffic Signal Inspector (CTSI)
- Certified General Inspector (CGI)
- Certified Hot Mixed Asphalt Concrete Inspector (HMAC)Certified Drilled Shaft Inspector (CDSI)

If a RPR is utilized by the EOR, the City reserves the right to require replacement of the RPR if it is determined that the RPR is not qualified or has the required competency to perform the work required by the City.

2.5 Limitations of the Engineer of Record and Resident Project Representative

Observations and site visits conducted by the EOR and RPR are not required to be exhaustive or to extend to every aspect of the Contractor's Work, but rather may be limited to periodic verifications, select sampling, and similar methods of general observation of the Contractor's Work based on the EOR's exercise of professional judgment. The purpose of the EOR's visits, and representation by the RPR, if any, is intended to enable the EOR to provide the City with a greater degree of confidence that the completed public improvements will conform in general to the requirements of the Contract Documents. Based on the information obtained during site visits, the EOR shall determine, in general, if the Contractor's Work is proceeding in accordance with the Contract Documents. The EOR shall be required to keep the City informed of the progress work through the submittal of the required Site Visit Reports.

The EOR and RPR shall not be responsible to have control over the Contractor's work or have authority of the Contractor's means, methods, techniques, sequences or procedures of construction. In addition, the Contractor shall be responsible for all safety and security of the project site and shall be solely responsible to ensure compliance with all laws and regulations applicable to the Contractor's work. The EOR's inspection is not to guarantee of the performance of any Contractor nor responsible for the Contractor's failure to furnish or correctly perform the work in accordance with the Contract Documents.

2.6 Pre-Construction Meeting

A pre-construction meeting shall be held following construction drawing approval and prior to 'Notice to Proceed' for construction. Before the meeting can be held, all necessary agreements must be signed, City of Bend easements must be recorded, and all final payments must be received. Items to be discussed/supplied are:

1. The Work: Construction documents, agreements, bonds, public facilities improvement agreement, and right of way permit.

2. Contractor's work schedule.

3. City Inspector assignment.
4. Traffic Control Plan/Public Notification.
5. Sub-Contractors and suppliers, including testing laboratories/engineering firms.
6. EOR approved material submittals proposed to be furnished (that is, type, brand, etc., trench backfill-sieve/proctor.)
7. Public safety requirements.
8. Any work requiring inspection outside normal work hours shall require prior coordination and advance payment of an hourly rate as established in the most recent City of Bend fee resolution.
9. Standard requirements for working in the City of Bend right of way.
10. Change/substitution request procedures.

No work shall be performed until a pre-construction meeting has been held with the City. At the pre-construction meeting, a City Inspector shall be assigned to the project and **all** communications, changes, and field decisions shall be coordinated through this inspector.

Progress Meetings
The City Inspector is not expected to participate in any progress meetings held by the Developer and Contractor.

Post-Construction Review
A post-construction meeting may be requested by the City Engineer, Developer, or the Contractor.

Meetings Required by the Supplemental Specifications
When required by Contract Documents, the City Inspector shall be permitted to participate in these meetings.

Public improvements may fall within the jurisdiction of several governmental agencies; for example, Deschutes County, ODOT, etc. When multiple jurisdictions are involved, the Developer, Contractor, and/or Engineer of Record, shall coordinate with and obtain all necessary approvals. The Contractor shall verify all approvals before starting work. The City may stop work on any project that lacks a necessary approval.

The Developer, EOR, and Contractor shall copy the City on all written correspondence with authorizing agencies.

2.7 Changes to Approved Plans or Character of Work

The EOR must notify the City Inspector of changes from the approved Contract Documents. Changes to the approved documents require approval of the City Engineer. The designated City Inspector may approve a minor change (as determined by the City Inspector) and require that the change is properly documented on the Record Drawings. Significant changes as determined by the City Engineer shall require the Developer to submit a plan revision in conformance with this document indicating the proposed changes and an explanation providing the issue and need for the design alteration. The revision shall be reviewed and construction of any changes may not proceed without City Approval. The EOR and RPR do not have authority to approve field changes.

2.7.1 Plan Revisions

Revisions to the Contract Documents are defined as all changes made between the dates the project plans are approved by the City and the date the Record Drawings are accepted as complete by the City.

The particular area of the drawing where a major revision has been made shall be clouded, and the appropriate revision number placed in a triangle shall be shown in that location. The clouded area shall not be shaded or in any form of grey tones.

Revisions shall be listed in the title block of the drawing and shall show:

1. The revision number in a triangle (revisions shall be consecutively numbered on each drawing beginning with number one).
2. Note: A particular set of revisions which may affect several drawings will not necessarily be identified with the same revision number, depending on the number of prior revisions made to each particular drawing.
3. The date the revision was made on the drawing.
4. Note: A particular set of revisions which may affect several drawings shall be assigned the same date even though the actual work involved may take several days to complete.
5. The initials of the person making the revision.

2.8 Modification Criteria

The City Engineer may make project-specific modifications and amendments to an existing standard or specification as authorized by the City Standards based on the following criteria:

1. The standard is inapplicable to a particular situation.
2. Topography, right-of-way, or other geographical conditions or impediments impose an undue economic hardship on the applicant, and an equivalent alternative that can accomplish the same design objective is available and does not compromise public safety, increase short/long term maintenance or cause future increased costs of accessibility.
3. A change to a standard is required to address a specific design or construction problem, and if not modified, the standard will impose an undue hardship on the applicant with little or no material benefit to the public.

2.9 Site Visits and Construction Observation

2.9.1 General

For private development projects, construction of all public improvements shall be observed by the EOR or a qualified RPR under the direct supervision of the EOR. The City will not authorize work to begin on public improvement without designation of the EOR and RPR, if applicable, at the City's

mandatory pre- construction conference. All inspection costs, including required testing, shall be paid by the owner or developer.
The City's policies on inspection services for infrastructure improvements are as follows:

1. **City Inspection Services:** The City will provide only "spot check" inspection services. These services do not relieve the Developer, Engineer of Record, or Contractor of responsibility for proper construction and compliance with the Contract Documents and these Standards and Specifications, nor do City inspection services constitute approval of any modification to the approved construction plans.

2. **Engineer of Record Services:** The EOR and RPR services are the primary construction observation services on a project. These site visits shall be more comprehensive and extensive than City inspection services, and are the responsibility of the owner, developer, and Engineer of Record.

2.9.2 Limitations of City Inspection Services:

The City Inspectors may make site visits to observe the progress of work and provide project coordination. These services do not relieve the Contractor of the responsibility for proper construction and compliance with the requirements of the Contractor Documents, nor do City inspection services constitute approval of any modification to the approved construction plans. The City Inspectors shall provide, but are not limited to, the following services:

1. Acting as a liaison between the designated EOR, RPR, and the City
2. Inspect both work progress and performance testing results.
3. Administrative and coordination activities as required for supporting the processing and completion of the project.
4. Issuing a stop work order to the EOR. If the EOR is not available, the stop work order may be posted.
5. Informing the City Engineer of all proposed plan changes, material changes, stop work orders, or errors or omissions in the approved plans or specifications. Any revision to approved plans must be under the direction of the EOR. The City's inspector has discretion as to whether the revision is significant enough to warrant review by the City Engineer.
6. The City Inspectors shall be notified of all water and sewer connections into active City Lines.

2.9.3 Advance Notification for City Inspection

City inspections will be provided when requested at least 48-hours in advance. The City may at times be able to inspect on shorter notice. Any work performed without a required inspection shall be subject to removal at the City Inspector's discretion.

2.10 Communications

2.10.1 Written Communications

All project communications, required documentation, interpretations, clarifications, and changes to the Contract Documents s will be issued in writing when required by the Contract Documents.

The City Inspector may provide verbal notification to the Contractor, EOR, or RPR at the job site if the work is observed to not conform to the construction documents. The substance of this communication will be included in the City Inspector's regular written reports. The City Inspector will initiate formal, written notice to the Contractor when the work does not meet the requirements of the Contract Documents.

2.11 Record Drawings

The City requires approved record drawings, survey notes and Contractor field installation notes as a condition of final acceptance for all improvement projects.

Failure to maintain accurate record drawings shall be a basis for a stop-work order by the City Engineer.

2.11.1 Record Drawings

Record drawings shall be original single matte film, at least three mil thick, rendered to provide for clear blue line copies and electronic scanned prints. The record drawing shall contain the same data shown on the construction Contractor's field installation notes, symbols and identifiers of data provided by the construction Contractor, and data provided by the EOR.

Record drawings shall include at a minimum:

1. Construction Contractor's name.
2. Engineering firm's name and address.
3. All certifications or professional seals as required by the State of Oregon's regulations and as stated in the foregoing.
4. Numbers for permits issued during design and construction (i.e., ODOT/PF, ROW, Wetlands, Recorded Easements, etc.).
6. A brief description of the any field revisions.
7. Any waivers acquired either during the design or construction on the record drawings.
8. Pertinent information from the Contractor's redline drawings of the facilities as-constructed.
9. Pertinent field installation notes from the line and grade books.
10. Station and elevation of all utilities encountered in the trench.
11. Horizontal and vertical attribute values in accordance with the City Standards and Specifications.

The EOR shall fix any errors in the calculations with the Contractor prior to submittal to the City for approval.

2.11.2 Record Drawing Stamp and Certification Statements

The EOR shall provide the following certification stamp to the Record Drawings. This stamp (in PDF and dwg format) is available from the City Engineer.

RECORD DRAWING CERTIFICATION

I certify that this project has been constructed in substantial compliance with the City approved plans and the City of Bend Public Improvement Construction Procedure Standard and Specifications, dated July 1, 2011. This certification is based on periodic inspections performed by me or by representatives under my direct supervision and information provided by the Construction Contractor and other independent testing and inspection agencies. The information provided by others has been assumed to be correct and has not be verified by the Engineer. This certification indicates that I have reviewed this information and verified that any revision(s) or changes as defined by the record do not appear to be adverse to the planned use and/or intent of the original design.

