

**PERSONAL SERVICE AGREEMENT**

0-222A REV. 12/96 (Stock No. 6938-170-07)

PRINT OR TYPE

STATE OF CONNECTICUT  
OFFICE OF THE STATE COMPTROLLER  
ACCOUNTS PAYABLE DIVISION

PREPARE IN QUINTUPPLICATE

THE STATE AGENCY AND THE CONTRACTOR AS LISTED BELOW HEREBY ENTER INTO AN AGREEMENT SUBJECT TO THE TERMS AND CONDITIONS STATED HEREIN AND / OR ATTACHED HERETO AND SUBJECT TO THE PROVISIONS OF SECTION 4-98 OF THE CONNECTICUT GENERAL STATUTES AS APPLICABLE.

ACCEPTANCE OF THIS CONTRACT IMPLIES CONFORMANCE WITH TERMS AND CONDITIONS STATED ON THE REVERSE SIDE OF PART 1

|                     |   |   |  |
|---------------------|---|---|--|
|                     |   | (1) ORIGINAL <input checked="" type="checkbox"/> AMENDMENT <input type="checkbox"/> | (2) IDENTIFICATION NO. P.S. 5594   |
| CONTRACTOR          | (3) CONTRACTOR NAME   | University of Massachusetts Lowell  |  |
|                     | (4) ARE YOU PRESENTLY A STATE EMPLOYEE?   | <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO                 |  |
|                     | CONTRACTOR ADDRESS  | Research Foundation<br>600 Suffolk Street, Second Floor South, Lowell, MA 01852     |  |
|                     | (5) AGENCY NAME AND ADDRESS   | CT Department of Transportation, 2800 Berlin Tpk., Newington, CT 06131-7546         |  |
|                     | (6) AGENCY NO.  | 5000  |  |
| CONTRACT PERIOD     | (7) DATE (FROM) 9/1/03  | THROUGH (TO) 2/28/05  | (8) INDICATE <input type="checkbox"/> MASTER AGREEMENT <input type="checkbox"/> CONTRACT AWARD NO. 6.06-06(03) <input checked="" type="checkbox"/> NEITHER |
| CANCELLATION CLAUSE | THIS AGREEMENT SHALL REMAIN IN FULL FORCE AND EFFECT FOR THE ENTIRE TERM OF THE CONTRACT PERIOD STATED ABOVE UNLESS CANCELLED BY THE STATE AGENCY, BY GIVING THE CONTRACTOR WRITTEN NOTICE OF SUCH INTENTION (REQUIRED DAYS NOTICE SPECIFIED AT RIGHT.) |   | (9) REQUIRED NO. OF DAYS WRITTEN NOTICE 60   |

(10) CONTRACTOR AGREES TO (Include special provisions - Attach additional blank sheets if necessary.)

Conduct a research study for NETC Project No. 03-4 entitled, "Measuring Pollutant Removal Efficiencies of Stormwater Treatment Units."

(See attached Proposal.)

(11) PAYMENT TO BE MADE UNDER THE FOLLOWING SCHEDULE UPON RECEIPT OF PROPERLY EXECUTED AND APPROVED INVOICES.

Maximum payment not to exceed \$80,000 for contract period. Payment shall be in accordance with the provisions of 2.(C), 3.(B), 3.(C) and 3.(D).

| ACT CD           | (13) DOC TYP | (14) COM TYP      | (15) LSE TYP          | (16) ORIG. AGCY       | (17) DOCUMENT NO                 | (18) COMMIT. AGCY | (19) COMMIT. NO. | (20) VENDOR FEIN / SSN - SUFFIX |               |                |           |
|------------------|--------------|-------------------|-----------------------|-----------------------|----------------------------------|-------------------|------------------|---------------------------------|---------------|----------------|-----------|
|                  |              |                   |                       | 5400                  |                                  |                   |                  |                                 |               |                |           |
| COMMITTED AMOUNT |              |                   |                       | (22) OBLIGATED AMOUNT | (23) CONTRACT PERIOD (FROM / TO) |                   |                  |                                 |               |                |           |
| 80,000           |              |                   |                       | \$ 80,000             | 9/1/03 2/28/05                   |                   |                  |                                 |               |                |           |
| LT               | CD           | (25) COMM LINE NO | (26) COMMITTED AMOUNT | (27) COMM. AGCY.      | (28) COST CENTER                 |                   | (29) OBJECT      | (30) AGENCY TAG                 |               |                | (33) F.Y. |
|                  |              |                   |                       |                       | FUND                             | SID               |                  | (30) FUNCTION                   | (31) ACTIVITY | (32) EXTENSION |           |
|                  |              |                   |                       |                       |                                  |                   |                  |                                 |               |                |           |

Individual entering into a Personal Service Agreement with the State of Connecticut is contracting under a "work-for-hire" arrangement. As such, the individual is an independent contractor, and does not satisfy the characteristics of an employee under the common law rules for determining the employer/employee relationship of Internal Revenue Code section 3121(d). Individuals performing services as independent contractors are not employees of the State of Connecticut and are responsible themselves for payment of all State and local income taxes, federal income taxes and Federal Insurance Contribution Act (FICA) taxes.

|  |  |   |
|--|--|---|
| ACCEPTANCES AND APPROVALS                        |  | (34) STATUTORY AUTHORITY ConnDOT 13b-4 and 13b-23 |
| CONTRACTOR (OWNER) OR AUTHORIZED SIGNATURE       | TITLE  | DATE  |
| <i>Louise G. Griffin</i>                         | Louise G. Griffin<br>Managing Director, External Funding, Technology | 7/2/03  |
| AGENCY (AUTHORIZED OFFICIAL)                     | TITLE  | DATE  |
| <i>James M. Sime</i>                             | James M. Sime<br>Manager of Research                                 | 8/18/03   |
| OFFICE OF POLICY & MGMT. / DEPT. OF ADMIN. SERV. | TITLE  | DATE  |
| <i>Leah S. Arnold</i>                            |  | 8/20/03   |

**EXECUTIVE ORDERS**

This contract is subject to the provisions of Executive Order No. Three of Governor Thomas J. Meskill promulgated June 16, 1971, and, as such, this contract may be canceled, terminated or suspended by the State Labor Commissioner for violation of or noncompliance with said Executive Order No. Three, or any state or federal law concerning nondiscrimination, notwithstanding that the Labor Commissioner is not a party to this contract. The parties to this contract, as part of the consideration hereof, agree that said Executive Order No. Three is incorporated herein by reference and made a part hereof. The parties agree to abide by said Executive Order and agree that the State Labor Commissioner shall have continuing jurisdiction in respect to contract performance in regard to nondiscrimination, until the contract is completed or terminated prior to completion. The contractor, as part consideration hereof, that this contract is subject to the Guidelines and Rules issued by the State Labor Commissioner to implement Executive Order No. Three, and that he will not discriminate in his employment practices or policies, will file all reports as required, and will fully cooperate with the State of Connecticut and the State Labor Commissioner. This contract is also subject to provisions of Executive Order No. Seventeen of Governor Thomas J. Meskill promulgated February 15, 1973, and, as such, this contract may be canceled, terminated or suspended by the contracting agency or the State Labor Commissioner for violation of or noncompliance with said Executive Order No. Seventeen, notwithstanding that the Labor Commissioner may not be a party to this contract. The parties to this contract, as part of the consideration hereof, agree that Executive Order No. Seventeen is incorporated herein by reference and made a part hereof. The parties agree to abide by said Executive Order and agree that the contracting agency and the State Labor Commissioner shall have joint and several continuing jurisdiction in respect to contract performance in regard to listing all employment openings with the Connecticut State Employment Service.

**I. NON-DISCRIMINATION**

(a) For the purposes of this section, "minority business enterprise" means any small contractor or supplier of materials fifty - one per cent or more of the capital stock, if any, or assets of which is owned by a person or persons: (1) who are active in the daily affairs of the enterprise; (2) who have the power to direct the management and policies of the enterprise; and (3) who are members of a minority, as such term is defined in subsection (a) of Conn. Gen. Stat. § 32-9n; and "good faith" means that degree of diligence which a reasonable person would exercise in the performance of legal duties and obligations. "Good faith efforts" shall include, but not be limited to, those reasonable initial efforts necessary to comply with statutory or regulatory requirements and additional or substituted efforts when it is determined that such initial efforts will not be sufficient to comply with such requirements.

For purposes of this Section, "Commission" means the Commission on Human Rights and Opportunities.

For purposes of this section, "Public works contract" means any agreement between any individual, firm or corporation and the state or any political subdivision of the state other than a municipality for construction, rehabilitation, conversion, extension, demolition or repair of a public building, highway or other changes or improvements in real property, or which is financed in whole or in part by the state, including but not limited to, matching expenditures, grants, loans, insurance or guarantees.

(b) (1) The Contractor agrees and warrants that in the performance of the contract such Contractor will not discriminate or permit discrimination against any person or group of persons on the grounds of race, color, religious creed, age, marital status, national origin, ancestry, sex, mental retardation or physical disability, including, but not limited to, blindness, unless it is shown by such Contractor that such disability prevents performance of the work involved, in any manner prohibited by the laws of the United States or of the State of Connecticut. The Contractor further agrees to take affirmative action to insure that applicants with job related qualifications are employed and that employees are treated when employed without regard to their race, color, religious creed, age, marital status, national origin, ancestry, sex, mental retardation, or physical disability, including, but not limited to, blindness, unless it is shown by the Contractor that such disability prevents performance of the work involved; (2) the Contractor agrees, in all solicitations or advertisements for employees placed by or on behalf of the Contractor, to state that it is an "affirmative action - equal opportunity employer" in accordance with regulations adopted by the Commission; (3) the Contractor agrees to provide each labor union or representative of workers with which the Contractor has a collective bargaining agreement or other contract or understanding and each vendor with which the Contractor has a contract or understanding, a notice to be provided by the Commission, advising the labor union or worker's representative of the Contractor's commitments under this section and to post copies of the notice in conspicuous places available to employees and applicants for employment; (4) the Contractor agrees to comply with each provision of this section and Conn. Gen. Stat. § 46a-56e and 46a-56f and with each regulation or relevant order issued by said Commission pursuant to Conn. Gen. Stat. § 46a-56, 46a-58e and 46a-58f; (5) the Contractor agrees to provide the Commission on Human Rights and Opportunities with such information requested by the Commission, and permit access to pertinent books, records and accounts, concerning the employment practices and procedures of the Contractor as relate to the provisions of this section and section 46a-56. If the Contract is a public works contract, the contractor agrees and warrants that he will make good faith efforts to employ minority business enterprises as subcontractors and suppliers of materials on such public works projects.

(c) Determination of the Contractor's good faith efforts shall include, but shall not be limited to the following factors: The Contractor's employment and subcontracting policies, patterns and practices; affirmative advertising, recruitment and training; technical assistance activities and such other reasonable activities or efforts as the Commission may prescribe that are designed to ensure the participation of minority business enterprises in public works projects.

(d) The Contractor shall develop and maintain adequate documentation, in a manner prescribed by the Commission, of its good faith efforts.

(e) The Contractor shall include the provisions of subsection (b) of this Section in every subcontract or purchase order entered into in order to fulfill any obligation of a contract with the State and such provisions shall be binding on a subcontractor, vendor or manufacturer unless exempted by regulations or orders of the Commission. The Contractor shall take such action with respect to any such subcontract or purchase order as the Commission may direct as a means of enforcing such provisions including sanctions for noncompliance in accordance with Conn. Gen. Stat. § 46a-56; provided, if such contractor becomes involved in, or is threatened with, litigation with a subcontractor or vendor as a result of such direction by the Commission, the Contractor may request the State of Connecticut to enter into any such litigation or negotiation prior thereto to protect the interests of the State and the State may so enter.

(f) The Contractor agrees to comply with the regulations referred to in this Section as they exist on the date of this contract and as they may be adopted or amended from time to time during the term of this contract and any amendments thereto.

(g) The contractor agrees to the following provisions: The contractor agrees and warrants that in the performance of the agreement such contractor will not discriminate or permit discrimination against any person or group of persons on the grounds of sexual orientation, in any manner prohibited by the laws of the United States or of the state of Connecticut, and that employees are treated when employed without regard to their sexual orientation; the contractor agrees to provide each labor union or representative of workers with which such contractor has a collective bargaining agreement or other contract or understanding and each vendor with which such contractor has a contract or understanding, a notice to be provided by the commission on human rights and opportunities advising the labor union or workers' representative of the contractor's commitments under this section, and to post copies of the notice in conspicuous places available to employees and applicants for employment; the contractor agrees to comply with each provision of this section and with each regulation or relevant order issued by said commission pursuant to Section 46a-56 of the general statutes; the contractor agrees to provide the commission on human rights and opportunities with such information requested by the commission, and permit access to pertinent books, records and accounts, concerning the employment practices and procedures of the contractor which relate to the provisions of this section and section 46a-56 of the general statutes.

(h) The contractor shall include the provisions of the foregoing paragraph in every subcontract or purchase order entered into in order to fulfill any obligation of a contract with the state and such provisions shall be binding on a subcontractor, vendor or manufacturer unless exempted by regulations or orders of the commission. The contractor shall take such action with respect to any such subcontract or purchase order as the commission may direct as a means of enforcing such provisions including sanctions for noncompliance in accordance with section 46a-56 of the general statutes; provided, if such contractor becomes involved in, or is threatened with, litigation with a subcontractor or vendor as a result of such direction by the commission, the contractor may request the state of Connecticut to enter into any such litigation or negotiation prior thereto to protect the interests of the state and the state may so enter.

**INSURANCE**

The contractor agrees that while performing services specified in this agreement that he shall carry sufficient insurance (liability and / or other) as applicable according to the nature of the service to be performed so as to "save harmless" the State of Connecticut from any insurable cause whatsoever. If requested, certificates of such insurance shall be filed with the contracting State agency prior to the performance of services.

**STATE LIABILITY**

The State of Connecticut shall assume no liability for payment for services under the terms of this agreement until the contractor is notified that this agreement has been accepted by the contracting agency and, if applicable, approved by the Office of Policy and Management (OPM) or the Department of Administrative Services (DAS) and by the Attorney General of the State of Connecticut.

**EXTRACT FROM THE RECORDS OF  
UNIVERSITY OF MASSACHUSETTS**

**Granting Authority to Execute Contracts and All Other Instruments**

I, Barbara DeVico, Secretary to the Board of Trustees of the University of Massachusetts. do hereby certify that the following is a true and complete copy of a vote duly adopted by the Board of Trustees of the University of Massachusetts at a meeting duly called and held on the fifth day of February, nineteen hundred and ninety-seven at the University of Massachusetts, Chancellor's Conference Room, Boston, Massachusetts:

"Further, to affirm that, except as to matters governed by the University of Massachusetts Intellectual Property Policy (Doc. T96-040), the Treasurer of the University of Massachusetts or his designee shall be the sole contracting officer of the University with the Authority to execute all contract, grants, restricted gifts (excluding endowments), and amendments thereto for sponsored programs in instruction, research, or public service, unless and until otherwise voted by the Board of Trustees."

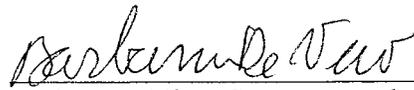
I further certify that the Vice President for Management and Fiscal Affairs and Treasurer of the University, Stephen W. Lenhardt, has retained the right to remain the sole contracting officer of the University of Massachusetts, but in his absence, he has designated Philip J. Marquis, Assistant Vice President for Central Administrative Services and Associate Treasurer.

