I. What is Soil Erosion and Sedimentation?

Soil erosion and sedimentation are slow, continuous, naturally occurring processes that have had a great influence on the geologic contour, configuration, and structure of this county as it exists today. Most natural sediment inputs are very small and can be incorporated by stream processes into non-destructive forms and quantities. The term *erosion* is defined as the detachment of particles of soil from the earth's land surface through the action of wind, water, ice, or gravity. These detached particles are known as sediment and the transportation and deposit of this sediment to a location different from its origin is defined as *sedimentation*. Together they result in soil being detached, carried away, and eventually deposited elsewhere.

Erosion is the process by which the land surface is worked away by the action of wind, water, ice, or gravity. It is the process where soil particles are dislodged or detached and put in motion.

The problem of erosion and sedimentation has increased greatly due to the recent trend toward greater urbanization. The resulting *accelerated soil erosion* is defined as the increased loss of land surface as a direct result of man's activities. Compared with agriculture, forestry, and mining, urban development is less extensive in geographic distribution as a source of human-caused sediment. However, the sediment load (and other pollutants) per acre to streams from construction activities is many more times than that of any other source. Studies show a major problem is disturbed surfaces that lay exposed for more than a year.

II. What are the Effects of Sediment?

Sediment has several forms but of greatest concern in our waterways are the fine organic particles that flow with the current (causing turbidity) or that are deposited on the streambed (causing loss of benthic productivity and habitat). Such sediment occurs to some extent in all streams. Excessive sediment overwhelms the assimilative capacity of a stream. Once a stream is overloaded, sediments re-suspend, embed in stream bottoms, and eliminate habitat. Obvious effects of sediment deposition include the loss of topsoil, decreased water retention capacity of wooded and wetlands, increased flood frequency, and rapid filling of the "waters of the State." Less obvious, however, is how sedimentation impacts the ecology of our headwater streams. Sedimentation leads to increased water temperature and decreased oxygen levels. Turbidity and sediment have negative impacts on aquatic plants and wildlife, including endangered and threatened species. Preventing soil erosion is also much less expensive than mitigating the effects. Dredging costs, lowered property values, and costs of cleaning storm systems and watercourses have an impact on property owners and local government budgets.

Sedimentation is the process by which the detached particles generated by erosion are deposited elsewhere on the land, in our streams, lakes, and wetlands.

III. Purpose of the Soil Erosion and Sedimentation Control Program

The prime goal of Part 91 of P.A. 451 is to achieve effective and reasonable control of accelerated soil erosion. This is to be accomplished by using a comprehensive and integrated approach involving the best practical combination of procedures, techniques, and people to prevent sediment, the product of accelerated soil erosion, from leaving the construction site and reaching the "waters of the State." The goal is to be attained by the enforcement of Soil Erosion and Sedimentation Control Programs by agencies on the county or local level. In Livingston County, Michigan, the Drain Commissioner was designated on April 1, 1974, by resolution of the Livingston County Board of Commissioners, as the County Enforcing Agency to implement and administer Part 91 of P.A. 451. The administrative policies included in this document are promulgated pursuant to the resolution adopting an updated Soil Erosion and Sedimentation Control Ordinance (the Ordinance) by the Livingston County Board of Commissioners on December 18, 2000. The Ordinance is included as Part C of this document. While the principal intent of the ordinance is preventative, it also includes provisions for enforcement action where this becomes necessary. The developer and/or permittee are responsible for any off-site sedimentation impacts. Since some soil loss is inevitable from a construction site, even with all required practices maintained, the Livingston County Drain Commissioner, at his/her discretion, may require the developer of the permitted site to be financially responsible for restoring County watercourses and/or drainage ways as defined herein.

Sediment contributes 2 billion tons per year to U.S. streams (Waters, 1995).

The intent of this LCDC's Soil Erosion and Sedimentation Control Program and these Administrative Policies is to:

- Preserve high quality water resources essential to Livingston County residents' health, quality of life, and to our natural environment.
- Protect vital land resources from erosion and minimize the disturbance of natural and constructed drainage.
- Support the education of applicants, builders, developers, and County plan reviewers and enforcing officers on the implementation of an effective plan to minimize erosion and, thereby, reduce sedimentation.
- Promote the economic benefits of maintaining compliance. See the figure below which shows the economic benefit of maintaining temporarily seeded lots (green) versus unvegetated lots (brown).
- Safeguard life, limb, property, and public welfare by establishing minimum requirements for controlling accelerated erosion from stripping, excavating and filling of land, or any disturbance of the land surface.
- Encourage compliance, innovation, and open spaces.

- Provide a policy to maximize proper maintenance of permanent soil erosion and sedimentation practices and adequate restoration of adverse impacts from sediments.

- Establish procedures by which these requirements are to be administered and enforced.

- Protect our lakes, streams, rivers, drains, and watercourses from unnecessary degradation due to sedimentation.

IV. Permit Requirements

The Soil Erosion and Sedimentation Control Act, as administered by the Livingston County Drain Commissioner, shall apply to earth changes on land solely within Livingston County that:

Source: Purdue University, 1997.

1. Does not fall within the legal boundaries of any city, village, or charter township granted the status of Local Enforcing Agency by the MDEQ or,

2. That is not part of an earth disruption project undertaken by a state, local, or county agency that has been granted by the MDEQ the status of Authorized Public Agency to enact and enforce their own soil erosion and sedimentation control programs. However, an Authorized Public Agency is still required to notify the Livingston County Drain Commissioner's office of each proposed earth change to be undertaken.

An erosion and sedimentation control plan shall be submitted and a soil erosion and sedimentation control permit shall be obtained **by the landowner/developer** (per Part 91 of P.A. 451) before commencement of any construction project in the County which involves one or more acres of land or any construction project in the County within five hundred feet of a surface water as defined in the ordinance.

A "stream" is interpreted to include any watercourse and/or storm sewer discharging into a lake or stream.

A definition of surface water includes such elements as lakes, "watercourses," and "drainage ways." "Watercourse" and/or a "drainage way" is interpreted as any natural or artificial water course

(including, but not limited to; streams, rivers, creeks, channels, canals, or drains) which has definite banks, a bed, and in which waters flow in a definite direction or course, either continuously or intermittently, and including any area adjacent thereto which is subject to inundation by reason of water flow or flood water.

A “lake” is interpreted as the Great Lakes and all natural and artificial inland lakes or impoundments that have definite banks, a bed, visible evidence of a continued occurrence of water, and a surface area of water that is equal to or greater than one (1) acre. Lake does not include basins constructed for the sole purpose of water retention, cooling water, or treating polluted water.