_____ *(Engineer's Stamp)*

Signature

_____

Date

2.11.3 Survey and Field Installation Notes

A post-construction survey shall be performed to include the items addressed in this section. The post construction survey notes, the construction Contractor's field installation notes, the engineer's daily inspection notes, and the record drawings shall be submitted to the City for review and approval.

Construction surveys shall include at a minimum:

1. Contractor's name and address
2. Line and grade survey notes
3. Surveyor's firm's name and address

4. Construction survey notes

Field installation notes from the Contractor shall contain the horizontal and vertical location information as constructed including, but not limited to:

1. Manholes and cleanouts, horizontal station and vertical elevations;
2. Valves, fire hydrants, key boxes, PRV's and mechanical joint fittings;
3. Make, model and location of all thrust restraint fittings and total footage of pipe restrained;
4. Service connections at the mains and stationing;
5. Special fittings;
6. All encountered utilities, any pipe or street insulation and limits of all fabric material;
7. Changes in pipe size, slope or type; and,
8. Service locations at property lines swing-tied to above-ground facilities, such as fire hydrants, houses, light poles, or water key boxes. For sanitary sewer, give the invert elevation of the connection at the property line or easement line. Buried or Unmarked Appurtenances

Buried or unmarked appurtenances are not justifiable reasons for not submitting Record Drawings. If necessary, the developer or engineer shall uncover or expose the appurtenances and all utilities required for proper records. The Record Drawings should state who provided the record information.

2.11.4 Sanitary Sewer and Water Record Drawings

Record Drawings shall include:

1. Vertical and horizontal location on all tees, bends, valves, restrained piping and fittings, hydrants, manholes, cleanouts, changes in alignment, and ends of pipe. Vertical and horizontal location at minimum intervals of 300 feet on extended runs without alignment change or fittings.
2. Lineal footage of pipe installed, including revisions to stationing and elevations.
3. Vertical and horizontal location on all existing utilities exposed by the trench excavation. Horizontal location may be relative to the line being installed.
4. Horizontal location on new surface features such as valves, hydrants, key boxes, manholes, cleanouts, any repair coupling, etc. This information should be relative to street center lines and/or property lines. Key boxes and sanitary sewer service connections shall be measured from property corners.
5. Horizontal location or stationing from the nearest feature at any change in pipe material (i.e., transitions to ductile, change in pipe class, etc.).
6. Areas where foundation material is used and/or where bedding material is imported.
7. Water and sewer service connection chart data.
8. Vertical elevation of the service connection at the main and at the property line. Horizontal offset measurement of the service connection to the property line on the plan view.

9. Information on subsurface soil conditions encountered in trenches every 300 feet or where significant changes occur. Particular emphasis shall be placed on native materials at the bottom of the trench. Areas where over-excavation is performed and foundation material is placed shall be delineated.
10. Location and stationing of all pipe abandonment. Include both length of pipe removed and pipe abandoned in place.
11. Horizontal and vertical location of any approved sanitary sewer or water service connection Pig-Tail(s).
12. Location size and type of all cathodic protection devices.
13. Horizontal dimensions of building foot prints.
14. Horizontal dimensions of all easements.

Any changes authorized in the field shall be shown and noted as "field change".

2.12 Final Acceptance and Project Closeout

The EOR shall submit a formal Final Acceptance Request to the City when all required work has been completed. The EOR shall compile and submit the following closeout documentation:

1. A complete set of Record Drawings
2. Contractor's field installation notes of the facilities as-constructed
3. EOR and RPR's inspection reports,
4. All lab and on-site materials testing reports/results
5. Original construction field survey notes,
6. Drywell Testing Reports and final Grading and Drainage Certification Letter
7. ADA Compliance Documents
8. Final water and sewer testing documents
9. Any other documentation as required by the City.

The City Inspector shall schedule a final project inspection on submission of required complete Project Closeout documentation. The City Inspector shall issue a Final Project Punch List. Once all the punch list items are completed, the City Inspector shall notify the City Engineer when all requirements of the Contract Documents have been completed.

The City Engineer shall then coordinate with the Developer to complete all required final project acceptance and warranty documents. Once all the required documents are completed and the warranty financial guarantees have been accepted by the City, the City Engineer shall issue a Certificate of Substantial Completion that establishes a specific date for the project substantial completion, recommendations for approval for occupancy of the project or final plat signatures, and the initiation of the warranty period as required by Contract Documents.

2.12.1 Warranty Period

The City Engineer and City Inspectors shall monitor the project during the warranty period and schedule a final project inspection with the Owner approximately 30 days before the end of the warranty period. The City Inspector shall issue a Final Warranty Punch List to the Owner if there are any items that need to be corrected. The Owner shall be responsible to repair all punch list items and notify the City Inspector to verify all items have been repaired to the satisfaction of the City. The City Inspector shall notify the City Engineer after all requirements of the warranty period have been successfully completed. The City Engineer shall than issue a Certification of Final Project Acceptance and release the warranty document.

2.12.2 Final Acceptance and Use of System Improvements

The public system improvements shall be available for public use only after Final Acceptance, or by approval with the City Engineer.

3. Other Considerations

3.1 Contractor Responsibilities

3.1.1 General

Any Contractor or sub-Contractor performing work on City facilities must be pre-approved by the City. The Contractor must meet the City's insurance, bonding and business license requirements.

Any Contractor and sub-Contractor shall employ responsible and qualified personnel to perform the work. If the City Engineer or designee deems any employee or contractor to be unqualified, the unqualified person shall be immediately replaced.

3.1.2 Public Notification

Any impeding or interruptions of existing public services requires 48 hours' prior notice to the public. Each notification shall be the responsibility of the Contractor performing the work and shall be coordinated with the City Inspector. Failure to adequately notify the public may result in an immediate suspension of the Contractor's activities.

Project-specific requirements enacted through PFIA, or other agreements made on Development projects, shall supersede this notification requirement.

3.1.3 City of Bend Fire Department Requirements

3.1.3.1 Fire Safety during Construction

a) Approved Fire Department access roads, water supply, and fire hydrants shall be installed and accepted for operation prior to any combustible construction, unless otherwise approved in writing by the Fire Department.

b) All construction activities shall maintain horizontal and vertical clearance from existing structures during construction to facilitate fire department access (i.e., work in right of way may provide a physical barrier or operational issue preventing fire department and emergency services appropriate access to properties.) Coordinate work sequencing to avoid such conflicts and to provide fire department and emergency services access through construction in the right of way.

3.1.3.2 Obstruction and Protection of Fire Hydrants

a) A 3-foot clear space shall be maintained around the perimeter of fire hydrants at all times.

b) Fire hydrants shall comply with City standards.

3.2 Construction

3.2.1 Work Hours, Trespass, Staging Areas, and Sanitation

Work hours are subject to the following limitations:

1. **Noise:** All construction activities must comply with the noise restrictions of the Bend Municipal Code.

2. **Lane Restrictions:** Unless approved by the City Engineer, arterial roads shall have no lane restrictions from 6:30 am to 9:00 am and from 3:30 pm to 6:30 pm. Collectors and Neighborhood Routes with an Average Daily Traffic of over 1000 trips shall have no lane restrictions from 7:00 am to 8:30 am and from 4:00 pm to 6:00 pm.

3. **Trespass:** The Contractor shall limit work, including any physical disturbance, to the area defined within the boundaries of the easements and right-of-way shown on the approved plans for the project. The Contractor shall be solely responsible for any trespass upon adjacent property including all claims, fines, penalties and other remedies deemed applicable under Federal, State, County, and local laws, rules, ordinances, and regulations.

4. **Staging and Stockpiling Areas:** The Contractor shall be required to obtain all necessary permissions, right-of-way permits, easements, and any other permits associated with equipment and material staging areas. Stockpiling and staging of equipment and materials within the public right of way is not allowed without approval of the City Engineer. These areas may be subject to local regulation and it is the sole responsibility of the Contractor to ensure that such regulations are satisfied. Materials shall be stored in a manner to ensure quality for use. Temporary fencing may be required for security and/or safety concerns.

5. **Sanitation:** The Contractor shall be responsible for providing adequate sanitation facilities (e.g. Portable restrooms, etc.) at the job site for its employees and those of its sub-Contractors. Access to these facilities shall also be made available to City representatives.

6. **Disposal of spoils:** The Contractor shall obtain all necessary land use approvals and disposal or fill permits for the off-site disposal of spoils from the construction site.

3.2.1.1 Safety Requirements

1. The Contractor is responsible for the safety of the work and of all persons and property coming into contact with the work. The Contractor shall conduct his work in such a manner as to comply with all the requirements prescribed by OSHA. Traffic control in work zones shall conform to the MUTCD and the ODOT supplements to the MUTCD. A traffic control plan shall be submitted and approved by the City prior to construction.

2. The City and its agents have no responsibility or liability relating to the safety of the work, or the enforcement of OSHA rules.

3. City may stop work if a serious safety issue is not addressed or corrected.

3.2.1.2 Scheduling

Sequence of operations:

1. The Contractor shall plan construction work and execute his operation with a minimum of interference with the operation of the existing public facilities. It may be necessary for the Contractor to schedule work outside normal working hours in order to avoid undesirable conditions. Work outside of normal working hours will require the approval of the City Engineer or designee. All scheduling is subject to the City's approval and does not relieve the Contractor from making work available for inspection.

2. Connections between existing work and new work shall not be made until the new work is found to conform in all respects to the requirements of the plans and specifications.

Progress of Construction:

Construction shall proceed in a systematic manner that will result in a minimum of inconvenience to the public.