I further certify that effective October 1, 2001, Jo Ann Gora, Chancellor, Boston Campus, Boston, Massachusetts, David J. MacKenzie, Vice Chancellor for Administration & Finance, Boston Campus, Boston, Massachusetts, Paul O'Keefe, Director of Research & Sponsored Programs, Boston Campus, Boston, Massachusetts, Margaret K. Vidrine, Director of the Office of Grants and Contracts Administration, Amherst Campus, Amherst, Massachusetts, Kevin H. Aiken, Director, Continuing Education and Public Service, Amherst Campus, Amherst, Massachusetts, Carol P. Sprague, Acting Associate Director of the Office of Grants and Contracts Administration, Amherst Campus, Amherst, Massachusetts, Jennifer A. Donais, Assistant Director of Grants and Contracts Administration, Amherst Campus, Amherst, Massachusetts, John Dubach, Deputy Chancellor, Amherst Campus, Amherst Massachusetts, Marcellette Williams, Interim Chancellor, Amherst Campus, Amherst, Massachusetts, Frederick W. Byron, Jr., Vice Chancellor for Research, Amherst Campus, Amherst, Massachusetts, Bruce F. McCandless, Assistant Vice Chancellor for Research, Amherst Campus, Amherst, Massachusetts, Aaron Lazare, Chancellor, University of Massachusetts Medical School, Worcester, Massachusetts, Jill Mortali, Director of Sponsored Programs, University of Massachusetts Medical School, Worcester, Massachusetts, Richard Stanton, Deputy Chancellor for Finance and Administration, University of Massachusetts Medical School, Worcester, Massachusetts, Frank Chlapowski, Ph.D., Assistant Vice Chancellor for Research, University of Massachusetts Medical School, Worcester, Massachusetts, Joseph F. X. McGuirl, Executive Director, Office of Commercial Ventures and

Intellectual Property, University of Massachusetts Medical School, Worcester, Massachusetts, Dr. John L. Sullivan, M.D., Director, Office of Research, University of Massachusetts Medical School, Worcester, Massachusetts, Elaine Zamarro, Manager, Office of Sponsored Programs, University of Massachusetts Medical School, Worcester, Massachusetts, Dr. William T. Hogan, Chancellor, Lowell Campus, Lowell, Massachusetts, Susan Goodwin, Vice Chancellor, Lowell Campus, Lowell, Massachusetts, Louis Petrovic, Director of External Funding, Technology Transfer & Partnering, Lowell Campus, Lowell, Massachusetts, Louise Griffin, Director of Grants & Contracts, Lowell Campus, Lowell, Massachusetts, Charles J. Gisondi, Comptroller, Lowell Campus, Lowell, Massachusetts, Donald L. Zekan, Vice Chancellor for Administrative and Fiscal Services, Dartmouth Campus, Dartmouth, Massachusetts, Jeffrey L. Robinson, Controller, Dartmouth Campus, Dartmouth, Massachusetts, Jean MacCormack, Chancellor, Dartmouth Campus, Dartmouth, Massachusetts, William Mitchell, Associate Vice Chancellor of Finance, University of Massachusetts, Dartmouth Campus, Dartmouth, Massachusetts, Thomas Curry, Vice Chancellor for Academic Affairs, University of Massachusetts, Dartmouth Campus, Dartmouth, Massachusetts, Deborah Marisi, Director of Grants & Contracts, University of Massachusetts, Dartmouth Campus, Dartmouth, Massachusetts, are designated in accordance with the aforementioned votes to review and execute all grants and contracts for sponsored programs in instruction, research and public service that are applicable to and received on behalf of the University of Massachusetts for their respective campuses.

I further certify that Stephen W. Lenhardt, Philip J. Marquis, Jo Ann Gora, David J. Mackenzie, Paul O'Keefe, Margaret Vidrine, Kevin H. Aiken, Carol P. Sprague, Jennifer A. Donais, John Dubach, Marcellette Williams, Frederick W. Byron Jr., Bruce F. McCandless, Aaron Lazare, Jill Mortali, Richard Stanton, Frank Chlapowski, Ph.D., Joseph F. X. McGuirl, John L. Sullivan, Elaine Zamarro, Dr. William T. Hogan, Susan Goodwin, Louis Petrovic, Charles J. Gisondi, Louise Griffin, Donald Zekan, Jeffrey L. Robinson, Jean MacCormack, William Mitchell, Thomas Curry, Richard Burke, are members of the University Administration with its principal office located at One Beacon Street, Boston, County of Suffolk in the Commonwealth of Massachusetts.

Date 1/1/03

  
Barbara DeVico, Secretary to the Board of Trustees



**NETC Agreement No. 6.06-06(03)**

**Research Agreement for NETC Project No. 03-4,**

**"Measuring Pollutant Removal Efficiencies of Stormwater Treatment Units"**

**THIS AGREEMENT**, concluded at Newington, Connecticut, by and between the State of Connecticut, Department of Transportation, James F. Byrnes, Jr., Commissioner, acting herein by James M. Sime, Manager of Research, Bureau of Engineering and Highway Operations, duly authorized, hereinafter referred to as the "New England Transportation Consortium" or "NETC," and the University of Massachusetts Lowell, acting herein by Louise G. Griffin, Managing Director, External Funding, Technology Transfer, and Partnering, hereunto duly authorized, hereinafter referred to as the University.

**WITNESSETH THAT:**

**WHEREAS**, the New England Transportation Consortium (NETC) is a joint undertaking through which the transportation agencies of the six (6) New England states pool their professional, academic and financial resources to focus on the research, development and implementation of improved methods for dealing with common problems associated with transportation systems; and,

**WHEREAS**, the State of Connecticut, Department of Transportation (ConnDOT), has been authorized as the lead agency for the NETC for the purposes of entering into and administering this Agreement; and,

**WHEREAS**, the Commissioner of ConnDOT is authorized to undertake the foregoing activities under Sections 13b-4 and 13b-23 of the General Statutes of Connecticut, as revised.

**NOW, THEREFORE, KNOW YE THAT:**

1. **THE UNIVERSITY AGREES TO:**

- (A) Perform the study, delineated in the attached Proposal and Work Plan, hereinafter called the "Proposal."
- (B) Provide NETC with seven (7) copies of quarterly progress reports which are to be received no later than three (3) working days after the end of each calendar year quarter.
- (C) Provide NETC with seven (7) copies of draft interim reports on specified tasks for review by NETC and the Federal Highway Administration (FHWA). Within ninety (90) calendar days after acceptance of the interim report(s) by NETC, subject to action on review commentary, one hundred and twenty (120) copies of the interim report(s) shall be furnished to NETC. A set of reproducibles, as well as an electronic ADOBE™ Portable Document Format (PDF) document, used in the preparation of the interim report(s), will be provided to NETC within thirty (30) calendar days after the interim report(s) is(are) delivered to NETC.
- (D) At the conclusion of the study, provide NETC with seven (7) copies of a draft of the final report, for review by NETC and FHWA. Within ninety (90) calendar days after acceptance of the draft final report by NETC, subject to action on review commentary, one hundred and twenty (120) copies of the final report shall be furnished to NETC. A set of reproducibles, as well as an electronic ADOBE™ Portable Document Format (PDF) document, used in the preparation of the final report, will be provided to NETC within thirty (30) calendar days after the final report is delivered to NETC.
- (E) Permit NETC and the FHWA to review, during normal business hours, all work performed under the terms of this Agreement at any stage of the work.
- (F) Attend conferences at locations designated by NETC for consultation and discussion upon request of NETC.
- (G) Submit properly executed vouchers on ConnDOT invoices (Service Transfer Invoice) for payment for a billing period not to exceed a calendar quarter.

The invoice shall indicate the total costs incurred for the billing period in accordance with the provisions of Section 2.(C)(1) herein. These vouchers shall be submitted, no later than forty-five (45) calendar days after the end of each billing period, to:

NETC Coordinator  
Transportation Institute  
U-37-TI  
University of Connecticut  
Storrs, CT 06269-3037.

- (H) Not sublet any portion of the work required for the completion of this Agreement without the prior written approval of NETC. The form of the Subcontractor's Agreement shall be as developed by the University and be subject to approval by NETC.
- (I) Maintain an accounting system that is adequate to segregate and accumulate reasonable, allocable and allowable costs and maintain accounts and records in accordance with generally accepted accounting principles consistently applied.
- (J) Recognize the authority for determining allowable costs under the Agreement to be OMB Circular A-21, "Cost Principles for Educational Institutions," OMB Circular A-110, "Grants and Agreements with Institutions of Higher Education, Hospitals and other Nonprofit Organizations," which are incorporated herein by reference.
- (K) Permit the authorized representatives of NETC, the United States Department of Transportation and the Comptroller General of the United States to perform an annual inspection and audit of all data and records of the University relating to its performance under this Agreement.
- (L) In the event that this Agreement is terminated under the provisions of Section 3.(E), the University shall permit the authorized representatives of NETC, the United States Department of Transportation, and the Comptroller General of the United States to inspect and audit all data and records of the University relating to its performance under this Agreement until the expiration of three (3) years after termination of this project under this Agreement.

The University further agrees to include in all its subcontracts hereunder a provision to the effect that the Subcontractor agrees that NETC, the United States Department of Transportation and the Comptroller General of the United States, or any of their duly authorized representatives, shall, until the expiration of three (3) years after termination of the project under the subcontract, have access to and the right to examine any directly pertinent books, documents, papers, and records of such Subcontractor, involving transactions related to the subcontract. The term "subcontract" as used in this clause excludes work not exceeding \$25,000.

The periods of access and examination described above, for records which relate to (1) appeals for disputes, (2) litigation of the settlement of claims arising out of the performance of this Agreement, or (3) costs and expenses of this Agreement as to which exception have been taken by NETC, the Comptroller General, or any of their duly authorized representatives, shall continue until such appeals, litigation, claims, or exceptions have been disposed of.

(M) Preserve all of its records and accounts concerning the implementation of this Agreement including, but not limited to, any records, books, or other documents relative to charges, including charges for Extra Work, alleged breaches of Agreement, settlement of claims, or any other matter involving the University's or Subcontractor's demand for compensation by NETC for a period of not less than three (3) years from the date of the termination of this project under this Agreement. If any litigation, claim, or audit is started before the expiration on the three (3) year period, the records shall be retained until all litigations, claims, or audit findings involving the records have been resolved.

(N) In the event that a transfer of funds between budget categories, contained in this Agreement, is required, the University may make cumulative transfers among direct cost categories of up to ten percent (10%) of the total approved budget, without approval of NETC. Larger changes require prior approval of NETC. In no case, however, will NETC be responsible for expenses in excess of the approved total amount.

2. ConnDOT, ON BEHALF OF NETC, AGREES TO:

- (A) Furnish the University copies of any data it may have in its possession such as, but not limited to, plans, maps, reports, aerial photos, data, publications, organizational arrangements, directives, computer tapes, etc., which the University may deem of value for use and analysis.
- (B) Arrange and hold conferences upon reasonable notice as may be necessary to the University's activities covered by this Agreement.
- (C) Pay the University, in accordance with the approved Proposal, for all work authorized by NETC and performed in accordance with the terms specified herein. The University may request partial payments for work performed. These requests for payment may be submitted for a billing period not to exceed a calendar quarter and shall be made on voucher forms supplied by ConnDOT on behalf of NETC. Partial payment will be made by ConnDOT, on behalf of NETC, on the following basis:
  - (1) Partial payments will be equal to one hundred percent (100%) of the University's costs incurred for each billing period, in conformance with the Budget contained in the Proposal, until the cumulative total amount invoiced equals 95% of the total of the Agreement value. If an invoice is submitted which results in the cumulative total amount invoiced exceeding 95% of the total Agreement value, ConnDOT shall withhold payment of that invoice and any further invoices, in accordance with the provisions of Section 2.(C)(3).
  - (2) ConnDOT, on behalf of NETC, agrees to pay the University an amount not to exceed the total amount of the Budget contained in the Proposal, for the contract period, established in accordance with the provisions of Sections 1.(A) and 3.(A).
  - (3) Final payment will be processed following completion of all services called for in the Agreement, as well as receipt of all

project deliverables. The final payment to the University shall include the amount invoiced for the final billing period plus any amount withheld on previous billings, in accordance with the provisions of Section 2.(C)(1).

3. NETC AND THE UNIVERSITY FURTHER MUTUALLY AGREE TO:

- (A) The term of this Agreement shall be from September 1, 2003, to February 28, 2005.
- (B) Payments to the University for work specified shall be based upon the following dated and signed certification: "The undersigned hereby certifies that payment of the sum claimed under the cited Agreement is proper and due and that information on the fiscal report is correct and such detailed supporting information is on file, available for certification and/or audit purposes, and that all services called for by the Agreement to the date of this billing, \_\_\_\_\_, have been met."

Date

\_\_\_\_\_

Director or Appropriate

Title

\_\_\_\_\_

Date

- (C) Payrolls shall be supported by time and attendance or equivalent records for individual employees. Salaries and wages of employees chargeable to more than one grant program or other cost objective will be supported by appropriate time distribution records. The method used shall conform with O.M.B. Circular A-21, "Cost Principles for Educational Institutions," and O.M.B. Circular A-110, "Grants and Agreements with Institutions of Higher Education, Hospitals and Other Nonprofit Organizations."
- (D) Specific Items Costs:
  - (1) Authorized reproduction and printing (including drafts of reports), will be paid for at cost as indicated by vouchers. All costs in connection

with obtaining data such as, but not limited to, plans, maps, reports, aerial photos, traffic data, publications, computer tapes, etc., will be paid for at cost.

- (2) Costs for all travel and subsistence between the University's offices, meetings as well as other trips necessary in connection with the study, will be reimbursed in accordance with the University's approved Travel Regulations and rates.
- (3) Any and all costs and expenses for work in connection with and pertinent to this Agreement as approved by NETC, will be paid for at cost.
- (4) Mainframe computer charges will be based on actual machine time, whether for running programs or de-bugging new programs, and will include the cost of operators and key punchers and supervisors. Charges for outside and University computers will be reimbursed at cost. Salaries for programmers will be reimbursed as other direct salaries.
- (5) For outside consulting services, required in and provided for in the project proposal, direct reimbursement will be paid the University by NETC. The Agreement between the University and the Consultant governing the Consultant services shall be approved by NETC prior to execution.
- (6) To the certified payroll may be added a percentage to cover fringe payroll costs for: F.I.C.A., Health Benefits, Retirement, Longevity, Vacation, Holiday, Sick Leave, etc. Reimbursement for fringe benefits and indirect costs will be based on the rates in effect at the time expenses are incurred. The base against which each rate is applied will be that specified in the University's current Indirect Cost Agreement.
- (7) All equipment purchased with project funds, as listed below, shall remain the property of NETC upon completion or termination of the study:

N/A.

All equipment not listed shall remain the property of the University upon completion or termination of the study.

(E) Termination of Work:

Either party may terminate a project Agreement upon sixty (60) days written notice to the other party. The University will immediately act to minimize project costs upon issuing or receiving such notice, and will submit to NETC a report describing all work completed to date. NETC will reimburse the University a percentage of the total project cost that is equal to the percentage of work completed. Upon receipt of written notification from either party that this Agreement is to be terminated, the University shall immediately cease operations on work stipulated in this Agreement and assemble all material that has been prepared, developed, furnished or obtained under the terms of this Agreement, that may be in its possession or custody and shall transmit the same to NETC on or before the sixtieth (60th) day following the receipt of the written notice of termination. Said material shall include, but not be limited to, documents, plans, computations, drawings, notes, records and correspondence.