V. Exemptions and Waivers

A permit is not required for any of the following:

Exemptions - Under Part 17 of the Michigan Administrative Code R 323.1705:

- A beach nourishment project permitted under Part 325 of Act 451 of the Public Acts of 1994, as amended.
- Normal road and driveway maintenance, such as grading or leveling, that does not increase the width or length of the road or driveway and that will not contribute sediment to lakes or streams.
- An earth change of a minor nature that is stabilized within 24 hours of the initial earth disturbance and will not contribute sediment to lakes or streams.
- Installation of oil, gas, and mineral wells under permit from the supervisor of wells if the owner-operator is found by the supervisor of wells to be in compliance with the conditions of Part 91. Note that access roads to and from these facilities are not exempt.
- Agricultural, mining, and forestry activities. Note that access roads to and from these facilities are not exempt.

In addition, decks that involve posts are exempt. Exemptions provided above shall not be construed as exemptions from enforcement of procedures under Part 91 of P.A. 451. If the activities exempted by the above sub-rules cause or result in a violation of Part 91 of P.A. 451 or these rules.

Waivers - Upon issuance of a grading waiver, the applicant will maintain responsibility for controlling erosion and sedimentation. A grading waiver may be granted for:

- Earth changes that disturb less than 225 square feet.
- Earth changes that will not contribute sediment to lakes and streams and measures under one acre.
- Sites greater than 500 feet from a surface water, as defined by the Ordinance.

VI. Submitting Permit Applications

The Soil Erosion and Sedimentation Control Program (SESC) divides construction activities into two types: single family residential sites and commercial, industrial, and residential subdivision. Applications for single family residential grading permits in residential developments with an open permit will not be accepted unless the overall development has passed an interim stabilization inspection performed by the office of the Drain Commissioner. An SESC permit application shall include the following information:

Single Family Residential Sites

- Description of the type of earth change (e.g., new basement, garage footings, etc.)
- Location of earth change, including tax identification number.
- Soil type information
- Timing Sequence, e.g., a description of the scheduled activities related to the earth disturbance, beginning with breaking ground and ending with a good stand of grass on the permitted site.
- Name and signature of the landowner as responsible party for ensuring compliance with Part 91.
- Name and contact number of the contractor, if available.
- One site plan detailing SESC measures in accordance with Article 6(E) of the Livingston County Soil Erosion and Sedimentation Control Ordinance.
- Required fees.

Commercial, Industrial, and Residential Developments - In accordance with Part 91 of P.A. 451, all elements listed in Appendix K must be included in the application and all specified measures must be included on all commercial, industrial, or residential subdivision soil erosion and sedimentation control plans. In addition, the following information must be provided:

- Timing and sequence of each phase of construction: Is it appropriate? Is the disturbance staged to avoid mass grading? Is permanent stabilization scheduled five days after final grade per Part 91 of P.A. 451? Are temporary and permanent seeding dates appropriate per the NRCS critical area plantings guide?
- Graphic location and SESC details for installing and removing all temporary practices designed to effectively reduce accelerated soil erosion and sedimentation along with an adequate maintenance schedule.
- Location and description for installing all permanent practices along with a program proposal for continued maintenance including the designation of the person or entity responsible for the maintenance.

NOTE: *For those applicants who have previously permitted sites that are not currently in SESC* compliance*, permit granting may be postponed until all sites are verifiably compliant. Evidence of other necessary permits, such as permits from the Michigan Department of Environmental Quality, may be required to be submitted with the SESC*

permit application. If an application is submitted for an earth change activity which was initiated prior to the issuance of a grading permit, the application and inspection fees are doubled to account for the cost of enforcement activities against the applicant.

VII. Performance Guarantee Requirements

Pursuant to Article 7(C) of the Soil Erosion and Sedimentation Control Ordinance, the Drain Commissioner is authorized to collect a performance guarantee from the applicant. The performance guarantee shall be in the form of a financial obligation to assure stabilization in accordance with the Ordinance, this Administrative Policy, and the Act for all commercial, industrial, or residential subdivision projects. Performance guarantees may also be required for single family residences. The dollar amount of the obligation shall be according to a bond schedule determined by resolution of the Livingston County Board of Commissioners, which shall be amended from time to time. All cash or certified checks shall be deposited in a trust and agency fund for erosion control bonds under the exclusive control of the Drain Commissioner. The following are the requirements for a performance guarantee:

A. An irrevocable letter of credit for a minimum time period of two years from the date of permit issuance, from an approved local financial institution made out to the Livingston County Drain Commissioner, in the amount specified above. The irrevocable letter of credit shall be automatically renewable for a second two-year period. Should the lending institution determine that the financial condition of the permittee is such that the letter of credit can no longer be continued, the financial institution shall provide the Drain Commissioner with three months notice of termination of the letter of credit. Should a letter of credit expire, the permit shall be revoked on the same date. Reapplication using a different form of performance guarantee shall be provided within five days of expiration of the letter of credit.

B. A surety bond posted by a surety licensed in the State of Michigan, using a bond form acceptable to the Drain Commissioner. The Drain Commissioner reserves the right to reject certain surety companies, and thus their bonds, based on prior non-performance associated with previous permits.

C. Cash.

D. A certified check in the amount specified above made out to the Livingston County Drain Commissioner. Individual or corporate checks are not acceptable.

E. In the event of failure of the permit holder to comply with conditions set forth in the approved plan, the Livingston County Drain Commissioner may draw on the bond, cash, or letter of credit as discussed in Section XIII to complete the work as required under the Act, the Ordinance, and these administrative policies. An additional 10% administrative fee, based on cost of corrections, will be deducted if used.

F. Upon permanent stabilization of all disrupted earth areas, the bonds, cash, or letters of credit (or residual remaining balance) will be returned to the permittee along with an accounting of any funds used.

VIII. Permit Validity and Renewal

The Drain Commissioner reserves the right to revoke permits should the single family homesite or commercially permitted facility be determined to be not compliant with the Ordinance and these administrative rules.

- The duration of a single family permit shall be one year. Permits may be extended for up to one year if the site is in compliance with the ordinance, these administrative rules, a request for extension is provided prior to expiration of the permit, and the Drain Commissioner's Office provides written approval**.**

- For multi-lot commercial, industrial, or residential developments, the permit duration is two years. Permits may be extended from year-to-year as necessary. To obtain an extension, the permittee must request an extension for the site from the Drain Commissioner's Office and obtain written approval from the Drain Commissioner's Office.