3.2.1.3 Preservation, Restoration, and Cleanup:

1. The Owner, Developer, and Contractor must not disturb the following site features and amenities, unless expressly allowed by the permit or construction documents:
    a. Existing drainage patterns and features;
    b. Existing vegetation, shrubs, trees, and landscaping;
    c. Public property, improvements, operations, and services;
    d. Private property and improvements;
    e. Access to public and private property and the enjoyment of same;
    f. Private utility facilities and services;
    g. Street signing, mail boxes; and,
    h. Other site features and amenities that the construction documents expressly indicate are to be preserved, protected, or maintained.
2. Disturbance of any existing drainage features or drainage features access shall not be left un-restored for more than 8 hours unless an extension is granted by the City.
3. No disruptions of public utility services shall last for more than 4 hours except that private utility services may be restored at the utility providers own convenience. The Contractor shall provide temporary utility services during the period of disruption of utility services that is beyond 4 hours, until the service is fully restored, unless an extension is granted by the utility provider.
4. No disturbance of other amenities shall be left un-restored for more than 12 hours unless more immediate restoration is required by the City or an extension is granted by the City.
5. Ongoing site maintenance and cleanup shall be performed during construction. The Contractor shall keep the premises clean and orderly at all times during the work and leave the project free of rubbish or excess materials of any kind upon completion of the work. During construction, the Contractor shall stockpile excavated materials so as to do the least damage to adjacent lawns, grassed areas, gardens, shrubbery, trees, or fences, regardless of the ownership of these areas.
6. Existing trees to be preserved shall be protected by tree protection fencing. Stockpiling of excavated material or the storage of construction material or equipment, shall not be permitted within the drip line of existing trees to be preserved.
7. All existing storm systems shall be cleaned and flushed, and original drainage capacity restored. Sediment, rock, and other debris shall be collected and disposed of in a manner meeting

DEQ standards. In no case shall debris be flushed down a storm or sanitary sewer for disposal. All damaged water pipes and appurtenances; sanitary sewer, and storm drainage facilities, irrigation and house drainage pipe, drain tiles, sewer lateral, and culverts shall be repaired and restored to City standards.

8. All areas of existing public rights-of-way and easements disturbed by the Contractor's operations shall be restored to their original condition or better as approved by the City Inspector. Areas outside public right-of-way that are disturbed by the Contractor's operations shall be graded and restored to original condition. The Contractor shall obtain a written release from property owners, for any claims of injury or property damage, when property is not restored to its original condition. The Contractor shall submit a copy of the written release to the City prior to final acceptance.

9. Street Cleanup: The Contractor shall clean up all spilled dirt, mud, rock, gravel, and other foreign material deposited by the Contractor's construction operations from all streets and roads at the conclusion of each day's operation, or as directed by the City. Cleaning shall be by grader and/or front-end loader, supplemented by power brushing and hand labor, unless otherwise approved by the City. Washing of streets with a water truck will not be permitted. Sawcut slurry shall be removed from the street and disposed of in an approved manner. The Contractor shall follow the City's erosion control procedures.

10. Dust Prevention: During all phases of work, the Contractor shall take precautions to abate any dust nuisance by cleaning up, sweeping, sprinkling with water, or other means as necessary to accomplish results satisfactory to the City. Dust prevention measures shall be continuous until final acceptance by the City. Obtaining water from a hydrant will require a bulk water permit from the City Water Department

11. Streams and Sensitive Areas: The Contractor shall comply with all provisions of the permits required by the Oregon Department of Environmental Quality (DEQ), Oregon Division of State Lands (DSL) and/or the U.S. Army Corps of Engineers (USACE).

3.2.1.4 Materials

1. All construction material and components used in the construction of public improvements shall be new manufacture, unless otherwise specified by the City. New manufacture materials do not include re-built, reconditioned, or refurbished materials. All new manufactured construction materials or components shall be installed as designed by the manufacturer.

2. No alteration of materials or components shall be made without consent of the City Engineer.

3. Substitution of Products, "Approved Equal" Designation: Whenever a product, manufacturer's name or brand, or a specific item is designated, it shall be understood that the words "or approved equal" follow such designation. Determination of quality in reference to the project design requirement will be made by the City Engineer. A Contractor shall not use an alternative product without prior written approval of the City. A request to designate an alternative product as an "approved equal" shall be processed as if the alternative product were a modification under Section 140 of this manual.

4. All project submittals will be approved by the EOR and provided to the City electronically prior to the Pre-construction meeting. A hard copy of all approved submittals will be kept on site during construction at all times. Substitutions of approved equals will need to be approved with the EOR and the City prior to their use.

3.2.1.5 Environmental Protection during Construction

General Policy and Requirements

It is the policy of the City to require temporary and permanent measures for all construction projects to lessen the adverse effects of construction on the environment:

1. The City may, in addition, require that a construction project be scheduled so as to minimize erosion or other environmental harm.
2. The Contractor shall comply with all necessary City, DEQ, DSL, USACE, and any other applicable requirements and permits.
3. The Contractor shall properly install, operate, and maintain both temporary and permanent measures as provided in this section or in an approved plan, to protect the environment during the term of the project.
4. Nothing in this section shall relieve any person from the obligation to comply with the regulations or permits of any federal, state, or other local authority.

3.2.1.6 Erosion Control

1. Erosion and sediment control design and construction methodologies must meet or exceed the applicable standards of the City and DEQ.
2. The Engineer shall obtain and submit DEQ NPDES permit approvals for the project, if applicable.
3. Measures to prevent erosion at construction sites shall be incorporated into the construction drawings and specifications.
4. Areas for borrow pits and waste disposal shall be in locations with appropriate land use approvals and permits with full consideration of erosion control needs during and after borrow or disposal operations.

3.3 Contractor's Responsibility for Existing Utilities

Maps and information regarding underground utilities should be obtained from the utility owning and operating the utilities. The locations of the utilities are not guaranteed. 48 hours' notice shall be given to all utility operators that may be affected by the construction operation. Should a utility service be interrupted due to the construction operation, the proper authority shall be notified immediately and the utility service should be restored.

The Contractor shall exercise due care in protecting property and shall restore any property disturbed by the construction to as near original condition as possible.

The Contractor shall notify, at least two business days in advance of work, by calling the Oregon Utility Notification Center at 1-800-332-2344 in accordance with State law.

The contractor must be granted permission by the affected agency before exposing any utility. It shall be the Contractor's responsibility to locate and expose all of the existing underground utilities in advance of the trenching operation in accordance with State law (i.e. Potholing).

It shall be the Contractor's responsibility to protect all utilities and appurtenances above and below the ground from damage. The Contractor shall provide sufficient notice in advance of construction operations to permit the necessary arrangements with the affected utility company for protection or relocation of the interfering utility. The Contractor shall be solely and directly responsible to the Agency and operators of the utilities for any issues or claims arising out of the work done under the contract.

The Contractor shall promptly notify the apparent owner of the utility in the event of interruption to any utility service as a result of being exposed, unsupported, or accidental breakage. Contractor shall cooperate with the authority in restoration of service as promptly as possible and shall bear all costs of repair.

The City is not responsible to the Contractor for damages as a result of inaccuracies in the location or existence of the underground utilities.

3.4 Field Relocation

Minor relocations of the work shall be made only by direction or approval of the City Engineer or City Engineer's representative.

3.5 Blasting

When the Development project involves blasting, Contractor shall provide warning to all persons within the blast zone, together with the stationing of Contractor personnel at strategic locations to prevent persons and vehicles unaware of the danger from entering the blasting area.

The following are to be submitted at the Pre-construction Conference prior to performing blasting work. Additional approvals and submittals may be required by other agencies with jurisdiction.

1) Blasting Plan per Standard Specifications Part 00335.
2) Evidence of insurance.
3) Licenses of blasting personnel.

A permit from the Oregon Department of Fish and Wildlife (ODFW) is required for any use of explosives in the cause of removing any obstruction in any waters of this state, in constructing any foundations for dams, bridges or other structures, or in carrying on any trade or business.

Bend code requires a notification of all building occupants within 100 feet of the blast site be notified prior to blasting. The OSS requires a minimum of 300 feet (dependent on the amount and type of explosive used) and a minimum of 48 hours-notice prior to blasting. The OSS specification part 00335 will be used in all cases unless otherwise approved by the City Engineer.

4. Enforcement

4.1 General

This Section 4 Enforcement describes the enforcement procedures that will be used to enforce Part V Construction Inspection Requirements. This Chapter is to be applied in conjunction with the Bend Code (http://www.codepublishing.com/OR/bend/), the Bend Development Code and other portions of the Bend Standards and Specifications.

The intent is to clearly outline a process that will lead to the voluntary compliance of the "responsible party" as defined in Bend Code 1.40.005D.

4.1.1 Violation

Each violation will be documented and forwarded to the City Engineer for review. The corrective action process may not always commence with the verbal warning or include every step listed below. The City Engineer, or their designated representative, may immediately issue a stop work order for any work done in violation of any applicable law, regulation, or these Standards and Specifications. Each situation will be evaluated given the nature and seriousness of the violation, the work history, and the onsite conditions. The City may take any or all of the following steps and may vary the order of the steps:

1. Verbal warning (written follow up)
2. Written Warning
3. Stop work and suspension of construction privileges in the City of Bend
4. Civil infraction and penalties under Bend Code Chapter 1.40.

A corrective action plan will be included in each of the first three steps to provide a path towards compliance with the Construction Inspection Requirements, the BSS, approved contract plans and specifications, and all other applicable regulations.

Appendix A

These are the preferred Construction Observation tasks and guide lines for the construction of improvements that will be accepted by the City. The EOR will determine to what extent inspection is necessary to ensure that the improvements are constructed in compliance with the approved Contract Documents. This is not a comprehensive list, and the EOR may need to add additional inspection requirements as prescribed by the approved plans.