(F) Time Extensions:

NETC may extend the completion dates beyond the period specified when the work has been delayed for reasons beyond the control of the University. The University may present to NETC, in writing, requests for extension of allotted time for completion of work. NETC will evaluate such requests and if NETC determines such requests are based on valid grounds, shall grant such extension of time for completion of the work as NETC deems warranted. All requests by the University for extension of time must be made ninety (90) days prior to the scheduled expiration date.

The University further agrees that no charges or claim for damages shall be made by it for any delays or hindrances from any cause whatsoever during the progress of any portion of the services specified in this Agreement. Such delays or hindrances, if any, shall be compensated for by an extension of time for such reasonable period as NETC may determine, it being understood, however, that the permitting of the University to proceed to complete any services or any part of them after the date of completion or after the date to

which time of completion may have been extended, shall in no way operate as a waiver on the part of NETC of any of its rights herein.

- (G) The title to all products of research generated under this Agreement shall reside with the University. However, the University grants to NETC member departments, the United States Government, and the general public, a non-exclusive, irrevocable, royalty-free, worldwide license in such work products to use, reproduce and prepare derivative works. The University may use any of the data, plans and reports completed under the NETC program for whatever purpose and may distribute products in any way. However, the following text must appear on the inside front of any reports or publications: "This report was prepared by the University of Massachusetts Lowell for six New England states (Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island and Vermont), in cooperation with the United States Department of Transportation, Federal Highway Administration. The opinions, findings and conclusions expressed in the publication are those of the author(s) and not necessarily those of the six New England States or the Federal Highway Administration. This publication is based upon publicly supported research and is copyrighted. It may be reproduced in part or in full, but it is requested that there be customary crediting of the source."

(H) Publication Provisions:

- (1) The University shall be free to copyright material developed under this Agreement with the provision that NETC and FHWA reserve a royalty-free, non-exclusive and irrevocable license to reproduce, publish, or otherwise use, and to authorize others to use the work for government purposes, as specified in Section 3.(G).
- (2) No reports, articles, papers or publications may be published by the University without the written authority of NETC except as provided for in the following items:
  - (a) All reports, articles, papers or publications shall contain the disclaimer: "This report [article, paper or publication], prepared in cooperation with the New England Transportation

Consortium, does not constitute a standard, specification or regulation. The contents of this report [article, paper or publication] reflect the views of the author(s) who is(are) responsible for the facts and the accuracy of the data presented herein. The contents do not necessarily reflect the views of the New England Transportation Consortium or the Federal Highway Administration."

(b) It is anticipated that, in addition to interim and final reports that may be specified in this project Agreement, the University may wish to publish papers or articles based, in whole or in part, on information developed under this project Agreement. The University shall have the right to so publish provided the manuscript is submitted to NETC for concurrence. NETC will have forty-five (45) calendar days to review the manuscript. If no response is provided by NETC at the end of the specified period, the University may proceed with publication. In the event of nonconcurrence by NETC, the University may publish the manuscript provided the following statement is included: "The New England Transportation Consortium and the Federal Highway Administration do not concur with the findings and conclusions of the manuscript."

(I) Federal Requirements:

The University shall comply with the Regulations of the United States Department of Transportation (Title 49, Code of Federal Regulations, Part 21), issued in implementation of Title VI of the Civil Rights Act of 1964, 78 Stat. 252, 42 U.S.C. 2000d to 2000d-4, and Appendix CR attached hereto, both of which are hereby made a part of this Agreement.

(J) Patent Rights:

The terms "Invention" or "Discovery," as used herein mean any invention or discovery of the University conceived or first actually reduced to practice in the course of or under this Agreement, and includes any art, method, process,

machine or manufacture, design or composition thereof, or any variety of plant, which is or may be patentable under the Patent Laws of the United States of America or any foreign country.

23 CFR 420.121(j) of the "State Planning and Research Program Administration, Final Rule," and 37 CFR 401.14, "Standard Patent Rights Clauses," are herein by reference made part of this Agreement.

The quarterly report required in Section 1.(B) of this Agreement shall include disclosure of potentially patentable inventions or discoveries first conceived or reduced to practice since the prior report. The University shall have title to such inventions or discoveries. The University shall have the right to file patent applications on such inventions and discoveries. The University shall give written notice of its intention to file a patent application with respect to any such discovery or invention within sixty (60) days after disclosure to NETC. If the University becomes the owner of any patent with respect to any invention or discovery covered by this paragraph, it shall grant to NETC, its members and the Federal Government a paid-up, royalty-free, nonexclusive, irrevocable license, with the right to sublicense to practice or have practiced for or on the behalf of governmental agencies, either Federal, State, or municipal agencies including counties and townships, or quasi-governmental agencies, the patented invention or discovery. Any royalties from sales in the private sector or outside the United States shall be assigned to the University. With respect to inventions or discoveries covered by this paragraph which are not patented or patentable, such inventions or discoveries shall be jointly owned with each party having the unrestricted right to practice or have practiced the same on its behalf.

- (K) 37 CFR, Part 401, "Rights To Inventions Made by Nonprofit Organizations and Small Business Firms Under Government Grants, Contracts and Cooperative Agreements," is herein by reference made part of this Agreement.
- (L) NETC assumes no liability for payment under the terms of a specific project Agreement until such Agreement has been approved and signed by both parties.
- (M) Funding:

The University shall fund all work conducted under this Agreement in the first instance and bill NETC for reimbursement. In no case will NETC be liable for reimbursement of project costs in excess of the amount specified in the project Agreement.

- (N) Schedule A is attached hereto and made a part of this Agreement hereof. To the extent permitted by law, NETC and each of the state universities which belong to NETC shall, as part consideration for the promises of the State, fully comply with each of the terms and conditions set forth within Schedule A. It is understood and agreed among the parties that nothing within this subparagraph of this Agreement may be construed as a waiver of or limitation upon the sovereign immunity, if any, of any of the state universities which belong to the NETC or the NETC membership itself.
- (O) It is mutually understood and agreed by the parties hereto that any official notice from one such party to the other such party (or parties), in order for such notice to be binding thereon, shall:

(a.) be in writing addressed to:

- (i) when ConnDOT is to receive such notice -

Mr. James M. Sime  
Manager of Research  
Connecticut Department of Transportation  
280 West Street  
Rocky Hill, CT 06067; or,

- (ii) when the University is to receive such notice -

Ms. Louise G. Griffin  
Managing Director, External Funding, Technology Transfer, and  
Partnering  
University of Massachusetts Lowell  
Research Foundation  
600 Suffolk Street  
Second Floor South  
Lowell, MA 01852;

- (b.) be delivered in person or be mailed United States Postal Service - "Certified Mail" to the address recited herein as being the address of the party(ies) to receive such notice; and,
- (c.) contain complete and accurate information in sufficient detail to properly and adequately identify and describe the subject matter thereof.

The term "official notice" as used herein, shall be construed to include, but not be limited to, any request, demand, authorization, direction, waiver, and/or consent of the party(ies) as well as any document(s) provided, permitted, or required for the making or ratification of any change, revision, addition to or deletion from the document, contract, or agreement in which this "official notice" specification is contained.

Further, it is understood and agreed that nothing hereinabove contained shall preclude the parties hereto from subsequently agreeing, in writing, to designate alternate persons (by name, title, and affiliation) to which such notice(s) is (are) to be addressed; alternate means of conveying such notice(s) to the particular party(ies); and/or alternate locations to which the delivery of such notice(s) is (are) to be made, provided such subsequent agreement(s) is (are) concluded pursuant to the adherence to this specification.

- (P) Any standards (i.e., test methods, specifications, guidelines, suggested practices, recommended procedures, etc.) emanating from the research project shall be forwarded to the American Association of State Highway Transportation Officials (AASHTO) for consideration and possible adoption.

APPENDIX-CR (ED. 061077)

During the performance of this Agreement, the Second Party, for itself, its assignees and successors in interest agrees as follows:

(1) Compliance with Regulations: The Second Party shall comply with the Regulations relative to nondiscrimination in Federally-assisted programs of the United States Department of Transportation, Title 49, Code of Federal Regulations, Part 21, as they may be amended from time to time, (hereinafter referred to as the Regulations), which are herein incorporated by reference and made a part of this Agreement.

(2) Nondiscrimination: The Second Party, with regard to the work performed by it during the Agreement, shall not discriminate on the grounds of race, color, or national origin in the selection and retention of subcontractors, including procurements of materials and leases of equipment. The Second Party shall not participate either directly or indirectly in the discrimination prohibited by section 21.5 of the Regulations, including employment practices when the Agreement covers a program set forth in Appendix B of the Regulations.

(3) Solicitations for Subcontractors, Including Procurements of Materials

and Equipment: In all solicitations either by competitive bidding or negotiation made by the Second Party for work to be performed under a subcontract, including procurements of materials or leases of equipment, each potential subcontractor or supplier shall be notified by the Second Party of the Second Party's obligations under this Agreement and the Regulations relative to nondiscrimination on the grounds of race, color, or national origin.

(4) Information and Reports: The Second Party shall provide all information and reports required by the Regulations, or directives issued pursuant thereto, and shall permit access to its books, records, accounts, other sources of information, and its facilities as may be determined by the Connecticut Department of Transportation or the appropriate Federal Agency directly involved therewith, to be pertinent to ascertain compliance with such Regulations or directives. Where any information required of a Second Party is in the exclusive possession of another who fails or refuses to furnish this information, the Second Party shall so certify to the Connecticut Department of Transportation, or the appropriate Federal Agency directly involved therewith, if appropriate, and shall set forth what efforts it has made to obtain the information.

(5) Sanctions for Noncompliance: In the event of the Second Party's noncompliance with the nondiscrimination provisions of this Agreement, the Connecticut Department of Transportation shall impose such sanctions as it or the appropriate Federal Agency directly involved therewith, may determine to be appropriate, including, but not limited to:

- (a) withholding of payments to the Second Party under the Agreement until the Second Party complies, and/or
- (b) cancellation, termination or suspension of the Agreement, in whole or in part.

(6) Incorporation of Provisions: The Second Party shall include the provisions of paragraphs (1) through (6) in every subcontract, including procurements of materials and leases of equipment, unless exempt by the Regulations, or directives issued pursuant thereto. The Second Party shall take such action with respect to any subcontract or procurement as the Connecticut Department of Transportation or the appropriate Federal Agency directly involved therewith, may direct as a means of enforcing such provisions including sanctions for non-compliance: Provided, however, that, in the event a Second Party becomes involved in, or is threatened with, litigation with a subcontractor or supplier as a result of such direction, the Second Party may request the Connecticut Department of Transportation to enter into such litigation to protect the interests of the State of Connecticut, and in addition, the Second Party may request the United States to enter into such litigation to protect the interests of the United States.

**SCHEDULE A**

**NETC AND THE UNIVERSITY MUTUALLY AGREE TO:**

- (A) The University hereby acknowledges and agrees to comply with the Connecticut Required Contract/Agreement Provisions entitled, "Specific Equal Employment Opportunity Responsibilities," dated March 6, 1998, a copy of which is attached hereto and made a part hereof.
- (B) The University hereby acknowledges and agrees to comply with the policies enumerated in "Connecticut Department of Transportation Policy Statement No. ADMIN. - 10 Subject: Code of Ethics Policy," dated March 25, 1999, a copy of which is attached hereto and made a part hereof.

The University shall comply with the provisions contained in Section 1-86e of the Connecticut General Statutes, which provides as follows:

- a. No person hired by the State as a contractor or independent contractor shall:
  - 1. Use the authority provided to the person under the contract, or any confidential information acquired in the performance of the contract, to obtain financial gain for the person, and employee of the person or a member of the immediate family of any such person or employee;
  - 2. Accept another State contract which would impair the independent judgment of the person in the performance of the existing contract; or,
  - 3. Accept anything of value based on an understanding that the actions of the person on behalf of the State would be influenced.
- b. No person shall give anything of value to a person hired by the State as a contractor or independent contractor based on

an understanding that the actions of the contractor or independent contractor on behalf of the State would be influenced.

- (C) The University agrees that the attached "Policy Statement, Policy No. ADMIN. - 19, May 12, 2003, Subject: Policy on Disadvantaged Business Enterprise Program," is hereby made a part of this Agreement. The State advises the University that failure to carry out the requirements set forth in this Policy Statement shall constitute a breach of contract and may result in termination of this Agreement by the State or such remedy as the State deems appropriate.

The University shall comply with this provision in accordance with the "Agreements With Goals Special Provisions Disadvantaged Business Enterprises as Subcontractors and Material Suppliers or Manufacturers For Federal Funded Projects," dated October 16, 2000, attached hereto and hereby made a part of this Agreement.

- (D) The University hereby acknowledges and agrees to comply with the policies enumerated in Administrative Memorandum No. 104, dated August 28, 1984, Re: "Procurement and Property Management of Equipment Purchased by Construction Inspection Consultant Engineers."
- (E) The University hereby acknowledges and agrees to comply with Chapter 219 of the Connecticut General Statutes pertaining to tangible personal property or services rendered that is/are subject to sales tax. The attached copy of the "Governmental Agency Exemption Certificate" is hereby made a part hereof.
- (F) Suspended or debarred University suppliers, materialmen, lessors or other vendors may not submit proposals for a State contract or subcontract during the period of suspension or debarment

regardless of their anticipated status at the time of contract award or commencement of work.

(1) The signature on the Agreement by the University shall constitute certification that to the best of its knowledge and belief the University or any person associated therewith in the capacity of owner, partner, director, officer, principal investigator, project director, manager, auditor or any position involving the administration of Federal or State Funds:

(a.) Is not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transactions by any Federal department or agency;

(b.) Has not within a three (3) year period preceding this Agreement been convicted of or had a civil judgment rendered against him/her for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State or local) transaction or contract under a public transaction, violation of Federal or State antitrust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements or receiving stolen property;

(c.) Is not presently indicted for or otherwise criminally or civilly charged by a governmental entity (Federal, State or local) with commission of any of the offenses enumerated in paragraph (1)(b.) of this certification and,

(d.) Has not within a three (3) year period preceding this Agreement had one or more public transactions

(Federal, State or local) terminated for cause or default.

(2) Where the University is unable to certify to any of the statements in this certification, such University shall attach an explanation to this Agreement.

(G) The University agrees to insure that the following certification be included in each subcontract Agreement to which it is a party, and further, to require said certification to be included in any lower tier subcontracts and purchase orders:

(1) The prospective lower tier participant certifies, by submission of this proposal, that neither it nor its principals is presently debarred, suspended, proposed for debarment, declared ineligible or voluntarily excluded from participation in this transaction by any Federal department or agency.

(2) Where the prospective lower tier participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.

(H) This clause applies to those University who are or will be responsible for compliance with the terms of the Americans with Disabilities Act of 1990 ("Act"), Public Law 101-336, during the term of the Agreement. The University represents that it is familiar with the terms of this Act and that it is in compliance with the Act. Failure of the University to satisfy this standard as the same applies to performance under this Agreement, either now or during the term of the Agreement as it may be amended, will render the Agreement voidable at the option of the State upon notice to the University. The University warrants that it will hold the State harmless and indemnify the State from any liability which may be imposed upon the State from any liability which may

be imposed upon the State as a result of any failure of the University to be in compliance with this Act, as the same applies to performance under the Agreement.