IX. What are the Costs?

All minimum fees (excludes inspection fees) are administrative fees payable at the time of application and are therefore non-refundable. Additional fee costs are to be paid at the time the permit is terminated and before the permit file is closed. In compliance with the mandate from the Livingston County Board of Commissioners that administration of this Act be self-sustaining from fees imposed and to distribute such fees as equitably and fairly as possible, the schedule shall be determined by resolution by the Livingston County Board of Commissioners, which shall be amended from time to time. As per Section VI and XIX of these Administrative Rules, fees for certain permits may double. These include permits issued after earth change activity is commenced, and permits issued to permittees that were issued a cease and desist order under their previous permit.

X. Permit Review and Approval

Per Part 91 of P.A. 451, the County will approve, disapprove, or require modification of an application within 30 calendar days following receipt of the application. The County will notify the applicant of approval by first class mail or by written approval in person. The County will notify the applicant of disapproval and conditions required for approval by certified mail or by written disapproval in person. A permit given to the applicant either in person or by first class mail constitutes approval. For single family residential applications, applicants will be required to submit one set of plans, which will remain with the project file. For all applications requiring a permit other than single family residential applications, applicants must submit two sets of plans. Upon approval of a permit and plans, copies will be distributed as follows:

- one copy shall be placed in the County's SESC permit file.

- one copy shall be returned to the applicant/property owner.

NOTE: Per Part 91 of P.A. 451, one copy of the permit and approved plan shall be available at all times on the site of the earth change for inspection.

Permits are noted:

> "Prior to work commencing, the building contractor shall have all applicable soil erosion and sedimentation control measures installed. Two business days prior to work commencing, the contractor shall contact the County Drain Commissioner's office to schedule an inspection of the soil erosion and sedimentation control measures."

XI. Initial Inspections

A. Commercial/Industrial/Residential Subdivision

Prior to work commencing, the enforcing officer may choose to meet with the applicant and contractors on site to review their permit responsibilities and requirements for a residential subdivision, commercial, or industrial site disturbing greater than one acre. Temporary soil erosion and sedimentation controls shall be installed prior to, or upon commencement of, any earth change. After the building contractor has completed the installation of the initial erosion control measures as depicted on the plans and as per the approved timing sequence, the building contractor shall notify the Drain Commissioner or his designated representative two business days prior to commencing earth change activities. Upon receiving this notification, the enforcing officer shall perform an initial site inspection.

B. Single Family

The applicant must notify the Drain Commissioner's Office that the site is ready for inspection. An inspection of the soil erosion and sedimentation control measures will be conducted by the enforcing officer on the work day following the day of the request.

If the single family site passes initial inspection, then the County Drain Commissioner shall approve the site for grading and recommend the building department issue a Building Permit. Upon the approval of an initial site inspection for a commercial permit, the enforcing officer will file an inspection report, indicating the site has passed.

If a single family site does not pass initial inspection, then the enforcing officer will post a "rejected" tag on the site in a visible location, indicating the site has not passed. The reasons for the rejection will be listed on the tag. For a commercial site, the enforcing officer will provide an inspection report to the applicant, noting the reasons for rejection on the report. The applicant will call the enforcing officer when reasons for rejection have been addressed and the site is ready to be re-inspected. For single family sites, the applicant will be required to pay any re-inspection fees prior to picking up the permit. For

commercial sites, re-inspection fees will be collected prior to the release of performance guarantees.

XII. Regular State Inspection Schedule

The State Certified Stormwater Operator shall inspect the site on a regular basis, after each scheduled grading activity, and after each significant rain event that results in runoff. This inspection schedule is maintained until the site is permanently stabilized. A winter inspection schedule is established at the onset of frozen ground (greater than six inches deep) and rescinded at the spring thaw. Regular inspections continue until the site is completely restored and a final inspection is passed for permit closure.

A soil erosion and sedimentation control inspection form is used to record all inspections. A log of all inspections and contacts with the contractor, applicant, and property owner, including copies of the inspection forms and photos, is maintained in a file for each approved permit and an electronic file is also maintained. Copies of each inspection report shall be submitted to the Drain Commissioner on a weekly basis.

XIII. Enforcement Procedure

General Procedure: The approved SESC plan and permit language clarify applicant's responsibilities. This awareness, along with effective communication, are critical first steps in ensuring that minimum enforcement is not required. When the construction commences, the site is presumed to be in compliance.

If the Drain Commissioner's Office determines that soil erosion or sedimentation of adjacent properties or the water of the State has or will reasonably occur from land in violation of the Act, the Rules, or this Ordinance, the Drain Commissioner's Office may enforce compliance by notifying the person who owns the land, by mail with return receipt requested, of its determination to cease and desist all activities excluding those necessary to bring the site into compliance with the Act, the Ordinance, and the administrative policy herein. The notice shall contain a description of the violation and what must be done to remedy the violation. The landowner shall have five calendar days from the mailing date in which to implement and maintain soil erosion and sedimentation control measures in conformance with the Act, the Rules and this Ordinance.

The deposit for each subsequent SESC permit application within Livingston County will double each time the permit holder is issued a Cease and Desist Order to a given site.

A notice may also be placed on site indicating noncompliance along with a copy of the inspection form specifying requirements for compliance. Photos of violations may be taken and filed by the enforcing officer. A copy of the inspection form indicating noncompliance and an updated outline of items to be corrected or repaired is placed in the County's permit file with additional copies provided to the applicant, the Michigan Department of Environmental Quality, and the Local Building Department.

A person who fails to cease and desist the activities after receiving notice of the violation is responsible for the payment of a civil fine of $2,500.00 the first day of violation,

$5,000.00 the second day of violation, $10,000.00 the third day of violation, and $25,000.00 thereafter for each subsequent day of violation.

If all corrective measures have not been undertaken within five calendar days of the Cease and Desist Order, the following enforcement mechanisms may be used:

- The permittee may be issued a municipal civil infraction as stipulated in the ordinance and further discussed below, and/or

- A copy of the cease and desist order will serve as notice to the cooperating local building inspectors and other local government officials that all inspections and work is prohibited until further notice, and/or

- Performance may be compelled utilizing any of the various mechanisms discussed below.

Compelling Performance: The Cease and Desist Order letter will notify the applicant that if corrective measures are not taken within five days of the mailing date, the Drain Commissioner may compel performance of work to bring the site into compliance with the act. The Drain Commissioner's Office shall not expend more than $10,000.00 for the cost of the work, materials, or labor without prior written notice stated in the notice as required above to the person who owns the land that the expenditure of more than $10,000 may be made. If more than $10,000 is to be expended, then the work shall not begin until at least ten calendar days after the notice of a violation has been mailed.