The EOR or RPR should complete the following tasks, if relevant to the development:

1. Confirm erosion and sediment control measures have been provided prior to site activities that have potential to cause erosion or sediment movement.
2. Confirm that materials delivered meet requirements of the construction documents. The EOR may conduct field tests of material and request copies of manufacturers' certifications to verify that material at the construction site meets requirements of the construction documents.
3. Confirm that required permits have been obtained.
4. Observe subgrade conditions before work bearing on the subgrade is placed. Compaction testing or proof rolling (as appropriate) may be requested by the EOR or City Inspector.
5. Observe placement of bedding or base materials.
6. Review test results from Contractor-provided testing including: density tests on fill materials, such as bedding, backfill, and road base, and asphaltic concrete paving. Additional density tests will be performed to verify in-place densities. Test procedures for density testing are described in the ODOT *Manual of Field Test Procedures* (MFTP).
7. Observe backfill methods for placement, lifts, and compaction.
8. Confirm measurement for payment on unit price contracts if a City Contract.
9. If a traffic control plan is required, the EOR should provide periodic site visits to observe if the approved traffic plan is implemented.
10. Observe topsoil and landscaping placement as specified.
11. Verify that requirements of the construction documents for irrigation and maintenance of landscaping materials are met during the specified maintenance period.
12. Coordinate transfer of Agency-furnished materials, products, and equipment.
13. Observe project start-up and commissioning activities.
14. Observe and document required testing of equipment.
15. Check grades of buried pipe.
16. Observe final installation of buried structures prior to backfill

For Waterline construction, in coordination with City's inspector, perform the following inspections and record date of each:

1. Observe fire hydrant installation, assuring that the hydrant is braced properly, gravel is placed around drain ports, the fire hydrant branch restraining devices have been installed, the hydrant and isolation valve operate properly, and the valve box is free of debris.
2. Observe operation of valves from fully open to fully closed and verify that debris has not been left within the valve box. Verify that the valve is left in the position required for system operations. Coordinate with the city inspector and fire department for marking of hydrants which are to remain out of service.
3. Check joint type is per specifications and joint assembly practices.
4. Observe pipe restraints and verify that restrained lengths match those shown in the construction documents.
5. Check line and grade to verify straightness of pipe installation before covering. Acceptable pipe deflection and deviations from line and grade are defined by the Standard Specifications.
6. Check for pipe location with respect to easements.
7. Observe bedding procedures and verify that bell holes are provided.
8. Observe hydrostatic pressure test and verify that leakage is within acceptable limits specified by AWWA for the joint type and pipe material.
9. Coordinate with City Inspector and observe flushing and disinfection and verify that chlorinated water is disposed of following state and federal regulations.
10. Obtain from City test results of bacteria test sampling performed by City and verify that written test reports from a certified laboratory demonstrate that the samples passed the testing.
11. Obtain from Contractor test reports from all new backflow preventers.
12. Test control valves, following establishment of proper settings by Contractor.
13. Test meters, pressure gauges, and other instruments for proper operation.
14. Observe pipe has been stored properly, is US made per specifications, is undamaged, and is clean of pests and debris before being placed in the trench.
15. Confirm notifications of residents of temporary shutdowns required to perform the work.

For sanitary sewer pipe systems construction, in coordination with City Inspector, perform the following inspections and record date of each:

1. Gravity sewer pipe
    a. Confirm that the sewer pipe has been stored properly.
    b. Check each piece of pipe for damage upon delivery to project site prior to Contractor commencing excavation for pipe placement.
    c. Check joint type is per specifications and joint assembly practices.

d. Make a line and grade check before covering.

e. Make sure excavation has been provided for projecting bells.

f. Check lateral connections for proper installation.

g. Perform pressure testing as specified.

h. Check for pipe location with respect to easements (if any).

i. City crews will perform television inspection of pipes to confirm condition, no presence of debris, and pipe invert vertical sags and deflection compliance.

j. Review City-performed TV test results with City staff and confirm that deficiencies have been addressed.

2. Pressure sewer pipe and sewer force-mains

    a. Confirm that the sewer pipe has been stored properly.

    b. Check each piece of pipe for damage before lowering into the trench.

    c. Make a line and grade check before covering (minimum cover and location of high points in pressure sewer).

    d. Make sure excavation has been provided for projecting bells.

    e. Check lateral connections, and check valves for proper installation.

    f. Perform pressure testing as specified.

    g. Check pipe pigging facilities (if present), including valves, drains, foundation supports, linings and coatings, and appurtenances.

    h. Check for pipe location with respect to easements (if any).

3. Check manhole installations.

    a. Confirm inverts are formed per construction documents.

    b. Confirm manhole materials (including lining, gaskets, castings, ladders/steps) as required by specifications.

    c. Confirm gasket installation as required.

    d. Confirm manhole exterior coating and exterior joint seals as required (possible for high groundwater areas).

    e. Verify that sample manhole (even if not in public right of way), meets design and construction standards.

4. Observe placement of cut-off walls if part of the design.

5. For flexible pipe (for example, PVC), observe specified mandrel test to verify that deflection of flexible pipe does not exceed limits allowed by the Standard Specifications.

6. If video inspection of the sewer is specified, verify that video of the pipe installation meets requirements.

7. Observe a hydrostatic or low pressure air test on pipe system and manhole as specified. Low pressure air test shall conform to the requirements of Uni-Bell B-6-90, *Recommended Practice for Low Pressure Air Testing of Installed Sewer Pipe*.

8. Equipment - Pump Stations

    a. Verify hydrostatic testing of wet well.

    b. Follow procedures identified in Supplemental Specifications, including Equipment Testing and Facility Startup.

    c. Confirm equipment nameplate data versus approved submittals.

    d. Perform functional and performance testing per equipment specifications.

    e. Obtain copies of sign-offs for all required building permits

    f. Test each unit process (pumps, chemical feed systems, odor control systems, etc.) independently, and then as complete system.

    g. Inspect all hardware to ensure nets, bolts, chains and all other fasteners and hardware are made of the appropriate grade of stainless steel.

    h. Inspect guiderails for proper alignment, installation, and material.

    i. Inspect all components of the facility against approved submittal from Contractor / vendor / supplier.

9. Equipment - Engine Generator and Automatic Transfer Switch

    a. Follow procedures identified in Supplemental Specifications, including Equipment Testing and Facility Start-up.

    b. Confirm equipment nameplate data versus approved submittals.

    c. Perform functional and performance testing per equipment specifications.

    d. Simulate power failure and test system operation.

    e. Test auxiliary power connection and transfer switch with portable generator, as applicable.

For Stormwater construction, in coordination with City's inspector, perform the following inspections and record date of each:

1. Observe erosion controls, sediment controls, and construction site pollution prevention. These items are required by City development code, design standards, and are intended by City standards to be included on the approved construction plans for all CIP and Development projects.
    a. Confirm erosion and sediment control plan (ESCP) is submitted and approved.
    b. Confirm that ESCP has been implemented and that erosion and sediment control protection has been provided for existing drainage facilities.
2. Observe construction of catch basins.
    a. Observe excavation.
    b. Observe placement of rebar.
    c. Observe concrete pours and check mix age, temperature, mix composition and slump to determine compliance with specifications in accordance with ODOT MFTP.
    d. Check pipe wall thickness for compliance with plan.
    e. Check castings for compliance with specifications.
    f. Check for proper protection bars, if required.
    g. Confirm all interior joints are grouted per specifications (lid to base).
3. Observe construction of manhole installations.
    a. Confirm inverts are formed per construction documents.
    b. Confirm manhole materials (including lining, gaskets, castings, ladders/steps, riser ring shims) as required by specifications.
    c. Confirm gasket installation as required.
    d. Confirm manhole exterior coating and exterior joint seals as required (possible for high groundwater areas).
4. Check pipe installation.
    a. Check for proper pipe orientation.
    b. Check for connection of laterals.
    c. Check outlet location and invert from all structures.
    d. If corrugated metal pipe is allowed by the Design Standards, check for proper location of longitudinal laps and circumferential laps.
    e. Check for pipe location with respect to easements.
    f. Confirm manhole interior joints are sealed per specification.

g. Confirm channel inverts are smooth and properly aligned.

h. City crews will perform television inspection of pipes to confirm condition, no presence of debris, and pipe invert vertical sags and deflection compliance.

i. Review City-performed TV test results with City staff and confirm that deficiencies have been addressed.

5. Check treatment facility installation.

    a. Check grading versus plan and site planimetrics to confirm placement as designed (ie, within right-of-way or within established private easements.)

    b. Verify swale or other facility dimensions

    c. Verify swale infiltration, if swales provided

    d. Check plantings, if provided, against specifications.

6. Check underground injection control (drywell).

For street construction, in coordination with City's inspector, perform the following inspections and record date of each:

1. Subgrade and Base

    a. Check that all prior construction requirements are completed; for example, utilities, sewers, water pipe, electrical and communication conduit, curb and gutter work.

    b. Check that manholes and valve boxes are brought to finish grade.

    c. Check that soil foundation preparation and stabilization has been completed per specifications.

    d. Check that density, moisture, and thickness of base and subbase meet specifications.

    e. Check for protection and setting of hubs by the Contractor. Confirm grade stakes are established.

    f. Review requirements and procedures with the Contractor, including sources of base and subbase, soil stabilization method, material tests and approvals, and compaction tests.

    g. Check for soil movement under rollers and hauling equipment to locate soft spots.

    h. Confirm backfilled trenches are sufficiently dry and ready for base and subbase construction.

    i. Sample base and subbase materials and confirm results are satisfactory.

    j. Collect delivery tickets for tonnage payment from certified Weighmaster.

    k. Test for compacted density of subbase and base.

l. Check Contractor's provisions for protecting finished subgrade. Do not permit subgrade to dry out prior to being covered with finished surfacing.