- (I) The term "date data" as used herein shall mean any program function that utilizes data or input which includes an indication of or reference to the date. The University represents that any hardware, software, data in a computer format and/or firmware [hereinafter referred to as "product(s)"] delivered to or developed for the State shall be capable of accurately processing (including, but not limited to, calculating, comparing and sequencing) date data from, into and/or between the twentieth and twenty-first centuries, including leap year calculations, when used in accordance with the purpose for which the State intends to use the product(s). Such processing shall employ an expanded character format using at least eight digits in the date fields, but shall not be based upon a sliding scale format or increase the processing time of the product(s). The accurate processing of date data by such product(s) from, into and/or between the twentieth and twenty-first centuries, including leap year calculations, shall hereinafter be referred to collectively as "Year 2000 compliant." In addition, said product(s) delivered to or developed for the State shall be capable of accurately processing date data throughout the twenty-first century, as well as from, into and/or between centuries.

- (J) Violence in the Workplace Prevention:

This contract is subject to the provisions of Executive Order No. 16 of Governor John G. Rowland, promulgated August 4, 1999 and, as such, the contract may be cancelled, terminated or suspended by the state for violation of or noncompliance with said Executive Order No. 16. The parties to this contract, as part of the consideration hereof, agree that said Executive Order No. 16 is

incorporated herein by reference and made a part hereof. The parties agree to abide by such Executive Order.

STATE OF CONNECTICUT  
BY HIS EXCELLENCY  
THOMAS J. MESKILL  
GOVERNOR  
EXECUTIVE ORDER NO. THREE

WHEREAS, sections 4-61d (b) and 4-114a of the 1969 supplement to the general statutes require nondiscrimination clauses in state contracts and subcontracts for construction on public buildings, other public works and goods and services and

WHEREAS, section 4-61e (c) of the 1969 supplement to the general statutes requires the labor department to encourage and enforce compliance with this policy by both employers and labor unions, and to promote equal employment opportunities, and

WHEREAS, the government of this state recognizes the duty and desirability of its leadership in providing equal employment opportunity, by implementing these laws,

NOW, THEREFORE, I, THOMAS J. MESKILL, Governor of the State of Connecticut, acting by virtue of the authority vested in me under section twelve of article fourth of the constitution of the state, as supplemented by section 3-1 of the general statutes, do hereby ORDER and DIRECT, as follows, by this Executive Order:

I

The labor commissioner shall be responsible for the administration of this Order and shall adopt such regulations as he deems necessary and appropriate to achieve the purposes of this Order. Upon the promulgation of this Order, the commissioner of finance and control shall issue a directive forthwith to all state agencies, that henceforth all state contracts and subcontracts for construction on public buildings, other public works and goods and services shall contain a provision rendering such contract or subcontract subject to this Order, and that such contract or subcontract may be cancelled, terminated or suspended by the labor commissioner for violation of or noncompliance with this Order or state or federal laws concerning nondiscrimination, notwithstanding that the labor commissioner is not a party to such contract or subcontract.

II

Each contractor having a contract containing the provisions prescribed in section 4-114a of the 1969 supplement to the general statutes, shall file, and shall cause each of his subcontractors to file, compliance reports with the contracting agency or the labor commissioner, as may be directed. Such reports shall be filed within such times and shall contain such information as to employment policies and statistics of the contractor and each subcontractor, and shall be in such form as the labor commissioner may prescribe. Bidders or prospective contractors or subcontractors may be required to state whether they have participated in any previous contract subject to the provisions of this Order or any preceding similar Order, and in that event to submit on behalf of themselves and their proposed subcontractors compliance reports prior to or as an initial part of their bid or negotiation of a contract.

III

Whenever the contractor or subcontractor has a collective bargaining agreement or other contract or understanding with a labor organization or employment agency as defined in section 31-122 of the general statutes, the compliance report shall identify the said organization or agency and the contracting agency or the labor commissioner may require a compliance report to be filed with the contracting agency or the labor commissioner, as may be directed, by such organization or agency, signed by an authorized officer or agent of such organization or agency, with supporting information, to the effect that the signer's practices and policies, including but not limited to matters concerning personnel, training, apprenticeship, membership, grievance and representation, and upgrading, do not discriminate on grounds of race, color, religious creed, age, sex, or national origin, or ancestry of any individual, and that the signer will either affirmatively cooperate in the implementation of the policy and provisions of this Order, or that it consents and agrees that recruitment, employment and the terms and conditions of employment under the proposed contract shall be in accordance with the purposes and provisions of the Order.

IV

The labor commissioner may by regulation exempt certain classes of contracts, subcontracts or purchase order from the implementation of this Order, for standard commercial supplies or raw materials, for less than specified amounts of money or numbers of workers or for subcontractors below a specified tier. The labor commissioner may also provide by regulation for the exemption of facilities of a contractor which are in all respects separate and distinct from activities of the contractor related to the performance of the state contract, provided only that such exemption will not interfere with or impede the implementation of this Order, and provided further, that in the absence of such an exemption, all facilities shall be covered by the provisions of this Order.

V

Each contracting agency shall be primarily responsible for obtaining compliance with the regulations of the labor commissioner with respect to contracts entered into by such agency or its contractors. All contracting agencies shall comply with the regulations of the labor commissioner in discharging their primary responsibility for securing compliance with the provisions of contracts and otherwise with the terms of this Order and of the regulations of the labor commissioner issued pursuant to this Order. They are directed to cooperate with the labor commissioner and to furnish the labor commissioner such information and assistance as he may require in the performance of his functions under this Order. They are further directed to appoint or designate from among the personnel of each agency, compliance officers, whose duty shall be to seek compliance with the objectives of this Order by conference, conciliation, mediation, or persuasion.

VI

The labor commissioner may investigate the employment practices and procedures of any state contractor or subcontractor and the practices and policies of any labor organization or employment agency hereinabove described, relating to employment under the state contract, as concerns nondiscrimination by such organization or agency as hereinabove described, or the labor commissioner may initiate such investigation by the appropriate contract agency, to determine whether or not the contractual provisions hereinabove specified or statutes of the state respecting them have been violated. Such investigation shall be conducted in accordance with the procedures established by the labor commissioner and the investigating agency shall report to the labor commissioner any action taken or recommended.

VII

The labor commissioner shall receive and investigate or cause to be investigated complaints by employees or prospective employees of a state contractor or subcontractor or members or applicants for membership or apprenticeship or training in a labor organization or employment agency hereinabove described, which allege discrimination contrary to the contractual provisions specified hereinabove or state statutes requiring nondiscrimination in employment opportunity. If this investigation is conducted for the labor commissioner by a contracting agency, that agency shall report to the labor commissioner what action has been taken or is recommended with regard to such complaints.

VIII

The labor commissioner shall use his best efforts, directly and through contracting agencies, other interested federal, state and local agencies, contractors and all other available instrumentalities, including the commission on human rights and opportunities, the executive committee on human rights and opportunities, and the apprenticeship council under its mandate to provide advice and counsel to the labor commissioner in providing equal employment opportunities to all apprentices and to provide training, employment and upgrading opportunities for disadvantaged workers, in accordance with section 31-51 (d) of the 1969 supplement to the general statutes, to cause any labor organization or any employment agency whose members are engaged in work under government contracts or referring workers or providing or supervising apprenticeship or training for or in the course of work under a state contract or subcontract to cooperate in the implementation of the purposes of this Order. The labor commissioner shall in appropriate cases notify the commission on human rights and opportunities or other appropriate state or federal agencies whenever it has reason to believe that the practices of any such organization or agency violate equal employment requirements or state or federal law.

IX

The labor commissioner or any agency officer or employee in the executive branch designated by regulation of the labor commissioner may hold such hearings, public or private, as the labor commissioner may deem advisable for compliance, enforcement or educational purposes under this Order.

X

(a) The labor commissioner may hold or cause to be held hearings, prior to imposing ordering or recommending the imposition of penalties and sanctions under this Order. No order for disbarment of any contractor from further state contracts shall be made without affording the contractor an opportunity for a hearing. In accordance with such regulations as the labor commissioner may adopt, the commissioner or the appropriate contracting agency may

- (1) Publish or cause to be published the names of contractors or labor organizations or employment agencies as hereinabove described which it has concluded have complied or failed to comply with the provisions of this Order or the regulations of the labor commissioner in implementing this Order.
- (2) Recommend to the commission on human rights and opportunities that in cases in which there is substantial or material violation or threat thereof of the contractual provision or related state statutes concerned herein, appropriate proceedings be brought to enforce them, including proceedings by the commission on its own motion under chapter 563 of the general statutes and the enjoining, within the limitations of applicable law, of organizations, individuals or groups who prevent directly or indirectly or seek to prevent directly or indirectly compliance with the provisions of this Order.
- (3) Recommend that criminal proceedings be brought under chapter 939 of the general statutes.
- (4) Cancel, terminate, suspend or cause to be cancelled, terminated, or suspended in accordance with law any contract or any portion or portions thereof for failure of the contractor or subcontractor to comply with the nondiscrimination provisions of the contract. Contracts may be cancelled, terminated, suspended absolutely or their continuance conditioned upon a program for future compliance approved by the contracting agency.
- (5) Provide that any contracting agency shall refrain from entering into any further contracts or extensions or modifications of existing contracts with any contractor until he has satisfied the labor commissioner that he has established and will carry out personnel and employment policies compliant with this Order.
- (6) Under regulations prescribed by the labor commissioner each contracting agency shall make reasonable efforts within a reasonable period of time to secure compliance with the contract provisions of this Order by methods of conference, conciliation, mediation or persuasion, before other proceedings shall be instituted under this Order or before a state contract shall be cancelled or terminated in whole or in part for failure of the contractor or subcontractor to comply with the contract provisions of state statute and this Order.

(b) Any contracting agency taking any action authorized by this Order, whether on its own motion or as directed by the labor commissioner or pursuant to his regulations shall promptly notify him of such action. Whenever the labor commissioner makes a determination under this Order, he shall promptly notify the appropriate contracting agency and other interested federal, state and local agencies of the action recommended. The state and local agency or agencies shall take such action and shall report the results thereof to the labor commissioner within such time as he shall specify.

XI

If the labor commissioner shall so direct, contracting agencies shall not enter into contracts with any bidder or prospective contractor unless he has satisfactorily complied with the provisions of this Order, or submits a program for compliance acceptable to the labor commissioner, or if the labor commissioner so authorizes, to the contracting agency.

XII

Whenever a contracting agency cancels or terminates a contract, or a contractor has been disbarred from further government contracts because of noncompliance with the contract provisions with regard to nondiscrimination, the labor commissioner or the contracting agency shall rescind such disbarment, upon the satisfaction of the labor commissioner that the contractor has purged himself of such noncompliance and will thenceforth carry out personnel and employment policies of non-discrimination in compliance with the provision of this Order.

XIII

The labor commissioner may delegate to any officer, agency or employee in the executive branch any function or duty of the labor commissioner under this Order except authority to promulgate regulations of a general nature.

XIV

This Executive Order supplements the Executive Order issued on September 28, 1967. All regulations, orders, instructions, designations and other directives issued heretofore in these premises, including those issued by the heads of various departments or agencies under or pursuant to prior order or statute, shall remain in full force and effect, unless and until revoked or superseded by appropriate authority, to the extent that they are not inconsistent with this Order.

This Order shall become effective thirty days after the date of this Order.

Dated at Hartford, Connecticut, this 16th day of June, 1971.

  
GOVERNOR

GUIDELINES AND RULES  
OF STATE LABOR COMMISSIONER  
IMPLEMENTING GOVERNOR'S EXECUTIVE  
ORDER NO. THREE

---

SEC. 1. PERSONS AND FIRMS SUBJECT TO EXECUTIVE ORDER NO. THREE AND GUIDELINES AND RULES.

a. Every contractor, or subcontractor as defined in Sec. 2 hereof, supplier of goods or services, vendor, bidder and prospective contractor or subcontractor, having ten or more employees as defined in Sec. 3 of these Guidelines, having or entering into or bidding to enter into any type of contractual relationship with the State of Connecticut or any of its agencies, boards, commissions, departments or officers, and if the consideration, cost, subject matter or value of the goods or services exceeds \$5,000.00, shall be subject to the Governor's Executive Order No. Three and these Guidelines and Rules.

b. A copy of the Governor's Executive Order No. Three and of these Guidelines and Rules shall be available to each said contractor, subcontractor, supplier, vendor, bidder and prospective contractor and subcontractor, and the said Executive Order No. Three and these Guidelines and Rules shall be incorporated by reference and made a part of the contract, purchase order, agreement or document concerned. A copy of the Executive Order and of these Guidelines and Rules shall be furnished to a contracting party or bidder on request.

c. All persons, partnerships, associations, firms, corporations and other entities having less than ten employees as defined in Sec. 3 at the time of the bid and execution of the contract and continuing through the performance of the contract are exempt from the provisions of the said Executive Order and these Guidelines and Rules. All contracts, subcontracts, purchase orders and agreements wherein the consideration is \$5,000.00 or less shall be exempt from Executive Order No. Three and from these Guidelines and Rules.

SEC. 2. SUBCONTRACTORS.

As used herein, subcontractors are persons, partnerships, associations, firms or corporations or other entities having contractual relationship with a contractor who in turn has a contract with the State of Connecticut or any of its agencies, boards, commissions or departments. Subcontractors below this tier are exempt from the Executive Order and from these Guidelines and Rules.

SEC. 3 EMPLOYEES.

As used herein, employees are persons working full or part-time irrespective of personnel classification whose wages, salaries, or earnings are subject to the Federal Insurance Contribution Act and/or to Federal Withholding Tax as a matter of law (whether in fact or not any actual withholding occurs in a given case), in an employee-employer relationship at the time of bid, contract execution, or offer or acceptance, and/or during any time thereafter during the existence of the performance period of the contract to the conclusion thereof.

SEC. 4. REPORTS.

a. Prior to the execution of the contract or prior to acceptance of a bid, as the case may be, the contractor, subcontractor, bidder or vendor shall file a report with the State Labor Commissioner, which report shall be complete and contain all of the information therein prescribed. The report shall be on Form E.O. 3-1, a facsimile of which is attached hereto and made a part hereof, or in lieu thereof the contractor, subcontractor, bidder or vendor shall submit a detailed report containing all of the information required in Form E.O. 3-1.

b. The Labor Commissioner may require the filing of additional reports prior to final payment or prior to any renewal or extension of the contract and during the duration of the contract at such times as the Commissioner may, in his discretion, from time to time deem necessary. The Labor Commissioner may require the filing of additional information or reports, and the contractor, subcontractor, bidder or vendor shall furnish said information or reports within the times prescribed by the Labor Commissioner.

c. The Labor Commissioner may, at his discretion, also require timely statistical reports on the number of minority employees employed or to be employed in the performance of the contract, and the Labor Commissioner may define such minority groups or persons.

d. Reports filed pursuant to these Guidelines and Rules in implementation of Executive Order No. Three are not public records subject to public inspection, but may be inspected only by federal and state officials having jurisdiction and authority to investigate matters of this type. All federal and state agencies empowered by law to investigate matters relating to Executive order No. Three shall have access to these reports for inspection or copying during regular business hours.

e. Any person who wilfully, wantonly or through negligence destroys or permits to be destroyed, alters or allows to be altered after filing, any reports submitted in compliance herewith shall be subject to penalties as prescribed by law.