Performance may be compelled through one of the following:

- The Drain Commissioner may file an injunction in a court of appropriate jurisdiction requesting the court to compel the performance of the permittee.

- If the erosion resulting from the non-compliance of a permittee causes obstructions in a County Drain, the permittee will be cited under the provisions of the Drain Code, and the Drain Commissioner may perform corrective actions, the costs of which may be invoiced to the permittee. Alternatively, the costs of corrective actions may be assessed to lands owned by the permittee within the affected drainage district.

- If the permittee filed a grading and sedimentation control bond, the Drain Commissioner may notify the bonding company of the default of the permittee, and may request the bonding company to complete the stabilization of the site.

- If the permittee filed a cash bond with the office of the Drain Commissioner, the Drain Commissioner may perform the work. At the time of permit closure the amount of the cash bond to be refunded will be reduced to reflect payment of costs to the Drain Commissioner for implementation of corrective measures.

- The Drain Commissioner may perform work and bill the permittee. Unpaid invoices will preclude permittees from obtaining other permits from the Drain Commissioner. The Drain Commissioner may file a lien on the property to recover costs.

If there are insufficient funds to complete the necessary stabilization and sedimentation control, the Cease and Desist Order shall remain in effect until additional funds have been deposited with the County Drain Commissioner.

Municipal Civil Infractions: A municipal civil infraction action may be commenced upon the issuance by an authorized local official of a municipal civil infraction citation directing the alleged violator to appear in District Court. Municipal civil infraction citations shall be issued and served as set forth in the Livingston County Soil Erosion and Sedimentation Control Ordinance.

XIV. Permit Closure

Per Part 91 of P.A. 451, "a person shall complete permanent soil erosion control measures for all slopes, channels, ditches, or any disturbed land area within five calendar days after final grading or the final earth change has been completed. If it is not possible to permanently stabilize a disturbed area after an earth change has been completed or if significant earth change activity ceases, then a person shall maintain temporary soil erosion and sedimentation control measures until permanent soil erosion control measures are in place and the area is stabilized."

It is estimated that 6-13 billion dollars per year are spent in the U.S. to correct the effects of erosion and sediment.

When ready to close a commercial permit the applicant requests a final inspection for permit closure. Final inspections are performed during the growing season only, defined in the Michigan Department of Transportation Seeding Standards as from April 15 to October 15. The inspector will visit the site, verifying all temporary practices have been removed, all paved surfaces and storm systems have been cleaned, all permanent practices are in place and being maintained, and any other requirements have been fulfilled.

The following elements are required for closure of a Commercial, Industrial, Residential Subdivision Permit, or single family permit, unless otherwise indicated:

(1) All disturbed areas are permanently stabilized in a manner to prevent soil movement or loss from erosive forces such as rain, ice, gravity, wind, and human activities.

(2) Any temporary controls have been removed.

(3) The applicant's professional engineer has submitted a letter certifying the site is completed and stabilized per the approved construction plan. This requirement is not applicable for single family permits.

(4) All permit erosion control measures are in place and maintained.

(5) The Drain Commissioner's Office has received an as-built plan at the same scale as the original plan which shows all improvements and final grades. The plan must be sealed by a registered professional engineer in the State of Michigan, and must contain as-built elevations of all surface and sub-surface drainage structures. Sufficient as-built topography of detention or retention basins must be provided to

demonstrate that the storm water management basins contain the volumes indicated in the approved plan. This requirement is not applicable for single family permits.

If all requirements have been met, the permit will be closed and all deposits refunded minus fees. If all requirements have not been met, the inspector will contact the applicant to review the requirements.

XV. Keeping a Site in Compliance

In developing an effective soil erosion and sedimentation control plan, a comprehensive and integrated approach is required for protecting our natural resources during construction. The following is a minimum suggested guidance:

1. ***Minimize Clearing*** – Portions of a site near sensitive and critical areas should rarely be disturbed. Ideally, only the areas actually needed to build structures and provide access should be cleared. Limits of disturbance shall be marked on the SESC plan and be clearly visible in the field. Known as site fingerprinting, this technique can reduce earthwork and SESC practice costs by as much as $5,000 per acre (Brown and Caraco, 1997).

2a. ***Protect Waterways*** – Streams and watercourses are particularly susceptible to sedimentation. As a secondary form of protection, perimeter controls such as silt fence shall be installed along the perimeter of the watercourse buffer. If work is planned across or within the watercourse, special crossings and diversion techniques are required.

2b. ***Stabilize Drainage ways*** – Carefully consider future and existing drainage ways. Not only are drainage ways the major route of sediment to lakes and streams, they are prone to severe erosion due to concentrated runoff. Consequently, special controls such as check dams, silt fence, vegetation, erosion control blankets, and riprap are applied to the drainage way depending on their slope, length, and the disturbed areas that drain to them.

3. ***Phase Construction –*** Expose the smallest practical area for the shortest time by properly scheduling and staging project activities. Disturb only first phase areas and stabilize before beginning subsequent phases. The phases should be planned so that earthwork is balanced within a phase; i.e., the cut from one area matches the fill requirement elsewhere. Construction phasing is similar to “just-in-time manufacturing” in that earthmoving occurs only when it is absolutely needed. A potential reduction of 42% in off-site sediment loads in a typical development scenario is estimated if construction phasing is utilized (Brown and Caraco, 1997). The construction sequence outlines the specific order of construction that the contractor must follow to complete a single phase.

4. ***Rapid Soil Stabilization –*** Maintain appropriate soil erosion control practices as the primary control measure. A grass or mulch cover should be established within two weeks after soil exposure. Mulch is particularly needed in winter months. Research in Maryland shows soil stabilization can reduce sediment concentrations by up to six times compared to exposed soils, and a review of other studies indicates average sediment reduction of about 80 to 90% (Brown and Caraco, 1997). By preventing erosion on site to minimize sedimentation, the need for costly sediment control, imported topsoil, and remediation is reduced. One study has shown developers can produce a larger profit by vegetating undeveloped lots (Purdue University, 1997).

5. ***Protect Steep Slopes –*** Steep slopes are the most highly erodible surfaces of a construction site. Clearing and grading of existing steep slopes should be avoided. Special techniques can be used to prevent upland runoff from flowing down a slope and causing gullies. The use of silt fence at the toe of steep slopes should be carefully selected because flow velocities and sediment can quickly overload a silt fence. Additional practices may be required, such as scarification, erosion control blankets, and increased mulch application rates with mulch binders.

6. ***Perimeter Controls –*** Maintain sediment control practices to prevent soils from leaving the site. Common options are properly installed, located, and maintained silt fence, dikes, and diversions.