2. Surfaces

    a. Check plans and specifications for pavement type, thickness, method of payment, number of courses, and other project-specific paving requirements.

    b. Check that subgrade meets grade, cross-section, and compaction requirements. Check that subgrade is frost free.

    c. Check that all underground construction is completed.

    d. Check that manholes and valve boxes are marked.

    e. Check that contact surfaces and joints are prepared.

    f. Review procedures and requirements with Contractor.

    g. Check Contractor's preparations, source of paving material, and condition of equipment.

    h. Check for report from Plant Inspector sent with the first loads of materials.

    i. Check that pavement material meets specified requirements.

    j. Observe whether pavement placement and finishing are meeting specifications.

    k. Check that temperatures are correct for rolling. Check that ambient temperatures are warm enough for paving.

    l. Check that cleanup operations are adequate, including removal of all temporary signage.

    m. Check that all detours are properly setup and all signage is in place.

    n. Check that samples taken are representative and in accordance with the specifications.

    o. Refer to the sidewalk checklist below for additional guidelines for inspecting concrete pavement.

3. Sidewalks

    a. Verify that Contractor has notified nearby property occupants and potential users about the work to be performed and established accessible detour routes.

    b. Check to see that the subgrade meets specified requirements.

    c. Check grades for proper slopes to meet city and ADA requirements.

    d. Check that all vault, meter boxes, and pull boxes are set to grade, oriented parallel with curb, and located in appropriate horizontal position per standard details (ie. not in sidewalk, except where allowed).

    e. Check that tree wells are blocked out.

f. Check that blockouts for street lights and traffic signals are in place.

g. Check that concrete meets specified requirements.

h. Check that required reinforcement is installed per specifications.

i. Check edging.

j. Check surface for texture meeting specified requirements.

k. Check application of curing compound if required.

l. Check application of joint sealing compound if required.

m. Check joint sawing operation.

n. Check that work is properly barricaded and protected while the concrete pour cures. Check that concrete is properly blanketed to protect it during freezing weather.

4. Curbs and Gutters

   a. Check that headers are securely staked.

   b. Check that radius of curb returns are per plan.

   c. Check that driveway and ADA ramp depressions are located and marked properly.

   d. Check if keys, dowels, or performed joint filler (PJF) are required for adjoining sidewalk (if required, provide per specifications and standard detail).

   e. Check curb grades.

5. Transit Facilities

   a. Complete inspection for other features as specified (sidewalks, signage)

   b. The EOR will complete US Access Board ADAAG Form 29a: Transportation Facilities -- Bus Stops. This checklist is intended to confirm that design standards have been met in the constructed facility.

CITY OF BEND

ANNOUNCES STORMWATER MANAGEMENT TRAINING WEBINARS

Landscape Architects, Construction Inspectors, Planners, Engineers, Project Proponents, Reviewers, and Agency Staff Are Invited

The City of Bend Stormwater Utility is sponsoring these upcoming webinar training opportunities. Attendance is free. Contact us for information on PDH`s.

Biotic Soil Amendments for Site Revegetation
Wednesday, April 15, 2015 10:00 AM to 11:00 AM

From IECA website announcement:
Do your sites all to often fail at meeting revegetation establishment goals? Come learn the advantages of biotic soil amendments for site re-vegetation, about products that are commercially available, and examine several field case studies. Biotic Soil Amendments, BSA's, have become a cost effective way to successfully revegetate sites with poor soils. BSA's offer a cost effective way to jump start the soil building process at the time of seeding to ensure the site will be stable long term. This presentation explores the available BSA's and follows case studies of their effective use on challenging projects.

Instructors:
Alex Zimmerman, CPESC, CISEC, CESCL

Construction Inspection Techniques that Really Work
Wednesday, June 17, 2015 10:00 AM to 12:00 PM

From IECA website announcement:
This webinar is a welcome departure from traditional theory and speculation; it will consist of real world examples on how inspection techniques and programs can make a remarkable difference in construction site compliance. Participants in this course will be able to integrate several, concrete steps to change the condition of their existing projects to environmentally compliant, profitable projects. Take the time to refresh your set of skills on stormwater compliance, learn more profitable techniques, and experience lessons from project experience in several areas to bring back to your site. You will not be disappointed, this course is fast paced, filled with realistic tools, and designed with the end user benefits in mind.

Instructors:
Jennifer L. Hildebrand, CPESC, CPSWQ

TO REGISTER

For the webinars, please register by emailing or calling David Buchanan, City of Bend, dbuchanan@bendoregon.gov or (541) 693-2176 with your name, agency/company, and contact information.

Register today—seating is limited

Spring 2015

Why?

Protection of our water resources is important for our river, and associated economy; and for protection of our drinking water aquifers. Private and public Underground Injection Controls (UICs) such as drywells and drill holes are prevalent here, and these must meet Oregon Department of Environmental Quality and federal requirements to protect groundwater quality. The workshops will provide tools to help effectively address stormwater quality requirements, including Bend Code Title 16.

Location

City of Bend Utilities
Eisenhower Training Rm
62975 Boyd Acres Rd
Bend OR, 97701

CITY OF BEND UTILITY DEPARTMENT
62975 BOYD ACRES RD.
BEND, OREGON, 97701
541-317-3000
FAX: 541-317-3046
Wendy Edde, *Stormwater Program Manager*

Accessible Meeting Information
This meeting event/location is accessible. Sign language, interpreter service, assistive listening devices, materials in alternate format, such as Braille, large print, electronic formats and audio cassette tape, or any other accommodations are available upon advance request. Please contact the City of Bend Accessibility Manager Karin Morris no later than three days prior to the webinar at 541-693-2141, Accessibility@ci.bend.or.us, and/or fax 541-385-6676. Providing at least 3 days notice prior to the event will help ensure availability.

Thank you for Attending!

Biotic Soil Amendments for Site Revegetation

(April 15, 2015)

PLEASE SIGN IN

	Name (Please Print)	Department/Affiliation	Sign-in or Initial
1	*David Buchanan*	*City of Bend*	
2	*Mike Beaulieu*	*COCC*	
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Biotics in Soil Restoration & Site Revegetation

Restore – Reveg - Reclaim

The Biotic Approach Asks…

- Is importing topsoil really needed for establishing vegetation and controlling erosion?

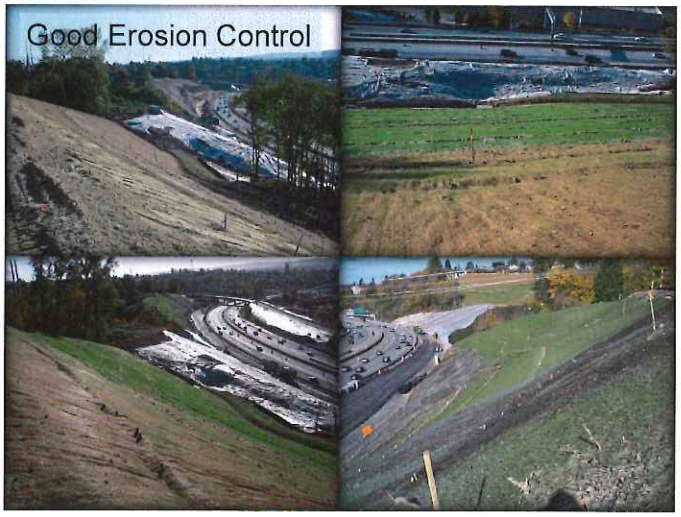
NEW SOLUTIONS

FOR THE SAME OLD PROBLEM

Conventional "Fixes"

- Sit upon the surface and focus more on immediate surface protection from detachment.

Good Erosion Control



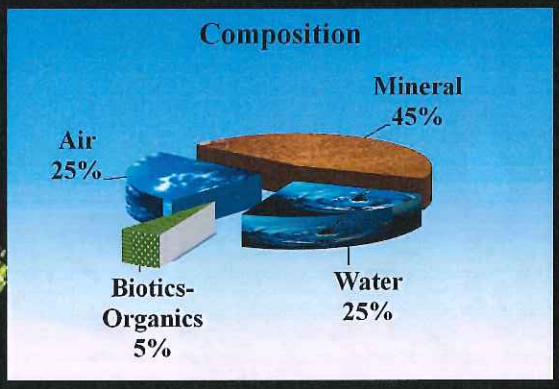
- The function of biotic elements is soil improvement.
- They should promote natural microbial activity, and natural topsoil forming processes, the hallmarks of healthy vegetation-supporting soil systems.

Conventional Reactions

Apply Herbicides, Chemicals, Fertilizer & Re-seed

Vegetation Performance Failures

What is Soil?

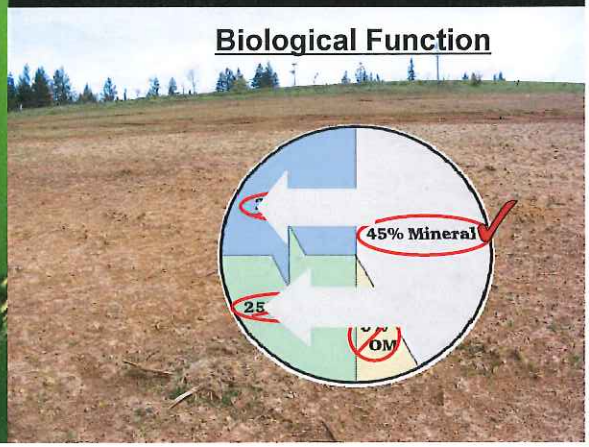


Without Biological Function

Vegetation is Unsustainable

What's Missing For Revegetation?

Biological Function



What sources of organic matter are available?

- **Peat Moss** is a great source of organic matter and a favorable growing medium; and a renewable natural resource
- **Compost** may contain some nutrients however, frequently it is not consistent in texture, quality, and *may* import contaminants such as hydrocarbons, metals, pathogens, pesticides and weeds

DESIGNED USING BIO MIMICRY

Think of it as "innovation inspired by nature." The core idea is that nature, imaginative by necessity, has already solved many of the problems we are grappling with today. Plants, animals, and microbes are the consummate engineers. They have found what works, what is appropriate, and most important, what lasts here on Earth. This is the real news of bio mimicry: After 4.2 billion years of research and development, failures are fossils, and the successes are living all around us!