SEC. 5. MANDATORY CLAUSES IN DOCUMENTS.

a. All contracts shall contain the following provisions verbatim:

This contract is subject to the provisions of Executive Order No. Three of Governor Thomas J. Meskill promulgated June 16, 1971 and, as such, this contract may be cancelled, terminated or suspended by the state labor commissioner for violation of or noncompliance with said Executive Order No. Three, or any state or federal law concerning nondiscrimination, notwithstanding that the labor commissioner is not a party to this contract. The parties to this contract, as part of the consideration hereof, agree that said Executive Order No. Three is incorporated herein by reference and made a part hereof. The parties agree to abide by said Executive Order and agree that the state labor commissioner shall have continuing jurisdiction in respect to contract performance in regard to nondiscrimination, until the contract is completed or terminated prior to completion.

The (contractor), (subcontractor), (bidder), (vendor) agrees, as part consideration hereof, that this (order) (contract) is subject to the Guidelines and Rules issued by the state labor commissioner to implement Executive Order No. Three, and that he will not discriminate in his employment practices or policies, will file all reports as required, and will fully cooperate with the State of Connecticut and the state labor commissioner.

These provisions are in addition to and not in lieu of other clauses required by law.\*

\* N.B. The above paragraphs contain requirements additional to those set forth in July 16, 1971 directive to state agencies.

b. Every purchase order or like form submitted by a vendor or bidder, as applicable shall contain the following clause verbatim:

Vendor agrees, as part of the consideration hereof, that this order is subject to the provisions of Executive Order No. Three and the Guidelines and Rules issued by the Labor Commissioner implementing said Order as to nondiscrimination, and vendor agrees to comply therewith.

c. Where preprinted contract forms have been prescribed by federal authority and the rules of the federal agency prohibit the alteration thereof, the compliance officer of the State agency concerned shall submit to the Labor Commissioner a suggested short form or addendum acceptable to the federal agency, and in such cases, after approval by the Labor Commissioner, said clause may be substituted.

SEC. 6. COOPERATION OF STATE AGENCIES, BOARDS AND COMMISSIONS.

Every agency, board, commission and department of the State of Connecticut shall cooperate with the Labor Commissioner in the implementation of Executive Order No. Three and shall furnish such information and assistance as the Labor Commissioner may from time to time request.

SEC. 7. INVESTIGATIONS, COMPLAINTS.

The Labor Commissioner may initiate an investigation upon receipt of a complaint alleging discrimination. The Labor Commissioner may request that an investigation be conducted by the State agency which is the party to the contract in question. Investigations shall be conducted in accordance with acceptable legal standards, safeguarding the rights of all parties involved, and obtaining all of the relevant facts necessary for a complete determination of the issues. If the Labor Commissioner is not satisfied with the investigation or any part thereof he may order it to continue or to proceed further.

SEC. 8. HEARINGS.

The Labor Commissioner or officers designated by the heads of the State agencies, boards and commissions may conduct hearings on complaints filed. Hearings shall be held only after a report of the complaint has been filed with the Labor Commissioner and after a hearing on the complaint has been authorized or directed by the Labor Commissioner. Hearings shall be conducted in accordance with the accepted principles of administrative law. All parties shall be afforded the opportunity to a full, fair, impartial and complete hearing, the opportunity to examine and cross examine witnesses and to be present at all sessions of the hearing. If any party is vulnerable to a charge of a violation of the law, he shall be afforded the opportunity to procure counsel who may be present at the hearing.

SEC. 9. EQUAL EMPLOYMENT OPPORTUNITIES.

All State contracting agencies, employers, and labor unions shall use their best efforts to provide equal employment opportunities to all apprentices and to provide training, employment and upgrading opportunities for disadvantaged workers in accordance with section 31-51(d) of the General Statutes.

SEC. 10. DUTIES OF CONTRACTING AGENCIES.

All State contracting agencies shall be responsible for compliance with said Executive Order and with all state and federal laws relating to equal employment opportunities. All contracting agencies conducting investigations for the Labor Commissioner pursuant to Executive Order No. Three and these Guidelines and Rules shall report to the Labor Commissioner the action taken or recommended with regard to each complaint filed. Each officer of the executive department, every commissioner, and each executive head of each State agency, board and commission in the executive branch of the State government is expected to assume the responsibility of seeing to complete compliance with the Governor's Executive Order No. Three and shall forthwith take steps to assure and guarantee that there shall be no discrimination within their departments, agencies, boards or commissions in the performance of any state contract or subcontract on the basis of race, creed, color, sex, age, national origin or national ancestry, or in any way in violation of any state or federal law relating thereto.

BY VIRTUE OF THE AUTHORITY VESTED IN ME PURSUANT TO EXECUTIVE ORDER NO THREE EFFECTIVE JULY 16, 1971, AND THE GENERAL STATUTES OF CONNECTICUT

Dated at Wethersfield, Connecticut this 19<sup>th</sup> day of Nov., 1971.

JACK A. FUSARI  
LABOR COMMISSIONER

STATE OF CONNECTICUT

BY HIS EXCELLENCY

THOMAS J. MESKILL

GOVERNOR

EXECUTIVE ORDER NO. SEVENTEEN

WHEREAS, Section 31-237 of the General Statutes of Connecticut as amended requires the maintaining of the established free services of the Connecticut State Employment Service to both employers and prospective employees and

WHEREAS, Section 31-5 of the General Statutes of Connecticut requires that no compensation or fee shall be charged or received directly or indirectly for the services of the Connecticut State Employment Service and

WHEREAS, large numbers of our citizens who have served in the Armed Forces of our nation are returning to civilian life in our state and seeking employment in civilian occupations and

WHEREAS, we owe a duty as well as gratitude to these returning veterans including the duty to find suitable employment for them and

WHEREAS, many of our handicapped citizens are fully capable of employment and are entitled to be placed in suitable employment and

WHEREAS, many of the citizens of our state who are unemployed are unaware of the job openings and employment opportunities which do in fact exist in our state and

WHEREAS, notwithstanding the free services of the Connecticut State Employment Service, many of our Connecticut employers do not use its free services or do not avail themselves fully of all of the services offered.

NOW, THEREFORE, I, THOMAS J. MESKILL, Governor of the State of Connecticut, acting by virtue of the authority vested in me under the fourth article of the Constitution of the State and in accordance with Section 3-1 of the General Statutes, do hereby ORDER and DIRECT, as follows, by this Executive Order:

I

The Labor Commissioner shall be responsible for the administration of this Order and shall do all acts necessary and appropriate to achieve its purpose. Upon promulgation of this Order, the Commissioner of Finance and Control shall issue a directive forthwith to all state agencies that henceforth all state contracts and subcontracts for construction on public buildings, other public works and goods and services shall contain a provision rendering such contract or subcontract subject to this Order, and that such contract or subcontract may be cancelled, terminated or suspended by the Labor Commissioner for violation of or noncompliance with this Order, notwithstanding that the Labor Commissioner is not a party to such contract or subcontract.

II

Every contractor and subcontractor having a contract with the state or any of its agencies, boards, commissions, or departments, every individual partnership, corporation, or business entity having business with the state or who or which seeks to do business with the state, and every bidder or prospective bidder who submits a bid or replies to an invitation to bid on any state contract shall list all employment openings with the office of the Connecticut State Employment Service in the area where the work is to be performed or where the services are to be rendered.

III

All state contracts shall contain a clause which shall be a condition of the contract that the contractor and any subcontractor holding a contract directly under the contractor shall list all employment openings with the Connecticut State Employment Service. The Labor Commissioner may allow exceptions to listings of employment openings which the contractor proposes to fill from within its organization from employees on the rolls of the contractor on the date of publication of the invitation to bid or the date on which the public announcement was published or promulgated advising of the program concerned.

IV

Each contracting agency of the state shall be primarily responsible for obtaining compliance with this Executive Order. Each contracting agency shall appoint or designate from among its personnel one or more persons who shall be responsible for compliance with the objectives of this Order.

V

The Labor Commissioner shall be and is hereby empowered to inspect the books, records, payroll and personnel data of each individual or business entity subject to this Executive Order and may hold hearings or conferences, formal or informal, in pursuance of the duties and responsibilities hereunto delegated to the Labor Commissioner.

VI

The Labor Commissioner or any agency officer or employee in the executive branch designated by regulation of the Labor Commissioner may hold such hearings, public or private, as the Labor Commissioner may deem advisable for compliance, enforcement or educational purposes under this Order.

VII

(a) The Labor Commissioner may hold or cause to be held hearings, prior to imposing, ordering, or recommending the imposition of penalties and sanctions under this Order. In accordance herewith, the Commissioner or the appropriate contracting agency may suspend, cancel, terminate, or cause to be suspended, cancelled, or terminated in accordance with law any contract or any portion or portions thereof for failure of the contractor or subcontractor to comply with the listing provisions of the contract. Contracts may be cancelled, terminated, suspended absolutely or their continuance conditioned upon a program for future compliance approved by the contracting agency.

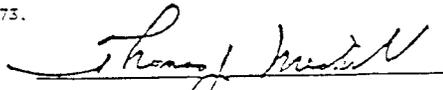
(b) Any contracting agency taking any action authorized by this Order, whether on its own motion or as directed by the Labor Commissioner, shall promptly notify him of such action. Whenever the Labor Commissioner makes a determination under this Order, he shall promptly notify the appropriate contracting agency of the action recommended. The agency shall report the results to the Labor Commissioner promptly.

VIII

If the Labor Commissioner shall so direct, contracting agencies shall not enter into contracts with any bidder or prospective contractor unless he has satisfactorily complied with the provisions of this Order.

This Order shall become effective sixty days after the date of this Order.

Dated at Hartford, Connecticut, this 15th day of February, 1973.

  
GOVERNOR

**CONNECTICUT REQUIRED CONTRACT/AGREEMENT PROVISIONS**  
**March 6, 1998**

Specific Equal Employment Opportunity Responsibilities

1. General

- A. Equal Employment Opportunity Requirements not to discriminate and to take affirmative action to assure equal employment opportunity as required by Executive Order 11246, Executive Order 11375, the Railroad Revitalization and Regulatory Reform Act of 1976 and other U.S. Department of Transportation nondiscrimination legislation are set forth in this Required Contract/Agreement Provision. The requirements set forth in these special provisions shall constitute the specific affirmative action requirements for project activities under this contract (or agreement) and supplement the equal employment opportunity requirements set forth in other related contract provisions.
- B. "Company" refers to any entity doing business with the Connecticut Department of Transportation and includes but is not limited to the following:
- |                |   |
|----------------|---|
| Contractors    | Vendors (where applicable)                |
| Subcontractors | Suppliers of Materials (where applicable) |
| Consultants    | Municipalities (where applicable)         |
| Subconsultants | Utilities (where applicable)              |
- C. The Company will work with the Connecticut Department of Transportation and the federal government in carrying out equal employment opportunity obligations and in their review of his/her activities under the contract or agreement.
- D. The Company and all their subcontractors or subconsultants holding subcontracts or subagreements of \$10,000 or more on federally-assisted projects and \$5,000 or more on state funded projects, will comply with the following minimum specific requirement activities of equal employment opportunity. The Company will physically include these requirements in every subcontract or subagreement meeting the monetary criteria above with such modification of language as is necessary to make them binding on the subcontractor or subconsultant.
- E. These Required Contract Provisions apply to all state funded and/or federally-assisted projects, activities and programs in all facets of the Connecticut Department of Transportation operations resulting in contracts or agreements.

2. Equal Employment Opportunity Policy

The Company will develop, accept and adopt as its operating policy an Affirmative Action Plan utilizing as a guide the Connecticut Department of Transportation Affirmative Action Plan Guideline.

3. Equal Employment Opportunity Officer

The Company will designate and make known to the State Department of Transportation contracting officers an equal employment opportunity officer (hereinafter referred to as the EEO Officer) who will have the responsibility for and must be capable of effectively administering and promoting an active program of equal employment opportunity and who must be assigned adequate authority and responsibility to do so.

4. Dissemination of Policy

- A. All members of the Company's staff who are authorized to hire, supervise, promote, and discharge employees, or who recommend such action, or who are substantially involved in such action, will be made fully cognizant of, and will implement, the Company's equal employment opportunity policy and contractual responsibilities to provide equal employment opportunity in each grade and classification of employment. To ensure that the above agreement will be met, the following actions will be taken as a minimum:
- (1) Periodic meetings of supervisory and personnel office employees will be conducted before the start of work and then not less than once every six (6) months thereafter, at which time the Company's equal employment opportunity policy and its implementation will be reviewed and explained. The meetings will be conducted by the EEO Officer or other knowledgeable Company official.

- (2) All new supervisory or personnel office employees will be given a thorough indoctrination by the EEO Officer or other knowledgeable Company official covering all major aspects of the Company's equal employment opportunity obligations within thirty (30) days following their reporting for duty with the Company.
  - (3) All personnel who are engaged in direct recruitment for the project will be instructed by the EEO Officer or appropriate Company official in the Company's procedures for locating and hiring protected class group employee.
- B. In order to make the Company's equal employment opportunity policy known to all employees, prospective employees and potential sources of employees, i.e., schools, employment agencies, labor unions (where appropriate), college placement officers, etc., the Company will take the following actions:
- (1) Notices and posters setting forth the Company's equal employment opportunity policy will be placed in areas readily accessible to employees, applicants for employment and potential employees.
  - (2) The Company's equal employment opportunity policy and the procedures to implement such policy will be brought to the attention of employees by means of meetings, employee handbooks, or other appropriate means.

5. Recruitment

- A. When advertising for employees, the Company will include in all advertisements for employees the notation: "An Equal Opportunity Employees." All such advertisements will be published in newspapers or other publications having a large circulation among minority groups in the area from which the project work force would normally be derived.
- B. The Company will, unless precluded by a valid bargaining agreement, conduct systematic and direct recruitment through public and private employee referral sources likely to yield qualified minority group applicants, including, but not limited to, State employment agencies, schools, colleges and minority group organizations. To meet this requirement, the Company will, through its EEO Officer, identify sources of potential minority group employees, and establish with such identified sources procedures whereby minority group applicants may be referred to the Company for employment consideration.
- In the event the Company has a valid bargaining agreement providing for exclusive hiring hall referrals, the Company is expected to observe the provisions of that agreement to the extent that the system permits the Company's compliance with equal employment opportunity contract provisions. (The U.S. Department of Labor has held that where implementation of such agreements have the effect of discriminating against minorities or women, or obligates the Company to do the same, such implementation violates Executive Order 11246, as amended.)
- C. The Company will encourage its present employees to refer minority group applicants for employment by posting appropriate notices or bulletins in the areas accessible to all such employees. In addition, information and procedures with regard to referring minority group applicants will be discussed with employees.

6. Personnel Actions

Wages, working conditions, and employee benefits shall be established and administered, and personnel actions of every type, including hiring, upgrading, promotion, transfer, demotion, layoffs, and termination, shall be taken without regard to race, color, religion, sex, or national origin, etc. The following procedures shall be followed:

- A. The Company will conduct periodic inspections of project sites to insure that working conditions and employee facilities do not indicate discriminatory treatment of project site personnel.
- B. The Company will periodically evaluate the spread of wages paid within each classification to determine any evidence of discriminatory wage practices.

- C. The Company will periodically review selected personnel actions in depth to determine whether there is evidence of discrimination. Where evidence is found, the Company will promptly take corrective action. If the review indicates that the discrimination may extend beyond the actions reviewed, such corrective action shall include all affected persons.
- D. The Company will promptly investigate all complaints of alleged discrimination made to the Company in connection with his obligations under this contract, will attempt to resolve such complaints, and will take appropriate corrective action within a reasonable time. If the investigation indicates that the discrimination may affect persons other than the complainant, such corrective action shall include such other persons. Upon completion of each investigation, the Company will inform every complainant of all of his avenues of appeal.
- E. The general contract provision entitled A(76) Affirmative Action Requirements is made part of this document by reference. In conjunction with this contract provision, only the job categories will change in order to be comparable with the job categories utilized by the Company proposing to do business with the Connecticut Department of Transportation. The goals and time tables will remain the same throughout the contract provision.