7. ***Employ Advanced Settling Devices –*** Even with the best SESC practices installed, construction sites will discharge high concentrations of sediment. The SESC plan for critical sites or sites larger than one acre shall require some type of sediment trap, or basin to operate at 80% efficiency.

8. ***Certified Contractors Implement Plan –*** Contractors who are State Certified SESC Stormwater Operators are required for the inspection of erosion and sedimentation controls. State Certified SESC Stormwater Operators are preferred for the implementation of installation, maintenance, and follow-up procedures. Soil erosion and sedimentation cannot be controlled without thorough, frequent monitoring and maintenance of the control practices. The Drain Commissioner shall be provided with copies of monitoring reports from certified operators on a weekly basis or after every storm event.

9. ***Adjust SESC Plan for Field Conditions –*** An effective plan may need to be modified during various phases due to discrepancies between planned and as-built grades, weather conditions, altered drainage, and unforeseen requirements. The need for maintenance repairs or additional, specialized controls may appear evident after storm events. Proposed modifications shall be submitted to the Drain Commissioner for review and concurrence.

10. ***Assess Practices After Storms –*** After the passing of a runoff causing storm event, many SESC practices will likely require maintenance. Incorporate this time into the regular monitoring schedule. The existing controls can be assessed and modified. Rapid response before the next storm is critical. Maintenance, clean out, reinforcement, or additional controls may be necessary.

11. ***Site-Specific Planning –*** Plan the development to fit the site topography, soils, drainage, and natural vegetation. When grading and Best Management Practices (BMPs) are designed to match a particular site, erosion is minimized, resulting in reduced costs and damages.

12. ***Effective Communication –*** Pre-construction meetings for sites larger than one acre or near sensitive areas help to define responsibilities, timelines, and appropriate contacts. The Drain Commissioner shall be notified and invited to attend pre-construction meetings.

It is a condition of all permits that the County Drain Commissioner reserves the right to require controls in addition to those requirements on the approved plan.

XVI. Erosion Control Best Management Practices:

The following represent control measures to reduce soil erosion:

Temporary Seeding and Mulching: "Mulching" is the process of placing a uniform layer of straw, wood fiber, wood chips, or other acceptable materials over a seeded area to allow immediate protection of the seed bed, moisture, and shading. Proper and timely application can enhance seed growth and minimize soil exposure to erosion.

Done in conjunction with seeding, soil management, fertilizer management, and grading practices.

Mulch is recommended on any areas exposed to erosion, particularly those next to streams, wetlands, and newly seeded areas, especially slopes, droughty sands, and clayey soils.

Organic mulches are preferred for most uses.

Roughen soil surface and broadcast mulch immediately after seeding.

Seed: Select and time seeding in accordance with the Michigan NRCS Critical Area Planting Guide. Apply seed at minimum rates in accordance with Appendix K. Heavier application rates may be required depending on site conditions.

Consider for steeper slopes, irregular slopes, critical sites, dust control, and where anchoring of straw with a tackifier is required.

Straw: Small grain straw of winter rye is preferred since fewer weeds are generally present.

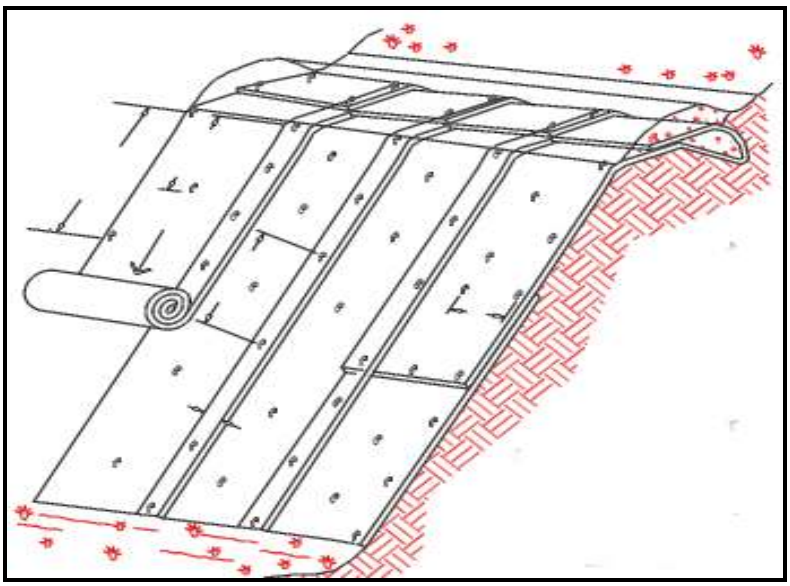
Uniformly spread 1.5 to two tons/acre for normal applications and 2.5 to three tons/acre for critically eroding areas. Depth of straw should be three inches.

Hydroseeding: Hydroseeding is a soil stabilization measure of last resort to be used only where site slopes do not exceed one percent. By the use of hydraulic equipment (hydroseeders and hydromulchers), seed, soil amendments, wood fiber mulch and tackifying agents, bonded fiber matrix, and liquid copolymers can be uniformly broadcast as a hydraulic slurry onto the soil to control erosion and dust.

Seed should be applied at recommended rates or, if not given, 150-250 lbs/acre. For hydromulching, apply two tons/acre for most applications and three tons/acre for dormant seeding. Anchor the mulch immediately following application.

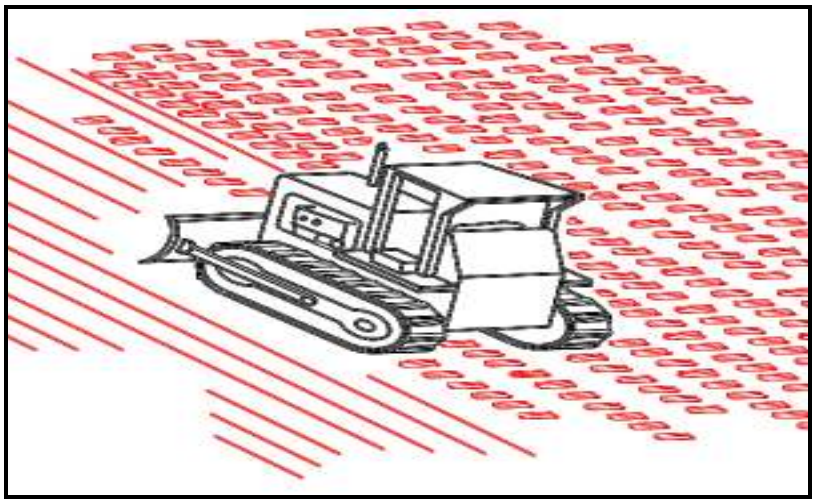
Erosion Control Blankets: Erosion control blankets are made of coarse wood fibers, coir (coconut) fibers, synthetic fibers, or a combination reinforced on top or both sides by degradable netting. Blankets are uniform and provide varying degrees of erosion drainage ways, stream banks, detention pond slopes, and concentrated flows such as pipe protection to sensitive and critical areas such as slopes, temporary and permanent outlets.