Bio mimicry 3.8

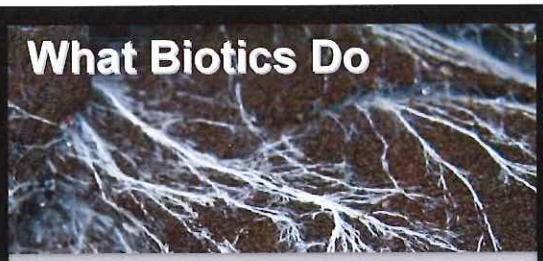
Why Peat Moss?

HONEYCOMB STRUCTURE

This photomicrograph of a peat moss particle shows it's natural capillary and porous structure (natural sponge). It increases the water and nutrient retention as compared with any other source of organic matter (compost, manure, wood, etc. The peat absorbs water and nutrients and avoids the leaching and loss of nutrients to the environment.

Why is it the most popular green house growing medium in the world?

What Biotics Do



- Restore Biological Function
- Mimic Natural Processes
- Improve Plant Establishment
- Ensure Project Success
- Save Money!

What are Biotic Soil Amendments?

- 100% Recycled Soil Building Organics
  - ✓ Biochar
  - ✓ Humic Compounds
  - ✓ Degradable Fibers
    - ✓ Straw – Jute - Flax
  - ✓ Mycorrhizae and Microbes
    - ✓ Beneficial Bacteria
  - ✓ Water Retaining Organic Polymers
- Hydraulically or Broadcast Applied

How Biotics Work!

Why Focus on Vegetation

Mulch is Temporary Vegetation is Permanent

The Goal:
Establish PERMANENT
Erosion Control

Germination

Just Add Water

Vegetation Establishment

- Vegetation Heals the Soil
- Increases Biological Activity
- Mulch does not have Roots

IT STARTS HERE

Seeds Germination

Sustainability: A Challenge

Habitat

Why Biochar?

- Optimum Microbial Host
- Mycorrhizal-Microbial Interaction
- Soil Structure
  - Water Retention-Filtering
  - Porosity
  - CEC-
  - Permeability

No Char With Char

Case Study: Wyeth OR

- PermaMatrix Applied October 4th 2010

Case Study: Wyeth OR

- PermaMatrix On Right of Photo

Case Study: Wyeth OR

- PermaMatrix Applied October 4th 2010

Case Study: Wyeth OR

- PermaMatrix in swale areas established sedge and rush species from seed to mature plants that went to seed head in the 1st year!

Case Study: Wyeth OR

- PermaMatrix Full Native Cover Spring 2011

Case Study: Wyeth OR

- Spring 2012 No Additional Inputs!

VERDYOL

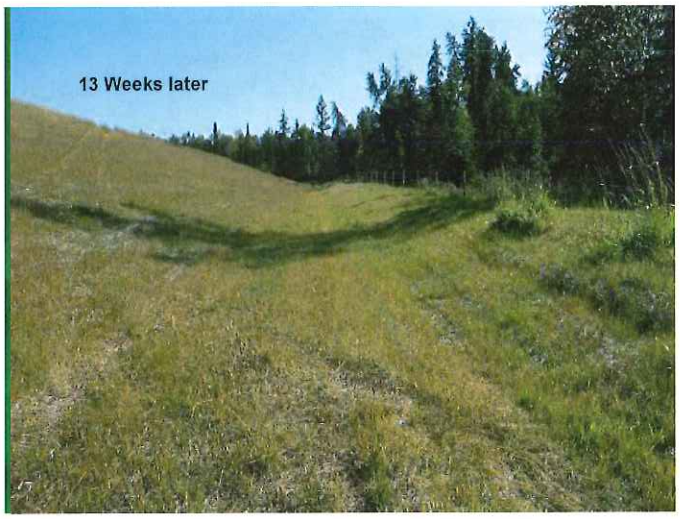
Milner Ridge Manitoba

- Government of Manitoba
- Medium security jail
- 70,000 square meter waste water pond

- PROBLEM
  - Very sandy material
  - marginal natural topsoil – not reclaimable


7 weeks later

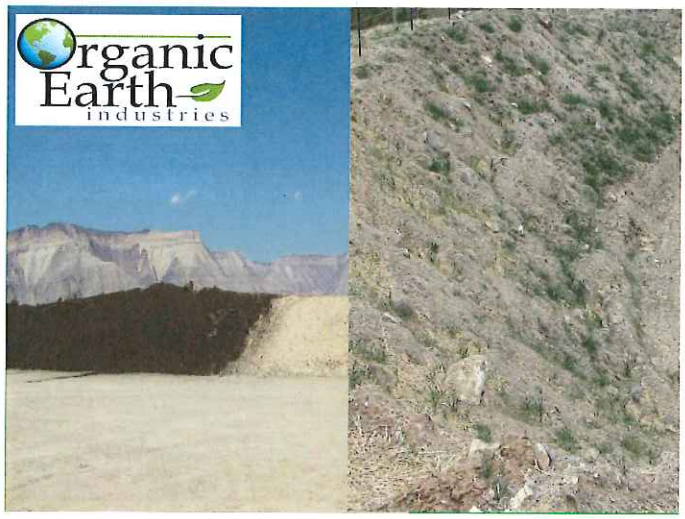

Effects of mycorrhizea
(a strong root system)

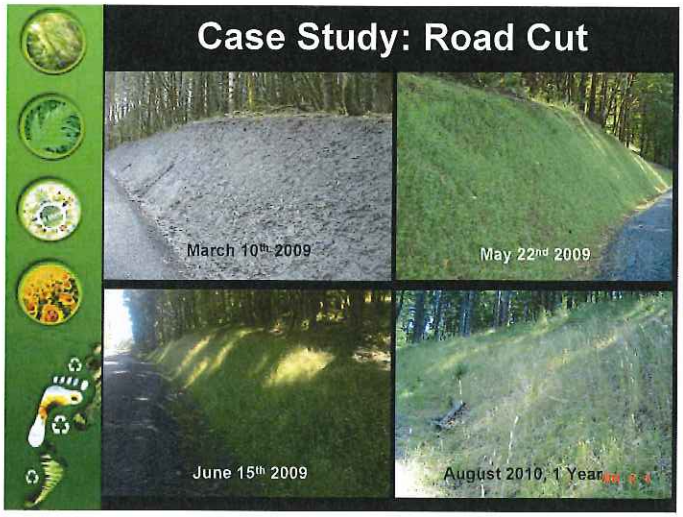

13 Weeks later

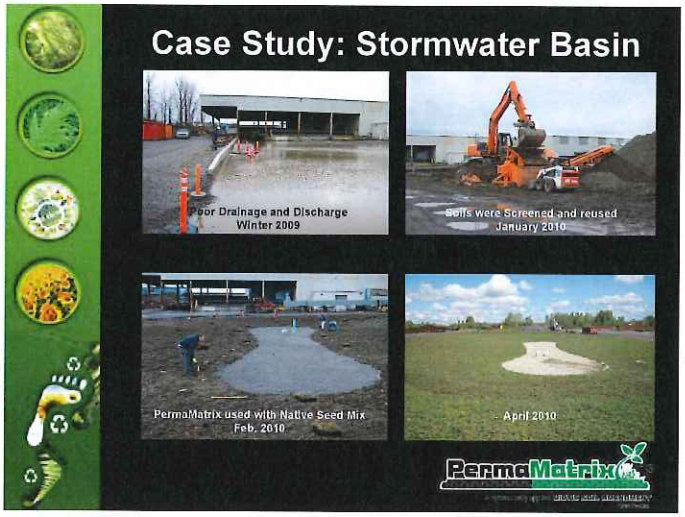

Biotic layer mimics the
natural O horizon
VERDYOL


14 Months later

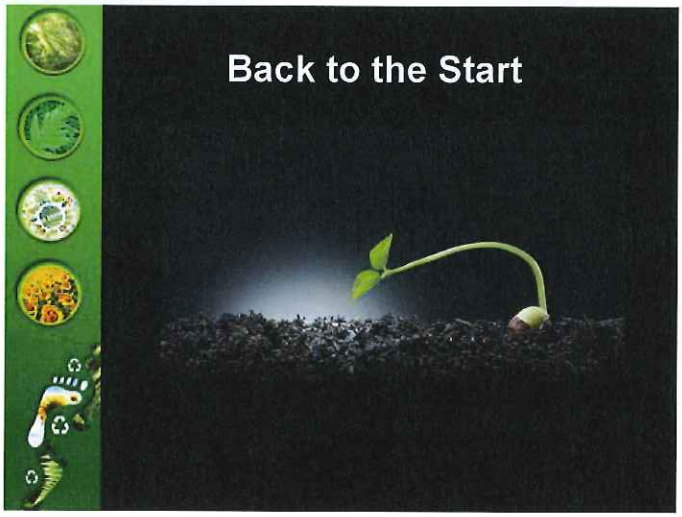

Organic Earth industries
TerraVita™
EARTH ENERGIZERS™


Organic Earth industries


Case Study: Road Cut
March 10th 2009
May 22nd 2009
June 15th 2009
August 2010, 1 Year


Case Study: Stormwater Basin
Poor Drainage and Discharge Winter 2009
Soils were Screened and reused January 2010
PermaMatrix used with Native Seed Mix Feb. 2010
April 2010
PermaMatrix


Case Study: Stormwater Basin
July 2010
July 2010
Fall 2010
Spring 2012 with no additional inputs to site!