7. Training and Promotion

- A. The Company will assist in locating, qualifying, and increasing the skills of minority group and women employees, and applicants for employment.
- B. Consistent with the Company's work force requirements and as permissible under Federal and State regulations, the Company shall make full use of training programs, i.e., apprenticeship, and on-the-job training programs for the geographical area of contract performance. Where feasible, 25 percent of apprentices or trainees in each occupation shall be in their first year of apprenticeship or training. In the event the Training Special Provision is provided under this contract, this subparagraph will be superseded.
- C. The Company will advise employees and applicants for employment of available training programs and entrance requirements for each.
- D. The Company will periodically review the training and promotion potential of minority group and women employees and will encourage eligible employees to apply for such training and promotion.

8. Unions

If the Company relies in whole or in part upon unions as a source of employees, it will use its best efforts to obtain the cooperation of such unions to increase opportunities for minority groups and women within the unions, and to effect referrals by such unions of minority and female employees. Actions by the Company either directly or through an association acting as agent will include the procedures set forth below:

- A. The Company will use its best efforts to develop, in cooperation with the unions, joint training programs aimed toward qualifying more minority group members and women for membership in the unions and increasing the skills of minority group employees and women so that they may qualify for higher paying employment.
- B. The Company will use its best efforts to incorporate an equal employment opportunity clause into each union agreement to the end that such union will be contractually bound to refer applicants without regard to their race, color, religion, sex, or national origin, etc.
- C. The Company is to obtain information as to the referral practices and policies of the labor union except that to the extent such information is within the exclusive possession of the labor union and such labor union refuses to furnish such information to the Company, the Company shall so certify to the Connecticut Department of Transportation and shall set forth what efforts have been made to obtain such information
- D. In the event the union is unable to provide the Company with a reasonable flow of minority and women referrals within the time limit set forth in the collective bargaining agreement, the Company will, through independent recruitment efforts, fill

the employment vacancies without regard to race, color, religion, sex or national origin, etc. making full efforts to obtain qualified and/or qualifiable minority group persons and women. (The U.S. Department of Labor has held that it shall be no excuse that the union with which the Company has a collective bargaining agreement providing for exclusive referral failed to refer minority employees). In the event the union referral practice prevents the Company from meeting the obligations pursuant to Executive Order 11246, as amended, these provisions, such Company shall immediately notify the Connecticut Department of Transportation.

9. Subcontracting

- A. The Company will use its best efforts to solicit bids from and to utilize minority group subcontractors, or subcontractors with meaningful minority group and female representation among their employees. Companies shall obtain a list of applicable Disadvantaged Business Enterprises firms from the Division of Contract Compliance.
- B. The Company will use its best efforts to ensure subcontractor compliance with their equal employment opportunity obligations.
- C. The General Contract Provisions entitled "Minority Business Enterprises as Subcontractors" is made part of this document by reference and its requirements are applicable to all entities proposing to do business with the Connecticut Department of Transportation.

10. Records and Reports

For the duration of the project, the company will maintain records as are necessary to determine compliance with the Company's equal employment opportunity obligations and Affirmative Action requirements. Additionally, the company will submit all requested reports in the manner required by the contracting agency.

- A. The number of minority and nonminority group members and women employed in each work classification on the project.
- B. The progress and efforts being made in cooperation with unions to increase employment opportunities for minorities and women (applicable only to Companies which rely on whole or in part on unions as a source of their work force).
- C. The progress and efforts being made in locating, hiring, training, qualifying, and upgrading minority and female employees, and
- D. The progress and efforts being made in securing the services of minority and female owned businesses.
  - (1) All such records must be retained for a period of three (3) years following completion of the contract work and shall be available at reasonable times and places for inspection by authorized representatives of the State Department of Transportation and the U.S. Department of Transportation including consultant firms.
  - (2) If on-the-job training is being required by the "Training Special Provision," the Company will be required to furnish a Monthly Training Report and Supplement Report (1409) for each trainee.

11. Affirmative Action Plan

- A. Contractors, subcontractors, vendors, suppliers, and all other Companies with contracts, agreements or purchase orders completely state funded will submit an Affirmative Action Plan if the contract value is \$5,000 or over.
- B. Contractors, subcontractors, vendors, suppliers, and all other Companies with federally-assisted contracts, agreements, or purchase orders valued at \$10,000 or more will submit an Affirmative Action Plan.
- C. Companies with contracts, agreements, or purchase orders with total dollar value under that which is stipulated in A and B above shall be exempt from the required submission of an Affirmative Action Plan unless otherwise directed by the Division of Contract Compliance.



CONNECTICUT DEPARTMENT OF TRANSPORTATION  
**POLICY STATEMENT**

Policy No. ADMIN.-10  
March 25, 1999

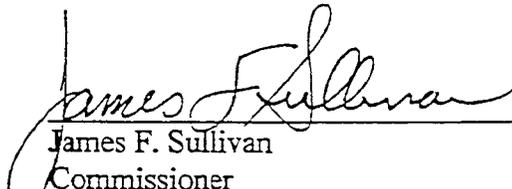
SUBJECT: Code of Ethics Policy

It is the policy of the Department that all employees are to comply with Sections 1-79 through 1-89 of the Connecticut General Statutes, as amended, entitled Code of Ethics for Public Officials.

Any questions concerning the application of the Code of Ethics for specific situations should be directed to the State Ethics Commission.

The Personnel Administrator shall be responsible for issuing periodic updates and/or clarifications of previously released Personnel Memorandums concerning this Code of Ethics Policy as is deemed appropriate.

(This statement supersedes the Commissioner's Policy Statement No. ADMIN.-10 dated November 28, 1994.)

  
James F. Sullivan  
Commissioner



CONNECTICUT DEPARTMENT OF TRANSPORTATION  
**POLICY STATEMENT**

Policy No. ADMIN.-19  
May 12, 2003

SUBJECT: Policy on Disadvantaged Business Enterprise Program

The Department of Transportation (DOT) is committed to an effective implementation of a Disadvantaged Business Enterprise (D.B.E.) Program as defined in Title 49, Code of Federal Regulations, Part 26, and includes the following objectives:

- (a) To ensure nondiscrimination in the award and administration of DOT-assisted contracts in the Department's highway, transit, and airport financial assistance programs;
- (b) To create a level playing field in which D.B.E.s can compete fairly for DOT-assisted contracts;
- (c) To ensure that the Department's D.B.E. Program is narrowly tailored in accordance with applicable law;
- (d) To ensure only firms that fully meet this part's eligibility standards are permitted to participate as D.B.E.s;
- (e) To help remove barriers to the participation of D.B.E.s in DOT-assisted contracts; and
- (f) To assist the development of firms that can compete successfully in the marketplace outside the D.B.E. Program.

The Director of Equal Opportunity Assurance has been designated as the D.B.E. Liaison Officer. In that capacity, the Director of Equal Opportunity Assurance is responsible for implementing all aspects of the D.B.E. Program. Implementation of the D.B.E. Program is accorded the same priority as compliance with all other legal obligations incurred by the Connecticut Department of Transportation in its financial assistance agreements with the U.S. Department of Transportation.

As part of the requirements for Title 49, Code of Federal Regulations, Part 26, effective immediately, I am directing the following be included in all federal-aid contracts, all financial assistance agreements, and in all subcontracts.

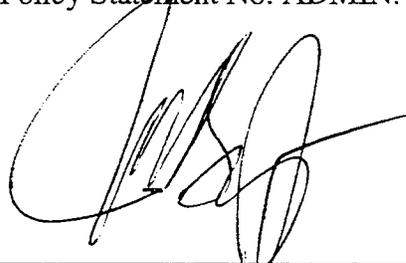
For all agreements with contractors, subcontractors, consultants, cities, towns, and all recipients of State or federal-assistance funds:

- 1) The contractor, subrecipient, or subcontractor shall not discriminate on the basis of race, color, national origin, or sex in the performance of this contract. The contractor shall carry out applicable requirements of 49 CFR Part 26 in the award and administration of DOT-assisted contracts. Failure by the contractor to carry out these requirements is a material breach of this contract, which may result in the termination of this contract or such other remedy as the recipient deems appropriate.

In addition to the above, all financial agreements shall also contain the following statement:

- 2) The recipient shall not discriminate on the basis of race, color, national origin, or sex in the award and performance of any DOT-assisted contract or in the administration of its D.B.E. Program or the requirements of 49 CFR Part 26. The recipient shall take all necessary and reasonable steps under 49 CFR Part 26 to ensure nondiscrimination in the award and administration of DOT-assisted contracts. The recipient's D.B.E. Program, as required by 49 CFR Part 26 and as approved by DOT, is incorporated by reference in this agreement. Implementation of this program is a legal obligation and failure to carry out its terms shall be treated as a violation of this agreement. Upon notification to the recipient of its failure to carry out its approved program, the Department may impose sanctions as provided for under Part 26 and may, in appropriate cases, refer the matter for enforcement under 18 U.S.C. 1001 and/or the Program Fraud Civil Remedies Act of 1986 (31 U.S.C. 3801 et seq).

(This statement supersedes the Commissioner's Policy Statement No. ADMIN.-19, dated March 14, 2003.)



---

James F. Byrnes, Jr.  
Commissioner

**AGREEMENTS WITH GOALS**  
**SPECIAL PROVISIONS**  
**DISADVANTAGED BUSINESS ENTERPRISES**  
**AS SUBCONTRACTORS AND MATERIAL SUPPLIERS OR MANUFACTURERS**  
**FOR FEDERAL FUNDED PROJECTS**

Revised – October 16, 2000

NOTE: Certain of the requirements and procedures stated in this special provision are applicable prior to the execution of the Contract document.

I. ABBREVIATIONS AND DEFINITIONS AS USED IN THIS SPECIAL PROVISION

- A. “CDOT” means the Connecticut Department of Transportation.
- B. “DOT” means the U.S. Department of Transportation, including the Office of the Secretary, the Federal Highway Administration (“FHWA”), the Federal Transit Administration (“FTA”), and the Federal Aviation Administration (“FAA”).
- C. “Broker” means a party acting as an agent for others in negotiating contracts, agreements, purchases, sales, etc., in return for a fee or commission.
- D. “Contract,” “agreement” or “subcontract” means a legally binding relationship obligating a seller to furnish supplies or services (including, but not limited to, construction and professional services) and the buyer to pay for them. For the purposes of this provision a lease for equipment or products is also considered to be a Contract.
- E. “Contractor,” means a consultant, second party or any other entity doing business with CDOT or, as the context may require, with another Contractor.
- F. “Disadvantaged Business Enterprise” (“DBE”) means a small business concern:
  - 1. That is at least 51 percent owned by one or more individuals who are both socially and economically disadvantaged or, in the case of a corporation, in which 51 percent of the stock of which is owned by one or more such individuals; and
  - 2. Whose management and daily business operations are controlled by one or more of the socially and economically disadvantaged individuals who own it.
- G. “DOT-assisted Contract” means any Contract between a recipient and a Contractor (at any tier) funded in whole or in part with DOT financial assistance, including letters of credit or loan guarantees.
- H. “Good Faith Efforts” means efforts to achieve a DBE goal or other requirement of this part which, by their scope, intensity, and appropriateness to the objective, can reasonably be expected to fulfill the program requirement. Refer to Appendix A of 49 Code of Federal Regulation (“CFR”) Part 26 – “Guidance Concerning Good Faith Efforts,” a copy of which is attached to this provision, for guidance as to what constitutes good faith efforts.

- I. “Small Business Concern” means, with respect to firms seeking to participate as DBEs in DOT-assisted Contracts, a small business concern as defined pursuant to Section 3 of the Small Business Act and Small Business Administration (“SBA”) regulations implementing it (13 CFR Part 121) that also does not exceed the cap on average annual gross receipts specified in 49 CFR Part 26, Section 26.65(b).
- J. “Socially and Economically Disadvantaged Individuals” means any individual who is a citizen (or lawfully admitted permanent resident) of the United States and who is –
  - 1. Any individual who CDOT finds on a case-by-case basis to be socially and economically disadvantaged individual.
  - 2. Any individuals in the following groups, members of which are rebuttably presumed to be socially and economically disadvantaged:
    - i. “Black Americans,” which includes persons having origins in any of the Black racial groups of Africa;
    - ii. “Hispanic Americans,” which includes persons of Mexican, Puerto Rican, Cuban, Dominican, Central or South American, or other Spanish or Portuguese culture or origin, regardless of race;
    - iii. “Native Americans,” which includes persons who are American Indians, Eskimos, Aleuts, or Native Hawaiians;
    - iv. “Asian-Pacific Americans,” which includes persons whose origins are from Japan, China, Taiwan, Korea, Burma (Myanmar), Vietnam, Laos, Cambodia (Kampuchea), Thailand, Malaysia, Indonesia, the Philippines, Burnei, Samoa, Guam, The U.S. Trust Territories of the Pacific Islands (Republic of Palau), the Commonwealth of the Northern Marianas Islands, Macao, Fiji, Tonga, Kirbati, Juvalu, Nauru, Federated States of Micronesia, or Hong Kong;
    - v. “Subcontinent Asian Americans,” which includes persons whose origins are from India, Pakistan, Bangladesh, Bhutan, the Maldives Islands, Nepal or Sri Lanka;
    - vi. Women;
    - vii. Any additional groups whose members are designated as socially and economically disadvantaged by the SBA, at such time as the SBA designation becomes effective.

## II. GENERAL REQUIREMENTS

- A. The Contractor, sub-recipient or subcontractor shall not discriminate on the basis of race, color, national origin, or sex in the performance of this Contract. The Contractor shall carry out applicable requirements of 49 CFR Part 26 in the award and administration of DOT-assisted Contracts. Failure by the Contractor to carry out these requirements is a material breach of this Contract, which may result in the termination of the Contract or such other remedy, as the DOT deems appropriate.

- B. The Contractor shall cooperate with CDOT and DOT in implementing the requirements concerning DBE utilization on this Contract in accordance with Title 49 of the Code of Federal Regulations, Part 26 entitled "Participation by Disadvantaged Business Enterprises in Department of Transportation Financial Assistance Programs" ("49 CFR Part 26"), as revised. The Contractor shall also cooperate with CDOT and DOT in reviewing the Contractor's activities relating to this Special Provision. This Special Provision is in addition to all other equal opportunity employment requirements of this Contract.
- C. The Contractor shall designate a liaison officer who will administer the Contractor's DBE program. Upon execution of this Contract, the name of the liaison officer shall be furnished in writing to CDOT's Division of Contract Compliance.
- D. For the purpose of this Special Provision, DBEs to be used to satisfy the DBE goal must be certified by CDOT's Division of Contract Compliance for the type(s) of work they will perform.
- E. If the Contractor allows work designated for DBE participation required under the terms of this Contract and required under III-B to be performed by other than the named DBE organization without concurrence from CDOT's unit administering the Contract, CDOT will not pay the Contractor for the value of the work performed by organizations other than the designated DBE.
- F. At the completion of all Contract work, the Contractor shall submit a final report to CDOT's unit administering the Contract indicating the work done by, and the dollars paid to DBEs. If the Contractor does not achieve the specified Contract goals for DBE participation, the Contractor shall also submit written documentation to the CDOT unit administering the Contract detailing its good faith efforts to satisfy the goal that were made during the performance of the Contract. Documentation is to include but not be limited to the following:
  - 1. A detailed statement of the efforts made to select additional subcontracting opportunities to be performed by DBEs in order to increase the likelihood of achieving the stated goal.
  - 2. A detailed statement, including documentation of the efforts made to contact and solicit bids/proposals with CDOT certified DBEs, including the names, addresses, dates and telephone numbers of each DBE contacted, and a description of the information provided to each DBE regarding the scope of services and anticipated time schedule of work items proposed to be subcontracted and nature of response from firms contacted.
  - 3. Provide a detailed statement for each DBE that submitted a subcontract proposal, which the Contractor considered not to be acceptable stating the reasons for this conclusion.
  - 4. Provide documents to support contacts made with CDOT requesting assistance in satisfying the Contract specified goal.
  - 5. Provide documentation of all other efforts undertaken by the Contractor to meet the defined goal.