Install per manufacturer's specifications. Slope surface is graded, seeded, and free of rocks, clods, sticks, and grass. Anchor at the top of the slope, unroll loosely, use recommended staple pattern, and overlap edges by six inches. Install along channels in the direction of flow. Install horizontally along shorelines during low water, only if one width is sufficient.



Erosion Control Blanket Installation

Surface Roughening: Scarification involves running tacked machinery such as bulldozers up and down slopes to leave horizontal depressions in the soil. To avoid undue compaction of the soil, this method should only be used on sandy soils.



Scarification

Cut Slope Roughening involves stair-step grade or groove cutting the slopes of soft material that are steeper than 4:1. Do not make individual vertical cuts more than two feet high in soft materials and three feet high in rocky materials. Groove the slope using machinery to create a series of ridges and depressions that run across the slope, on the contour, and are sloped toward the vertical up-hill wall.

Maximum Slopes: Fills and cuts shall be constructed at slopes of three horizontal to one vertical or flatter. Gentler slopes may be required based on site conditions. Specialized stabilization measures may be required for these maximum slopes above and beyond the requirements enumerated herein.

Check dams: Construct check dams across drainage ways to reduce concentrated flows in the channel and protect vegetation in the early stages of growth as well as filter and detain runoff. Construct check dams on all ditch slopes exceeding 3.0%. Check Dams should be designed by a Professional Engineer.

42% of the total stream miles in the U.S. are impaired by siltation (Waters, 1995).

Commercial Products: Temporary silt dike, diversion or check dam of triangular urethane foam covered with woven geotextile fabric and installed per manufacturer's instructions perpendicular to the flow of water, can be used in some applications.

XVII. Sediment Control Best Management Practices:

The following are control measures to reduce sedimentation:

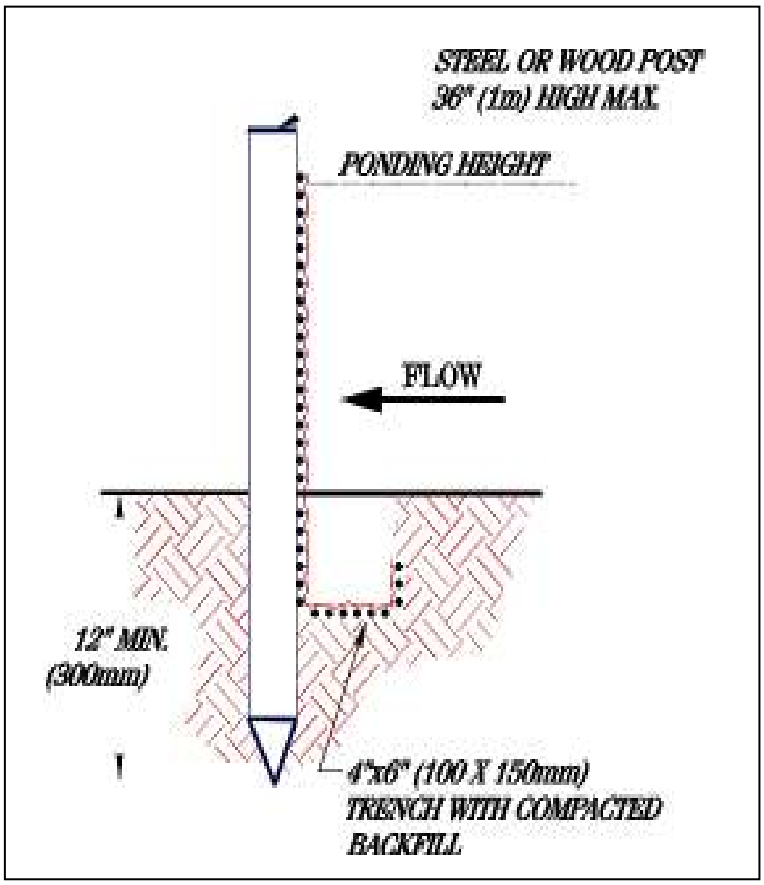
Buffers and Filter Strips: The buffer/filter strip is a vegetated area surrounding a disturbed area. They are particularly beneficial adjacent to a water body. It may be natural, undeveloped land where existing vegetation is left intact, or it may be planted with vegetation. The buffer of vegetation between human land use and a stream provides shade, leaf litter, woody debris, erosion protection, and often serves as wildlife habitat.

The vegetative filter absorbs sheet flow and effectively reduces phosphorus attached to sediment. It removes pollutants by filtration, deposition, adsorption, decomposition, and volatilization. Where feasible, a 100-foot buffer/filter strip should be used to protect water quality along a stream corridor.

A 1967 study estimated annual sediment yields from urban developmet to streams at 200 tons/acre and from agricultural erosion at 5 tons/acre in the same area (Waters, 1995).

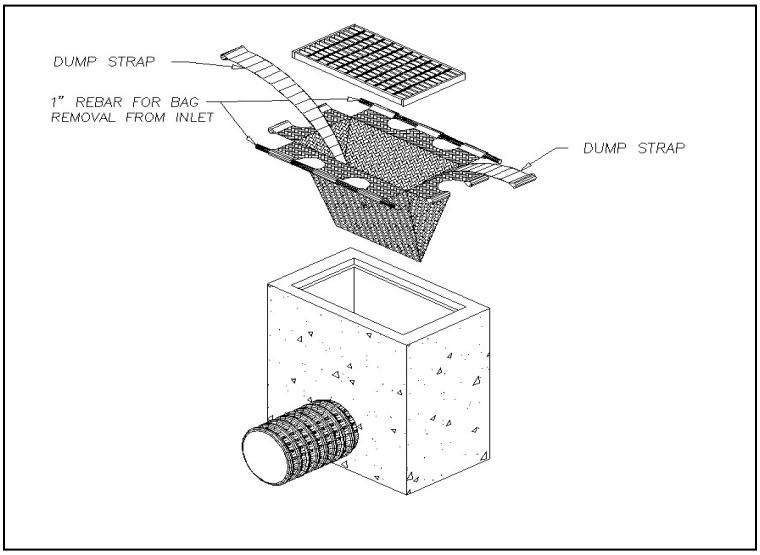
Silt Fence: Filter fabric is attached to the upstream side of the posts and must be trenched and buried a minimum of four-to-six inches. Use 36-inch silt fence for all commercial permit sites. Single family permits may utilize 24-inch silt fence. Posts are spaced a maximum of six feet apart. Silt fence is not designed for steep slopes, concentrated flow, or outlet pipes. Silt fence is placed on slope contours to maximize ponding efficiency.