Back to the Start

Take The Challenge

"Healing the Disturbed Soil to Support Vegetation"

- Agencies
  - ✓ Require Successful Natural Processes
- Architects & Engineers
  - ✓ Design Sustainable Systems
- Contractors
  - ✓ Drive New Technologies

Alex Zimmerman CPESC, CISEC, CESSWI
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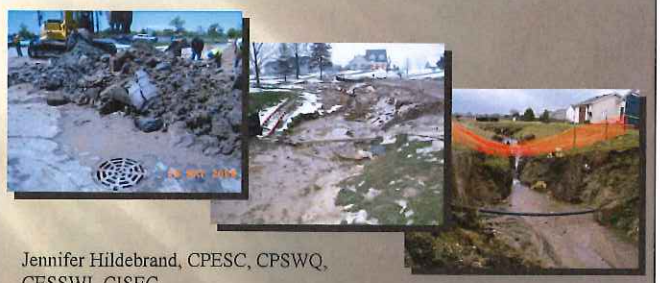
Construction Inspection
Techniques That Really Work!

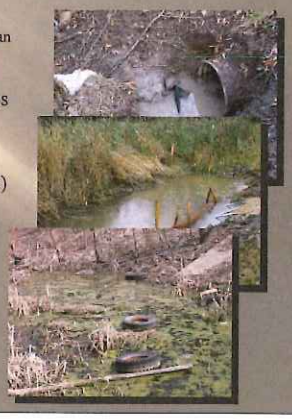


Jennifer Hildebrand, CPESC, CPSWQ, CESSWI, CISEC

June 2015

Construction Inspection Agenda

1. Inspection Preparation
   a. Stormwater Pollution Prevention Plan
   b. Schedules, Sequencing, and Stages
   c. Plans and Construction Documents
2. Inspector Roles and Responsibilities
   a. Active Observation
   b. Thorough Documentation
   c. Open Communication
3. Best Management Practices (BMPs)
   a. Erosion Control
   b. Sediment Control
   c. Other Site Management BMPs
   d. What is <u>not</u> a BMP?
4. Questions?

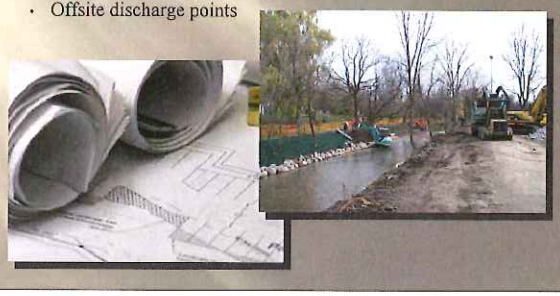


Inspection Preparation

- Stormwater Pollution Prevention Plan
  - Description of the construction activity
  - Site map
  - Responsible person
  - Erosion and sediment control Best Management Practices
  - Undisturbed areas (buffer zones)
  - Final site stabilization measures
  - Chemical treatments – what, where, when, how, and why

Inspection Preparation

- Review of the project plans and permits
  - Stormwater Pollution Prevention Plan
    - Project Schedule, Sequencing, Stages
    - Restrictions
    - Sensitive areas
    - Stormwater management system
    - Offsite discharge points



Inspection Preparation

- Project Schedule, Sequencing, Stages
  - Construction staging / phasing
  - Site plan with phasing /staging zones
  - Erosion and sediment control Best Management Practices
  - Stabilization measures
  - Post-construction permanent stormwater management features

Inspection Preparation

- Restrictions
  - Site map and / or narrative detailing:
    - Wetlands
    - Waters / Impaired Waters
    - Undisturbed areas (buffer zones)
    - Soils restrictions
    - Other sensitive / non-permitted "no fly" zones

Inspection Preparation

- Sensitive areas
  - Site map and / or narrative detailing:
    - Wetlands or other natural habitats
    - Waters / Impaired Waters
    - Other sensitive / non-permitted "no fly" zones

Inspection Preparation

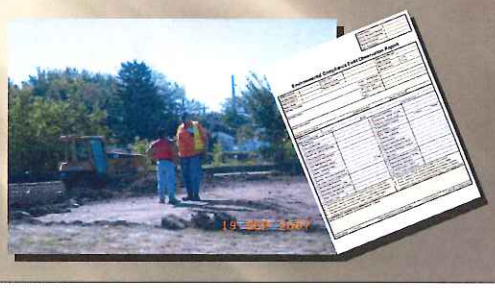
- Stormwater Management System
  - Offsite "run on" entering the project area
  - Overland flow routes / drainage swales & ditches
  - Storm sewer systems
  - Sediment basins
  - Detention / retention basins
  - Outfalls / offsite discharge locations

Inspection Preparation

- Offsite discharge points
- Description of the construction activity
- Erosion and sediment control Best Management Practices locations
- Locations of surface Waters and Wetlands
- Impaired Waters and TMDLs – Total Maximum Daily Loads

Inspector Role and Responsibility

- Schedule and conduct inspections as required by permit and as needed or contracted to maintain site compliance
- Observe site conditions
- Analyze – who, what, where, and why
- Document findings
- Report and recommend

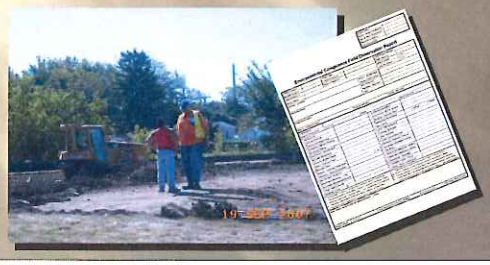


Inspector Role and Responsibility

Active Observation

Routine inspection observation for regulatory requirements and project needs

1. Work from the low point up:
    1. Start at the discharge points from the site, pond outlets, storm sewer outfalls, offsite drainage routes. Walk the perimeter next.
    2. Walk the rest of the site, and last, focus on the active work area.
2. Bring the plans, camera, sample bottles, etc. – be prepared

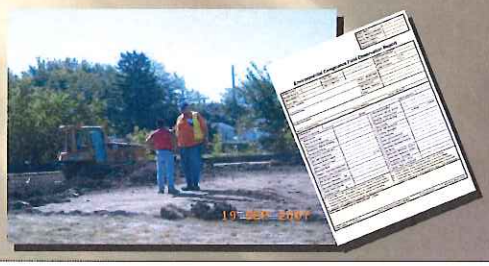


Inspector Role and Responsibility

Thorough Documentation

Written report – tell your story

1. Who is on the site? What work is occurring? Where? When? Why?
2. Take photographs – lots of them
3. Water samples, sediment samples, offsite discharge samples
4. Signed and dated

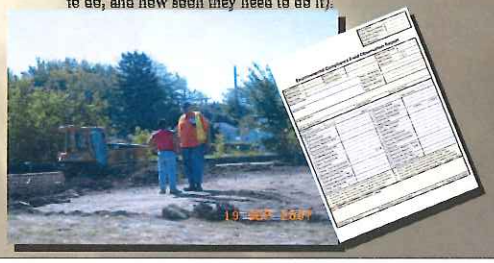


Inspector Role and Responsibility

Open Communication

Share your inspection results

1. Who needs to know what was observed? Owner? Contractor? Engineer?
2. Be specific with:
   1. Note what is working well – give credit where credit is due
   2. Areas of concern, and recommendations for correction
   3. Assign or give a reminder about responsibility (who needs to act, what they need to do, and how soon they need to do it).



Best Management Practice – BMP

·Any method or measure that is implemented to protect water quality and reduce the potential for pollution associated with storm water runoff.
·Any program, technology, process, siting criteria, operating method, measure, or device that controls, prevents, removes, or reduces pollution.

Best Management Practices - BMPs

·Erosion – the act of wind or water impacting and dislodging and wearing away the soil surface.

- Erosion Control BMPs – methods and measures used to reduce the amount of soil particles that are dislodged by wind or water
  - Construction phasing
  - Erosion control blanket
  - Flexible growth medium
  - Hydro-mulch
  - Slope tracking

Best Management Practices - BMPs

·Sediment – soil particles displaced by erosion, that are transported by, suspended in, or deposited by water or wind.

- Sediment Control BMPs – methods and measures used to settle or capture sediment within a defined location
  - Silt fence / Perimeter controls
  - Ditch checks (both erosion and sediment control)
  - Sediment basins
  - Construction entrance / exit
  - Polymers / Chemical additives or treatments

Erosion Control BMPs

Erosion Control Blanket (ECB) and Turf Reinforcement Mat (TRM)

- Straw, coconut, or wood fiber fill between polypropylene netting (longer durability), biodegradable jute netting (short term)
  - Any combination of the above – specific blanket for specific needs
  - Variable lifespan from 90 day to permanent

Erosion Control BMPs

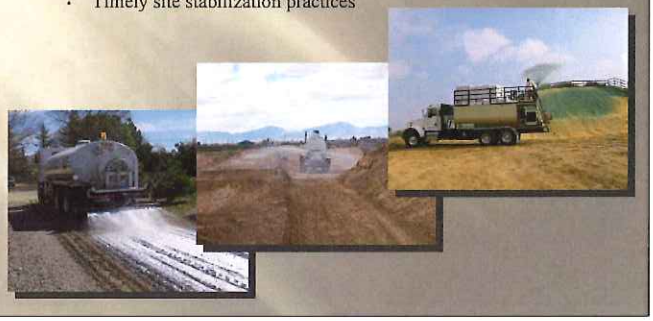
Erosion Control Blanket (ECB) and Turf Reinforcement Mat (TRM) – is it working?

- Is it the right blanket for the job? Is it what the plans call for?
- Is the staple pattern correct?
- Is the blanket installed tight to the ground, or is in on top of roots, rocks, etc.?
- Are the perimeter edges of the blanket keyed into the ground?