- G. Failure of the Contractor at the completion of all Contract work to have at least the specified percentage of this Contract performed by DBEs as required in III-B will result in the reduction in Contract payments to the Contractor by an amount determined by multiplying the total Contract value by the specified percentage required in III-B and subtracting from that result, the dollar payments for the work actually performed by DBEs. However, in instances where the Contractor can adequately document or substantiate its good faith efforts made to meet the specified percentage to the satisfaction of CDOT, no reduction in payments will be imposed.
- H. All records must be retained for a period of three (3) years following acceptance by CDOT of the Contract and shall be available at reasonable times and places for inspection by authorized representatives of CDOT and Federal agencies. If any litigation, claim, or audit is started before the expiration of the three (3) year period, the records shall be retained until all litigation, claims, or audits findings involving the records are resolved.
- I. Nothing contained herein, is intended to relieve any Contractor or subcontractor or material supplier or manufacturer from compliance with all applicable Federal and State legislation or provisions concerning equal employment opportunity, affirmative action, nondiscrimination and related subjects during the term of this Contract.

### III. SPECIFIC REQUIREMENTS:

- A. The Contractor shall assure that certified DBEs will have an opportunity to compete for subcontract work on this Contract, particularly by arranging solicitations and time for the preparation of proposals for services to be provided so as to facilitate the participation of DBEs regardless if a Contract goal is specified or not.
- B. Contract goal for DBE participation equaling 0 percent of the total Contract value has been established for this Contract. Compliance with this provision may be fulfilled when a DBE or any combination of DBEs perform work under Contract in accordance with 49 CFR Part 26, Subpart C, Section 26.55, as revised. **Only work actually performed by and/or services provided by DBEs which are certified for such work and/or services can be counted toward the DBE goal. Supplies and equipment a DBE purchases or leases from the prime Contractor or its affiliate cannot be counted toward the goal.**

If the Contractor does not document commitments, by subcontracting and/or procurement of material and/or services that at least equal the goal stipulated in III-B, or document a plan which indicates how the Contractor intends to meet the goal in the future phase(s) of the work, the Contractor must document the good faith efforts that outline the steps it took to meet the goal in accordance with VII.

- C. Prior to execution of the Contract the Contractor shall indicate, in writing on the forms provided by CDOT to the Director of Contract Administration or CDOT's unit administering the Contract, the DBE(s) it will use to achieve the goal indicated in III-B. The submission shall include the name and address of each DBE that will participate in this Contract, a description of the work each will perform and the dollar amount of participation. This information shall be signed by the named DBE and the Contractor. The named DBE shall be from a list of certified DBEs available from CDOT. **In addition, the named DBE(s) shall be certified to perform the type of work they will be contracted to do.**

- D. The prime Contractor shall provide a fully executed copy of each agreement with each DBE named to achieve the goal indicated in III-B to CDOT's unit administering the Contract.
- E. The Contractor is required, should there be a change in a DBE they submitted in III-C, to submit documentation to CDOT's unit administering the Contract which will substantiate and justify the change, (i.e., documentation to provide a basis for the change for review and approval by CDOT's unit administering the Contract) prior to the implementation of the change. The Contractor must demonstrate that the originally named DBE is unable to perform in conformity to the scope of service or is unwilling to perform, or is in default of its Contract, or is overextended on other jobs. **The Contractor's ability to negotiate a more advantageous agreement with another subcontractor is not a valid basis for change.** Documentation shall include a letter of release from the originally named DBE indicating the reason(s) for the release.
- F. Contractors subcontracting with DBEs to perform work or services as required by this Special Provision shall not terminate such firms without advising CDOT's unit administering the Contract in writing, and providing adequate documentation to substantiate the reasons for termination if the DBE has not started or completed the work or the services for which it has been contracted to perform.
- G. When a DBE is unable or unwilling to perform or is terminated for just cause the Contractor shall make good faith efforts to find other DBE opportunities to increase DBE participation to the extent necessary to at least satisfy the goal required by III-B.
- H. In instances where an alternate DBE is proposed, a revised submission to CDOT's unit administering the Contract together with the documentation required in III-C, III-D, and III-E, must be made for its review and approval.
- I. Each quarter after execution of the Contract, the Contractor shall submit a report to CDOT's unit administering the Contract indicating the work done by, and the dollars paid to the DBE for the current quarter and to date.

#### IV. MATERIAL SUPPLIERS OR MANUFACTURERS

- A. If the Contractor elects to utilize a DBE supplier or manufacturer to satisfy a portion or all of the specified DBE goal, the Contractor must provide the CDOT with:
  - 1. An executed "Connecticut Department of Transportation DBE Supplier/Manufacturer Affidavit" (sample attached), and
  - 2. Substantiation of payments made to the supplier or manufacturer for materials used on the project.
- B. Credit for DBE suppliers is limited to 60% of the value of the material to be supplied, provided such material is obtained from a regular DBE dealer. A regular dealer is a firm that owns, operates, or maintains a store, warehouse or other establishment in which the materials or supplies required for the performance of the Contract are bought, kept in stock and regularly sold or leased to the public in the usual course of business. To be a regular dealer, the firm must engage in, as its principal business, and in its own name, the purchase and sale of the products in question. A regular dealer in such bulk items as steel, cement, gravel, stone and petroleum products, need not keep such products in stock if it owns or operates distribution equipment. Brokers and packagers shall not be regarded as material suppliers or manufacturers.

- C. Credit for DBE manufacturers is 100% of the value of the manufactured product. A manufacturer is a firm that operates or maintains a factory or establishment that produces on the premises the materials or supplies obtained by the Department of Transportation or Contractor.

V. NON-MANUFACTURING OR NON-SUPPLIER DBE CREDIT:

- A. Contractors may count towards their DBE goals the following expenditures with DBEs that are not manufacturers or suppliers:
  - 1. Reasonable fees or commissions charged for providing a bona fide service such as professional, technical, consultant or managerial services and assistance in the procurement of essential personnel, facilities, equipment materials or supplies necessary for the performance of the Contract provided that the fee or commission is determined by the CDOT to be reasonable and consistent with fees customarily allowed for similar services.
  - 2. The fees charged for delivery of materials and supplies required on a job site (but not the cost of the materials and supplies themselves) when the hauler, trucker, or delivery service is a DBE but is not also the manufacturer of or a regular dealer in the materials and supplies, provided that the fees are determined by the CDOT to be reasonable and not excessive as compared with fees customarily allowed for similar services.
  - 3. The fees or commissions charged for providing bonds or insurance specifically required for the performance of the Contract, provided that the fees or commissions are determined by the CDOT to be reasonable and not excessive as compared with fees customarily allowed for similar services.

VI. BROKERING

- A. Brokering of work by DBEs who have been approved to perform subcontract work with their own workforce and equipment is not allowed, and is a Contract violation.
- B. DBEs involved in the brokering of subcontract work that they were approved to perform may be decertified.
- C. Firms involved in the brokering of work, whether they are DBEs and/or majority firms who engage in willful falsification, distortion or misrepresentation with respect to any facts related to the project shall be referred to the U.S. Department of Transportation's Office of the Inspector General for prosecution under Title 18, U.S. Code, Section 10.20.

VII. REVIEW OF PRE-AWARD GOOD FAITH EFFORTS

- A. If the Contractor does not document commitments by subcontracting and/or procurement of material and/or services that at least equal the goal stipulated in III-B before execution of the Contract, or document a plan which indicates how the Contractor intends to meet the goal in future phase(s) of the work, the Contractor must document the good faith efforts that outline the specific steps it took to meet the goal. Execution of the Contract will proceed if the Contractor's good faith efforts are deemed satisfactory and approved by CDOT. To obtain such an exception, the Contractor must submit an application to CDOT's Director of Contract Administration or CDOT's unit administering the Contract, which documents the specific good faith efforts that were made to meet the DBE goal. **Application forms for Review of Pre-Award Good Faith Efforts are available from CDOT's Division of Contract Administration.**

The application must include the following documentation:

1. a statement setting forth in detail which parts, if any, of the Contract were reserved by the Contractor and not available for subcontracting;
  2. a statement setting forth all parts of the Contract that are likely to be sublet;
  3. a statement setting forth in detail the efforts made to select subcontracting work in order to likely achieve the stated goal;
  4. copies of all letters sent to DBEs;
  5. a statement listing the dates and DBEs that were contacted by telephone and the result of each contact;
  6. a statement listing the dates and DBEs that were contacted by means other than telephone and the result of each contact;
  7. copies of letters received from DBEs in which they declined to bid or submit proposals;
  8. a statement setting forth the facts with respect to each DBE bid/proposal received and the reason(s) any such bid/proposal was declined;
  9. a statement setting forth the dates that calls were made to CDOT's Division of Contract Compliance seeking DBE referrals and the result of each such call; and
  10. Any information of a similar nature relevant to the application.
- B. All applications shall be submitted to the Director of Contract Administration or CDOT's unit administering the Contract. Upon receipt of the submission of an application for review of pre-award good faith efforts, CDOT's Director of Contract Administration or CDOT's unit administering the Contract shall submit the documentation to the Division of Contract Compliance who will review the documents and determine if the package is complete and accurate and adequately documents the Contractor's good faith efforts. Within fourteen (14) days of receipt of the documentation the Division of Contract Compliance shall notify the Contractor by certified mail of the approval or denial of its good faith efforts.

- C. If the Contractor's application is denied, the Contractor shall have seven (7) days upon receipt of written notification of denial to request administrative reconsideration. The Contractor's request for administrative reconsideration should be sent in writing to: Director of Contract Administration or CDOT's unit administering the Contract, P.O. Box 317546, Newington, CT 06131-7546. The Director of Contract Administration or CDOT's unit administering the Contract will forward the Contractor's reconsideration request to the DBE Screening Committee. The DBE Screening Committee will schedule a meeting within fourteen (14) days from receipt of the Contractors request for administrative reconsideration and advise the Contractor of the date, time and location of the meeting. At this meeting the Contractor will be provided with the opportunity to present written documentation and/or argument concerning the issue of whether it made adequate good faith efforts to meet the goal. Within seven (7) days following the reconsideration meeting, the chairperson of the DBE Screening Committee will send the contractor via certified mail a written decision on its reconsideration request, explaining the basis of finding either for or against the request. The DBE Screening Committee's decision is final. **If the reconsideration is denied, the Contractor shall indicate in writing to the Director of Contract Administration or CDOT's unit administering the Contract within fourteen (14) days of receipt of written notification of denial, the DBEs it will use to achieve the goal indicated in III-B.**
- D. Approval of pre-execution good faith efforts does not relieve the Contractor from its obligation to make additional good faith efforts to achieve the DBE goal should contracting opportunities arise during actual performance of the Contract work.

## APPENDIX A TO 49 CFR PART 26 – GUIDANCE CONCERNING GOOD FAITH EFFORTS

- I. When, as a recipient, you establish a Contract goal on a DOT-assisted Contract, a Bidder/Contractor must, in order to be responsible and/or responsive, make good faith efforts to meet the goal. The Bidder/Contractor can meet this requirement in either of two ways. First, the Bidder/Contractor can meet the goal, documenting commitments for participation by DBE firms sufficient for this purpose. Second, even if it doesn't meet the goal, the Bidder/Contractor can document adequate good faith efforts. This means that the Bidder/Contractor must show that it took all necessary and reasonable steps to achieve a DBE goal or other requirement of this part which, by their scope, intensity, and appropriateness to the objective, could reasonably be expected to obtain sufficient DBE participation, even if they were not fully successful.
- II. In any situation in which you have established a Contract goal, Part 26 requires you to use the good faith efforts mechanism of this part. As a recipient, it is up to you to make a fair and reasonable judgment whether a Bidder/Contractor that did not meet the goal made adequate good faith efforts. It is important for you to consider the quality, quantity, and intensity of the different kinds of efforts that the Bidder/Contractor has made. The efforts employed by the Bidder/Contractor should be those that one could reasonably expect a Bidder/Contractor to take if the Bidder/Contractor were actively and aggressively trying to obtain DBE participation sufficient to meet the DBE Contract goal. Mere pro forma efforts are not good faith efforts to meet the DBE Contract requirements. We emphasize, however, that your determination concerning the sufficiency of the firm's good faith efforts is a judgment call: meeting quantitative formulas is not required.
- III. The Department also strongly cautions you against requiring that a Bidder/Contractor meet a Contract goal (i.e., obtain a specified amount of DBE participation) in order to be awarded a Contract, even though the Bidder/Contractor makes an adequate good faith efforts showing. This rule specifically prohibits you from ignoring bona fide good faith efforts.
- IV. The following is a list of types of actions which you should consider as part of the Bidder/Contractor's good faith efforts to obtain DBE participation. It is not intended to be a mandatory checklist, nor is it intended to be exclusive or exhaustive. Other factors or types of efforts may be relevant in appropriate cases.
  - A. Soliciting through all reasonable and available means (e.g. attendance at pre-bid meetings, advertising and/or written notices) the interest of all certified DBEs who have the capability to perform the work of the Contract. The Bidder/Contractor must solicit this interest within sufficient time to allow the DBEs to respond to the solicitation. The Bidder/Contractor must determine with certainty if the DBEs are interested by taking appropriate steps to follow up initial solicitations.
  - B. Selecting portions of the work to be performed by DBEs in order to increase the likelihood that the DBE goals will be achieved. This includes, where appropriate, breaking out Contract work items into economically feasible units to facilitate DBE participation, even when the prime Contractor might otherwise prefer to perform these work items with its own forces.

- C. Providing interested DBEs with adequate information about the plans, specifications, and requirements of the Contract in a timely manner to assist them in responding to a solicitation.
- D. (1) Negotiating in good faith with interested DBEs. It is the Bidder/Contractor's responsibility to make a portion of the work available to DBE subcontractors and suppliers and to select those portions of the work or material needs consistent with the available DBE subcontractors and suppliers, so as to facilitate DBE participation. Evidence of such negotiation includes the names, addresses, and telephone numbers of DBEs that were considered; a description of the information provided regarding the plans and specifications for the work selected for subcontracting; and evidence as to why additional agreements could not be reached for DBEs to perform the work.  
  