Inspect and repair silt fence after each storm event or as required. Remove sediment when storage height exceeds nine inches and deposit to an area that will not contribute sediment off site.



Silt Fence Installation

Catch Basin Inserts: Commercial Products: Select a high flow rate product where sandy soils and high flow rates are anticipated. Install per manufacturer's directions. Reuse product if in good condition, e.g., no rips or tears. Select models with, or install separate, sediment protectors for the back of open curb inlets.



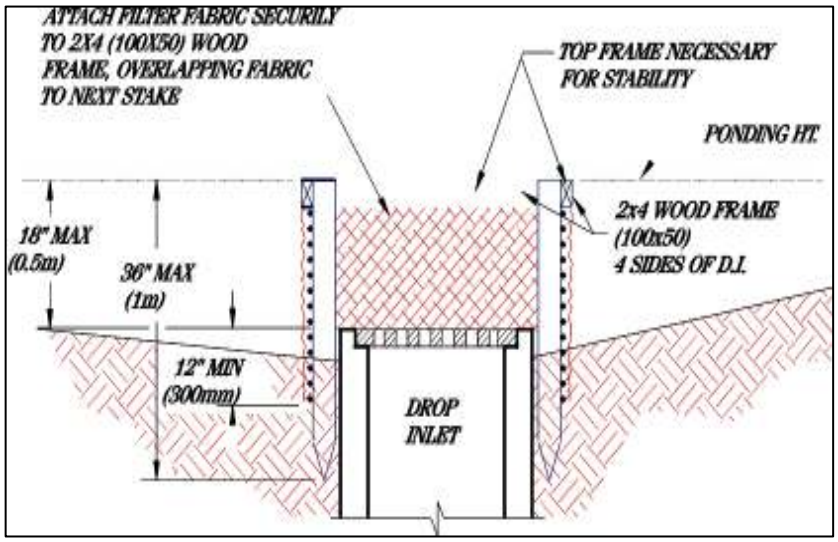
Catch Basin Insert

Inspection of its collected sediment level is important to maintain effectiveness and prevent ponding. If there are no major events, products should be inspected every two to three weeks and emptied as required.

Catch Basin Exerts: Silt Fence Sediment Barrier: Recommended for small nearly level drainage areas.

Excavating a trench around the catch basin may increase settling time. Wooden top frame adds stability.

Commercial Products: Highly durable, reusable, and visible.



Catch Basin Exert

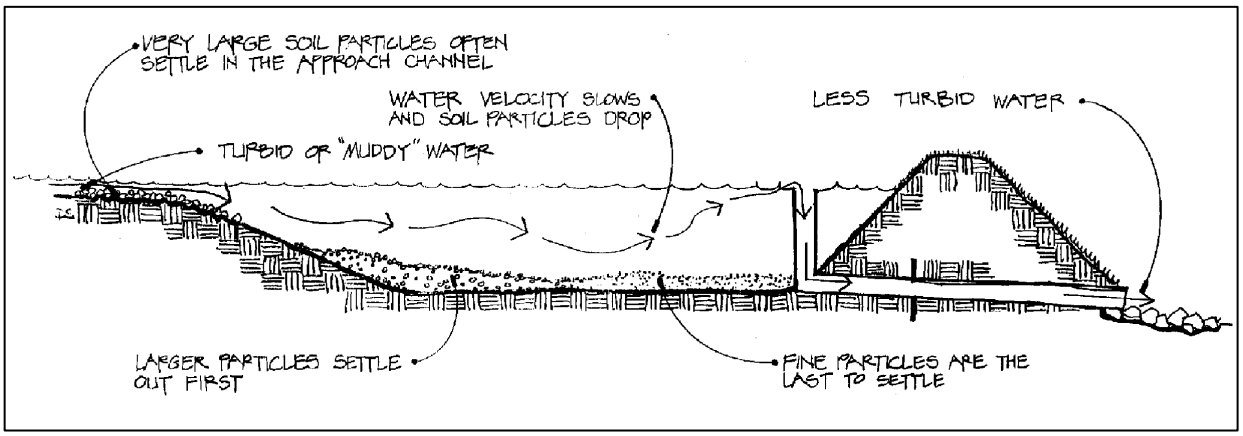
Sedimentation Basin: A sedimentation basin is a depression in the land with a defined surface area and detention volume, natural or constructed, to which sediment-laden runoff is conveyed allowing sediment to settle out. By definition, they are impoundment structures designed to:

1. remove the eroded soil from runoff before it leaves the site, and
2. store the sediment.

The basic components of a sedimentation basin include an inlet, a storage area, and an outlet. An effective sedimentation basin detains runoff long enough for sediment to settle out of the water. The amount of settling is dependent upon the following characteristics:

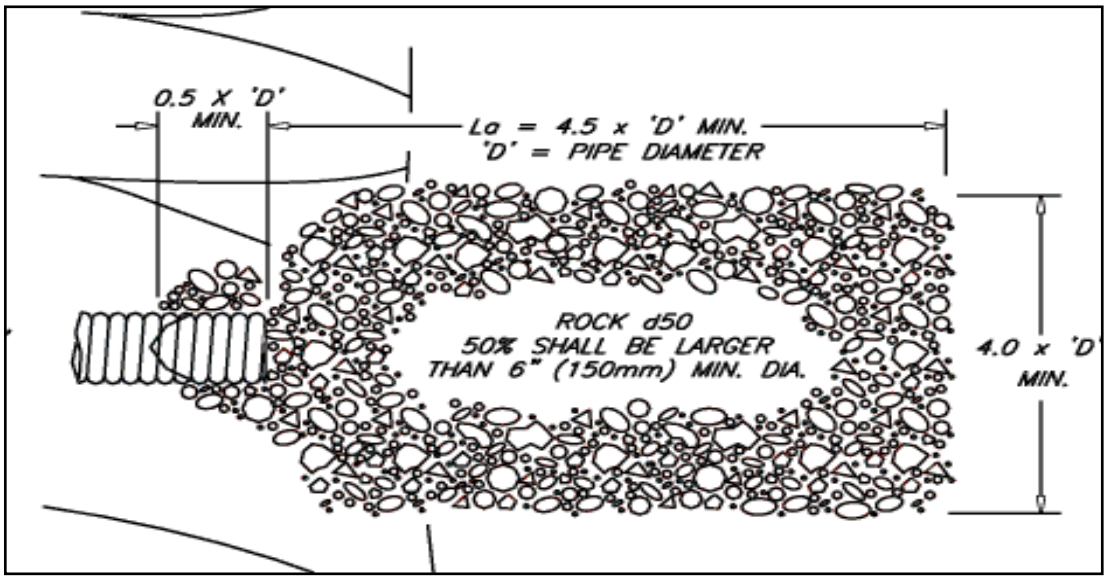
1. Rate of flow
2. Surface area of the basin
3. Velocity of flow through the basin
4. Particle size distribution
5. Volume and/or detention time