Erosion Control BMPs

Dust Control

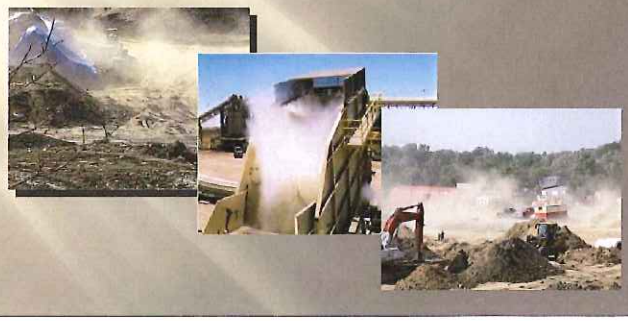
- Site watering
- Applied polymer stabilization
- Limited construction equipment movement over bare ground
- Timely site stabilization practices



Erosion Control BMPs

Dust Control – is it working?

- Is there windblown sediment visible in the air? Deposited in drift lines along buildings, equipment, fences?
- Is the site overly dusty and susceptible to wind erosion?



Sediment Control BMPs

Construction Entrance / Exit

- Timber mats
- Rumble racks
- Stabilized stone access route
- Tire wash

Sediment Control BMPs

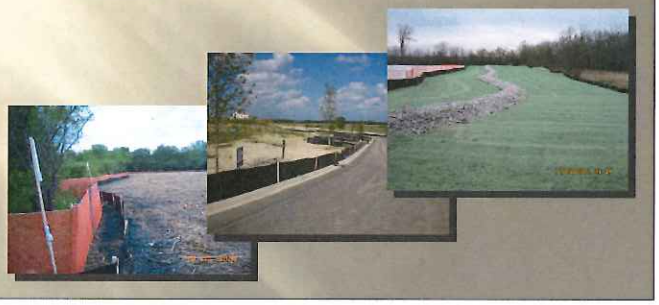
Construction Entrance / Exit – is it working?

- Are all entrance/exit locations protected?
- Is mud/debris/sediment being tracked offsite?
- Is it sized correctly? Long enough? Wide enough?
- Is it a constricted access point, or are trucks going around it?
- Does it need maintenance? Replacement?

Sediment Control BMPs

Perimeter Sediment Controls

- Silt fence
- Rolled product – straw wattles, compost logs, woodchip rolls
- Earthen berms
- Buffer zones



Sediment Control BMPs

Perimeter Sediment Controls – is it working?

- Is silt fence trenched in, backfilled, compacted?
- Are rolled products keyed in? Staked correctly?
- Are earthen or rock berms stabilized?
- Are buffer zones respected? Encroached upon or otherwise impacted?
- Is there evidence of undercutting or sediment on the outside of the perimeter?

Sediment Control BMPs

Inlet Protection

- Manufactured drop inlet baskets
- Geotextile fabric wraps
- Rock checks

Sediment Control BMPs

Inlet Protection – is it working?

- Are all inlets protected?
- Is it installed correctly? Can it be bypassed or short-circuited?
- Does it need maintenance? Replacement?

Sediment Control BMPs

Ditch Check

- Triangular Silt Dikes (TSDs)
- Straw/compost/woodchip/coir wattles
- Permeable plastic berms
- Rock checks

Sediment Control BMPs

Ditch Check – is it working?

- Is there evidence of flows going around, or underneat?
- Is it installed correctly? Is there a "smile" in the middle
- Is it the right BMP for the locations? Are there enough installed? Spaced correctly?
- Does it need maintenance? Replacement?

Sediment Control BMPs

Silt Fence

- A synthetic filter fabric supported between a series of wooden or metal fence stakes along a horizontal contour level.

Sediment Control BMPs

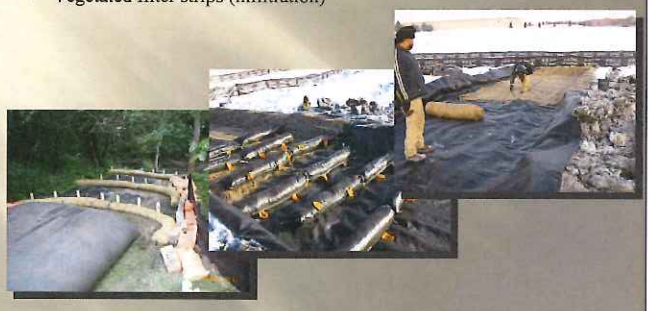
Silt Fence – is it working?

- Is it the correct type of silt fence, per plan? Is the fabric the right kind?
- Is it firmly trenched into the ground?
- Is the upslope side of the trench backfilled and compacted?
- Are the stakes sufficiently spaced? Are they secure in the ground?
- Is the fabric adequately attached to the stakes?

Sediment Control BMPs

Dewatering / Bypass Pumping Controls

- Sediment bags
- Polymer or flocculant application
- Vegetated filter strips (infiltration)



Sediment Control BMPs

Dewatering / Bypass Pumping – is it working?

- Is it working? Is the discharge clean and clear? How many NTU?
- Where is the discharge? Where's it going to end up?
- Is the sediment removal method approved and per plan?
- Are polymers or flocculant needed?
- Does it need maintenance? Replacement?

Sediment Control BMPs

Temporary Perforated Riser

- Temporary structure at the outlet of a pond, designed to exclude sediment from discharge to the outlet, while maintaining drainage.
  - One pipe size smaller than the outlet (i.e., 12" outlet = 10" riser)
  - Grouted or otherwise secured in the outlet
  - Loosely wrapped in wire, then wrapped in a woven monofilament geotextile
  - Drainage holes 1ft below the overflow spillway
    - #holes = 1.5x the surface area of the pipe opening (10" pipe = (5"radius^2 x 3.14) = 79 x 1.5 = 118 one-inch holes)

Sediment Control BMPs

Temporary Perforated Riser – is it working?

- Is it working? Is the outlet discharge clean and clear?
- Is the pipe mortared in place? Is it upright and solid?
- Is the fabric wrap clogged up or is it readily accepting flow?
- Is the pipe wrapped in wire, and the fabric wrapped around the wire?
- Are there enough holes?
- Is the pond unnecessarily holding water?
- Does it need maintenance? Replacement?

Other Site Management BMPs

Concrete Washout

- Watertight, lined excavation
- Self-contained, watertight constructed enclosure
- Self-contained, watertight, portable dumpster or container

Other Site Management BMPs

Concrete Washout – is it working?

- Is it working? Is it being used? Is there evidence of concrete washout outside of the contained area?
- Is it leaking? Is it full?
- Is it readily accessible to concrete trucks, and near the active work area?
- Does it need maintenance? Replacement?

Other Site Management BMPs

Secondary Containment

- Spill Prevention Control and Countermeasures (SPCC) – required for:
  - Oil, gasoline, paint and any hazardous substances must be properly stored, including secondary containment, to prevent spills, leaks or other discharge
  - Bulk storage and portable containers
  - Oil filled operational or process equipment
  - Transfer activities (fueling stations)

Other Site Management BMPs

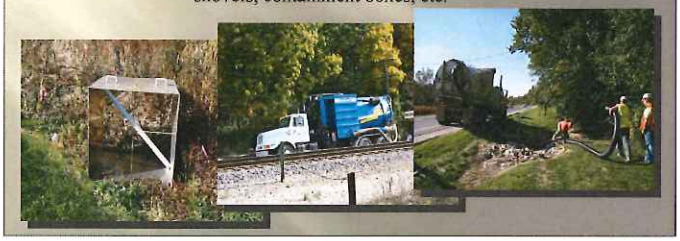
Secondary Containment – is it working?

- Is it working? Is it being used?
- Is it leaking? Is it sufficient capacity for what it is expected to contain?
- Does it need maintenance? Replacement?

Other Site Management BMPs

Directional Drilling Contingency Plan

- A contingency plan intended to provide the techniques needed to address directional drilling fluid releases / spills
  - While drilling is operational:
    - Walking the drill route looking for releases
    - Equipment, materials, and manpower on hand and ready
      - Vac trucks, sandbags, erosion control wattles, buckets, shovels, containment boxes, etc.



Other Site Management BMPs

Directional Drilling Contingency Plan – is it working?

- Are drilling fluid release being discovered promptly?
- Are they contained in as small an area as possible?
- Are they quickly cleaned up?
- Is the impacted area outside of the construction area? Is it restored?

What's not a BMP (even if we pretend it is)?

Straw Bales

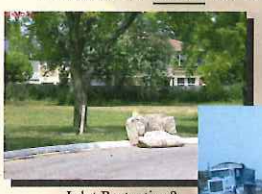
- Straw bales as ditch checks, perimeter controls, inlet protection, etc. do not work. Straw bales do not filter water, they block it.
- Straw bales get awfully heavy after they get wet.
- Straw bales are not allowed as a BMP in most jurisdictions.

What's not a BMP (even if we pretend it is)?

Street Sweeping

- Street sweeping is not a proactive approach, it is a reaction to a failed BMP – the construction entrance / exit.

What's not a BMP (even if we pretend it is)?



Inlet Protection?

Double Row Silt Fence?

Tire Cleaning?

Straw Bale Culvert Protection?

Dewatering Sediment Bag?

Erosion and Sediment Control BMPs Stop, Look, Question, and Think

- Is this the right BMP? Per plan? Per SWPPP? For this location and use?
- Is it working?
- Is there something that can be done to make this better?
- Will this work when it is most needed?

Is this the best place to put this?

Is this working?
What else can be done here?

Why are we doing this?

What are we protecting?

Water Quality

Habitat

Wildlife

Preservation

Aesthetics

Water Resources

Questions?

Thank you for Attending!

IECA - Construction Inspection Techniques that Really Work

(June 17, 2015)

PLEASE SIGN IN

	Name (Please Print)	Department/Affiliation	Sign-in or Initial
1	David Buchanan	COB - Storm	
2	Wendy Edde	City of Bend - Utility	Wendy Edde
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IECA

International Erosion Control Association

REGION ONE

CERTIFICATE OF PARTICIPATION

This certifies that

Wendy Edde, CSM

has participated in

Construction Inspection Techniques that Really Work

on

Wednesday, June 17, 2015 - Online

This course is valid for:
1 Professional Development Hour

Executive Director