To ensure maximum performance on site, each of the following sedimentation basin components must be carefully reviewed during the planning phase: site conditions, location, size, and structures. In addition to proper design, adequate maintenance is critical to achieving peak performance (CRWC and HRC, 1997). Sedimentation basins may be designed using either the surface area method or detention time method, as outlined in the Oakland County Erosion Control Manual for a one-year storm.



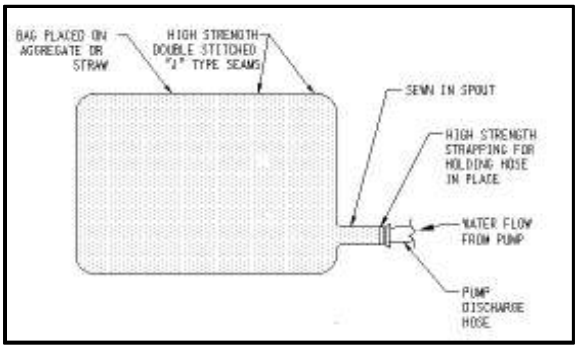
Sedimentation Basin Operation

Riprap Energy Dissipater: Length and width of apron at the end of outlet pipe will be sufficient to dissipate energy. Filter material is filter fabric or a six-inch thick minimum graded gravel layer, set at zero grade and aligned straight.



Level Spreader

Commercial Dewatering Filtration is a non-woven geotextile fabric bag placed on a flat surface stabilized with aggregate, vegetation, or mulch so filtered water flows downhill at a reasonable rate to a stabilized drainage way.



Fabric Energy Dissipator

XVIII. Construction Site Best Management Practices Used to Control Sedimentation:

Scheduling: The first construction practice is scheduling. It is a planning process where all control measures are implemented in a timely and logical fashion during construction. It may be necessary to implement controls sequentially. Staging or phasing is a part of scheduling. Staging, grading, and stabilization must be finished in one area before proceeding to the next.

By planning the phases so only the areas actively under construction are exposed, you can take advantage of existing vegetation.

Aggregate Access Roads: Access roads are gravel pads that allow workers and delivery vehicles to enter or leave the site. They remove mud from the tires of vehicles, reduce sedimentation from this disturbed area, and reduce the amount of street cleaning necessary. For residential lots, a minimum 10-foot by 30-foot by six-inch pad of two-inch to three-inch fractured aggregate stone is recommended on a filter fabric. For larger sites, a minimum 30-foot by 100-foot by 12-inch pad of three-inch to four-inch fractured aggregate stone is required. The pad should flare out wider at the curb. A filter fabric is recommended to improve stability, reduce the costs of topping up aggregate pads on soft soils, and aid in removal for the grading of concrete drives.

- ***It is estimated that from all sources over 4.5 billion tons of sediment pollute the rivers of this country each year.***
- ***Equivalent to a volume the size of 25,000 football fields, 100 feet high.***
- ***It costs 8 to 12 dollars per cubic yard to remove sediment from waterways.***

Construction Barriers: Signs, snow, or barrier fencing or other barriers are used to protect critical areas, protect trees, and confine equipment, vehicles, and personnel. Fencing is adequately fastened with three or four straps per post and is maintained regularly.

Stockpiles: Stockpiles of topsoil or excavated materials shall be identified and addressed on the SESC plan. Stockpiles should not be located adjacent to wetland or watercourses. Stockpiles may be located around the perimeter of the site away from activity or in the vicinity of construction. Place silt fence around the stockpile. Provide temporary seeding to all stockpiles in accordance with the Michigan NCRSs.

XIX. Disclaimer

The Best Management Practices (BMPs) which are provided throughout this document are minimal guidelines. Competent professional advice should be sought from a Michigan Registered Professional Engineer or Certified Professional in Erosion and Sediment Control (CPESC) concerning the application of these BMPs as they apply to a particular site. The user shall be solely responsible for determining the suitability of the application of these BMPs in any particular circumstance. Livingston County and the Livingston County Drain Commissioner assume no liability, and no guarantees are made that such practices will ensure compliance with all laws and regulations. No reference to any procedure or product shall be construed as an endorsement by Livingston County or the Livingston County Drain Commissioner. The BMPs provided are a small sample of techniques and devices available for erosion and sedimentation control and are only for your information and convenience. In no way are the BMPs listed to be construed as the only methods approved by the Drain Commissioner. Innovative erosion and sedimentation control measures may be required by the Drain Commissioner or the enforcement staff where deemed suitable.

Neither the issuance of an SESC permit nor compliance with the provisions hereto or with any condition imposed by the Livingston County Drain Commissioner hereunder, shall neither relieve any person from any responsibility for damage to persons or property

(including public utilities or services) otherwise imposed by law, nor imposed any liability upon Livingston County for damages to persons or property.

ADDITIONAL INFORMATION

For additional information on soil erosion and sedimentation control please consult:

Part 91: Soil Erosion and Sedimentation Control of the Natural Resources and Environmental Protection Act 451 of the Public Acts of 1994 Sections 324.9101 to 324.9123 and;
Rules: Part 17 of the Michigan Administrative Code Being Sections R 323.1701 to R 323.1714

International Erosion Control Association, 1-800-455-4322, email: ecinfo@ieca.org, http://www.ieca.org

Michigan Department of Environmental Quality SWQD, *Guidebook of Best Management Practices for Michigan Watersheds*, updated 1997, www.deq.state.mi.us/swq/

Oakland County Drain Commissioner, Latest Edition, *Erosion Control Manual*

Salix Applied Earthcare, Erosion Draw 2.0 software, 1-916-224-0878, email: edraw@sunset.net, http://www.erosiondraw.com

Soil and Water Conservation Society, CPESC Certification, 1-800-THE-SOIL, email: swsc@swcs.org, http://www.swcs.org

USDA Natural Resources Conservation Service - Michigan, *Critical Area Planting*, Technical Guide Section IV 342-1, February, 1988, www.nrcs.usda.gov