(2) A Bidder/Contractor using good business judgment would consider a number of factors in negotiating with subcontractors, including DBE subcontractors, and would take a firm's price and capabilities as well as Contract goals into consideration. However, the fact that there may be some additional costs involved in finding and using DBEs is not in itself sufficient reason for a Bidder/Contractor's failure to meet the Contract DBE goal, as long as such costs are reasonable. Also, the ability or desire of a prime Contractor to perform the work of a Contract with its own organization does not relieve the Bidder/Contractor of the responsibility to make good faith efforts. Prime Contractors are not, however, required to accept higher quotes from DBEs if the price difference is excessive or unreasonable.
- E. Not rejecting DBEs as being unqualified without sound reasons based on a thorough investigation of their capabilities. The Contractor's standing within its industry, membership in specific groups, organizations, or associations and political or social affiliations (for example union vs. non-union employee status) are not legitimate causes for the rejection or non-solicitation of bids/proposals in the Contractor's efforts to meet the project goal.
- F. Making efforts to assist interested DBEs in obtaining bonding, lines of credit, or insurance as required by the recipient or Contractor.
- G. Making efforts to assist interested DBEs in obtaining necessary equipment, supplies, materials, or related assistance or services.
- H. Effectively using the services of available minority/women community organizations; minority/women Contractors' groups; local, state, and Federal minority/women business assistance offices; and other organizations as allowed on a case-by-case basis to provide assistance in the recruitment and placement of DBEs.

- V. In determining whether a Bidder/Contractor has make good faith efforts, you may take into account the performance of other bidder/Contractors in meeting the Contract. For example, when the apparent successful Bidder/Contractor fails to meet the Contract goal, but others meet it, you may reasonably raise the question of whether, with additional reasonable efforts, the apparent successful Bidder/Contractor could have met the goal. If the apparent successful Bidder/Contractor fails to meet the goal, but meets or exceeds the average DBE participation obtained by other Bidder/Contractors, you may view this, in conjunction with other factors, as evidence of the apparent successful Bidder/Contractor having made good faith efforts.

CONNECTICUT DEPARTMENT OF TRANSPORTATION  
DBE SUPPLIER/MANUFACTURER AFFIDAVIT

This affidavit must be completed by the State Contractor's DBE notarized and attached to the Contractor's request to utilize a DBE supplier or manufacturer as a credit towards its DBE Contract requirements; failure to do so will result in not receiving credit towards the Contract DBE requirement.

State Project No. \_\_\_\_\_

Federal Aid Project No. \_\_\_\_\_

Description of Project \_\_\_\_\_

I, \_\_\_\_\_, acting in behalf of \_\_\_\_\_  
(Name of person signing Affidavit) (DBE person, firm, association or organization)  
of which I am the \_\_\_\_\_ certify and affirm that \_\_\_\_\_  
(Title of Person) (DBE person, firm, association or organization)

is certified Connecticut Department of Transportation DBE. I further certify and affirm that I have read and understand 49 CFR, Sec. 26.55(e)(2), as the same may be revised.

I further certify and affirm that \_\_\_\_\_ will assume the actual and  
(DBE person, firm, association or organization)

contractual responsibility for the provision of the materials and/or supplies sought by \_\_\_\_\_.  
(State Contractor)

If a manufacturer, I produce goods from raw materials or substantially alter them before resale, or if a supplier, I perform a commercially useful function in the supply process.

I understand that false statements made herein are punishable by Law (Sec. 53a-157), CGS, as revised).

\_\_\_\_\_  
(Name of Organization or Firm)

\_\_\_\_\_  
(Signature & Title of Official making the Affidavit)

Subscribed and sworn to before me, this \_\_\_\_ day of \_\_\_\_\_ 20\_\_\_\_.

Notary Public (Commissioner of the Superior Court)

My Commission Expires

CERTIFICATE OF CORPORATION

I, \_\_\_\_\_, certify that I am the \_\_\_\_\_ (Official)  
of the Organization named in the foregoing instrument; that I have been duly authorized to affix the seal of the Organization to such papers as require the seal; that \_\_\_\_\_, who signed said instrument on behalf of the Organization, was then \_\_\_\_\_ of said Organization; that said instrument was duly signed for and in behalf of said Organization by authority of its governing body and is within the scope of its organizational powers.

\_\_\_\_\_  
(Signature of Person Certifying) (Date)

State of Connecticut by His Excellency

John G. Rowland

Executive Order No. 16

WHEREAS, the State of Connecticut recognizes that workplace violence is a growing problem that must be addressed; and

WHEREAS, the State is committed to providing its employees a reasonably safe and healthy working environment, free from intimidation, harassment, threats, and /or violent acts; and

WHEREAS, violence or the threat of violence by or against any employee of the State of Connecticut or member of the public in the workplace is unacceptable and will subject the perpetrator to serious disciplinary action up to and including discharge and criminal penalties.

NOW, THEREFORE, I, John G. Rowland, Governor of the State of Connecticut, acting by virtue of the authority vested in me by the Constitution and by the statutes of this state, do hereby ORDER and DIRECT:

1. That all state agency personnel, contractors, subcontractors, and vendors comply with the following **Violence in the Workplace Prevention Policy**:

The State of Connecticut adopts a statewide zero tolerance policy for workplace violence.

Therefore, except as may be required as a condition of employment —

- No employee shall bring into any state worksite any weapon or dangerous instrument as defined herein.
- No employee shall use, attempt to use, or threaten to use any such weapon or dangerous instrument in a state worksite.
- No employee shall cause or threaten to cause death or physical injury to any individual in a state worksite.

Weapon means any firearm, including a BB gun, whether loaded or unloaded, any knife (excluding a small pen or pocket knife), including a switchblade or other knife having an automatic spring release device, a stiletto, any police baton or nightstick or any martial arts weapon or electronic defense weapon.

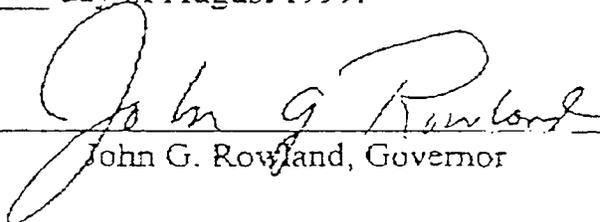
Dangerous instrument means any instrument, article, or substance that, under the circumstances, is capable of causing death or serious physical injury.

Violation of the above reasonable work rules shall subject the employee to disciplinary action up to and including discharge.

2. That each agency must prominently post this policy and that all managers and supervisors must clearly communicate this policy to all state employees.

3. That all managers and supervisors are expected to enforce this policy fairly and uniformly.
4. That any employee who feels subjected to or witnesses violent, threatening, harassing, or intimidating behavior in the workplace immediately report the incident or statement to their supervisor, manager, or human resources office.
5. That any employee who believes that there is a serious threat to their safety or the safety of others that requires immediate attention notify proper law enforcement authorities and his or her manager or supervisor.
6. That any manager or supervisor receiving such a report shall immediately contact their human resources office to evaluate, investigate and take appropriate action.
7. That all parties must cooperate fully when questioned regarding violations of this policy.
8. That all parties be advised that any weapon or dangerous instrument at the worksite will be confiscated and that there is no reasonable expectation of privacy with respect to such items in the workplace.
9. That this order applies to all state employees in the executive branch.
10. That each agency will monitor the effective implementation of this policy.
11. That this order shall take effect immediately.

Dated in Hartford, Connecticut this 4th day of August 1999.

  
\_\_\_\_\_  
John G. Rowland, Governor

Filed this 4th day of August 1999



  
\_\_\_\_\_  
Susan Byskiewicz, Secretary of the State



# STATE OF CONNECTICUT

## DEPARTMENT OF REVENUE SERVICES

92 FARMINGTON AVENUE

HARTFORD, CONNECTICUT, 06105

Agreement No. 6.06-06(03)  
GOVERNMENTAL AGENCY  
EXEMPTION CERTIFICATE

"I HEREBY CERTIFY: that this agency is exempt pursuant to §12-412(1) of the Connecticut General Statutes, that the tangible personal property described herein which I shall purchase or lease or the service(s) which I shall purchase from:

University of Massachusetts Lowell

Research Foundation, 600 Suffolk Street, Second Floor South,

Lowell, MA 01852

will be used exclusively by this governmental agency for the purposes for which it is organized and will not be resold. If a sale of meals to this agency is involved, I certify that this agency neither has been nor will be reimbursed in any manner, by donations, sales of tickets or otherwise, by the consumers of the meals for the price of such meals.

Description of property or service(s):

Conduct a research study for NETC Project No. 03-4 entitled, "Measuring

Pollutant Removal Efficiencies of Stormwater Treatment Units."

Purchaser State of Connecticut, Department of Transportation  
Name of Agency

By James M. Deane Title Manager of Research

Address 2800 Berlin Turnpike, P.O. Box 317546  
Newington, Connecticut 06131-7546

Dated August 18, 2003

at Newington, Connecticut

Proposal for NETC Project No. 03-4,

"Measuring Pollutant Removal  
Efficiencies of Stormwater Treatment  
Units"

**Measuring Pollutant Removal Efficiencies of Stormwater Treatment Units**

By Xiaoqi (Jackie) Zhang, PI

Assistant Professor, Ph.D.

Department of Civil & Environmental Engineering

University of Massachusetts Lowell

**Table of Contents**

- 1. Background**
- 2. Significance**
- 3. Objectives**
- 4. Methodology**
- 5. Expected Results**
- 6. Schedule of Major Activities**
- 7a. Budget**
- 7b. Budget Justification**
- 8. Facilities**
- 9. References**

**Resume (attached)**

**Related Research and Publications (attached)**

## Measuring Pollutant Removal Efficiencies of Stormwater Treatment Units

By Xiaoqi (Jackie) Zhang, PI

### 1. Background:

According to U.S. Environmental Protection Agency (USEPA)'s 1998 National Water Quality Inventory Report to Congress, about 40% of assessed US streams, lakes, and estuaries did not meet the criteria for locally designated uses such as fishing and swimming. High bacterial concentrations in stormwater runoff from agricultural and urban areas are a leading cause in the failures to meet designated use criteria (USEPA, 2000). Large concentrations of fecal coliform and pathogens such as *Pseudomonas aeruginosa* and *Staphylococcus aureus* in urban stormwater have been found (Oliveri et al., 1977). Besides pathogenic organism, high concentrations of total suspended solids, organic pollutants, heavy metals are commonly found in stormwater; major sources of these pollutants include highly traveled highways (processes such as tire abrasions, vehicular leakage, atmospheric deposition, and pavement degradation), gas stations, factories, and wash-off of street dirt, fertilizers and pesticides, etc.

Stormwater pollution is receiving priority attention from the USEPA in watershed management. Hydrodynamic separator units have been installed in many locations throughout the United States and abroad as Best Management Practices (BMP). These units are designed to treat stormwater runoff by capturing floatable debris, oil & grease and reducing Total Suspended Solids (TSS) concentrations (EPA, 1999). They are especially ideal for areas where land availability is limited. However, no sufficient evidence has been provided to evaluate whether hydrodynamic separator units are effective in reducing bacteria loading to receiving waters from stormwater. This research attempts to fill this gap with a focus on determining the bacteria removal efficiency by using the installed hydrodynamic separator units in New England area.

### 2. Significance:

This project will provide information on bacteria removal efficiency of hydrodynamic separators and enhance our understanding of the treatment capacity of hydrodynamic separators. Knowledge gained will substantially influence further evaluations and actions on the effluent discharged from the hydrodynamic separators. It will have significant impact on establishing preliminary guidelines for best management practices for stormwater. This project would also have a far-reaching significance of training one graduate student and one undergraduate student, with a potential of impacting 15 graduates and 30 undergraduates at UMass Lowell.

### 3. Objectives:

The goal of this project is to establish preliminary guidelines for best management practices for stormwater. The objectives of this project are to:

- (1) develop a "bacteria budget" to track influent and effluent bacteria concentrations as well as measuring the growth or reduction of bacteria within the separator units;
- (2) determine the extent of bacteria survivability in hydrodynamic separator units.

An 18-month research plan is presented to outline the scope of this research in order to fulfill the research objectives (see Figure 1). Each task listed in the diagram will be accomplished with detailed experimental plans.

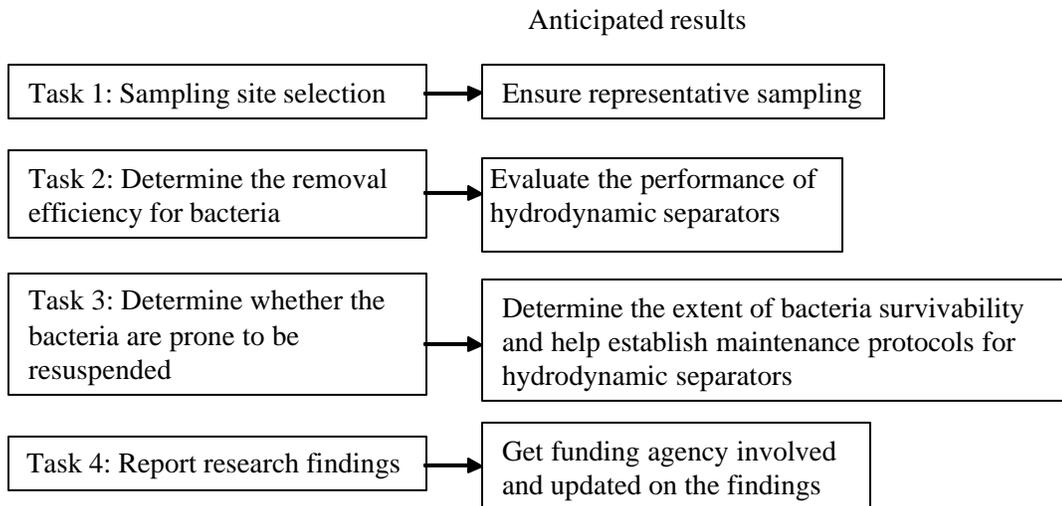


Figure 1. Scope of research activities

### Task 1: Sampling site selection

The purpose of task 1 is to ensure representative samplings by properly selecting sampling sites. Two existing hydrodynamic separator units will be selected in Massachusetts and each one will be sampled for a period of one year. The ideal sites will be selected in close proximity to one another (approximately a five-mile radius) in order to maintain comparable rainfall and antecedent condition. Features such as contributing drainage areas, outfall locations and site-specific information for each unit will be documented. Prior to the start of the study, each hydrodynamic separator unit will be thoroughly cleaned to ensure it is free of sediment, standing water and debris.

### Task 2: Determine the removal efficiency for bacteria

The purpose of task 2 is to evaluate the performance of the hydrodynamic separator units. Study will be performed on all storms events that have rainfall depths of at least 0.1 inch or greater. A minimum of 20 storms per unit will be sampled and antecedent conditions (e.g., days without rain, daily temperature) will be documented between storms. Automatic sampling equipment will be set up for each hydrodynamic separator unit. For each rainfall, grab samples of sump water (i.e. supernatant) and sediments (i.e. settled solids) will be taken at 24 hours, 3 days, 5 days and 10 days after the cessation of each rainfall to develop a “bacteria budget” and determine the growth or reduction of bacteria within the hydrodynamic separator units.

Sampling procedure will follow USEPA microbiology methods manual (EPA, 1978). Both sump water samples and sediment samples will be collected in sterilized screw-cap borosilicate glass bottles. Sample bottles will be labeled and tagged carefully and stored in insulated ice

containers at a temperature of 1-4°C and transited to Dr. Zhang's environmental laboratory at UMass Lowell for immediate analysis (EPA Method 1600, 1997).

Fecal coliform is an indicator organism that represents total pathogenic organisms present in various water. In 1986, EPA issued a revision to its bacteriological ambient water quality criteria recommendations to include new indicator bacteria, *E. coli* and *enterococci*, which provide better correlation with swimming-associated gastrointestinal illness than the previous criteria recommendations for fecal coliform bacteria (EPA Method 1600, 1997). In this project, all samples collected will be analyzed for fecal coliform, *E. coli*, and *Enterococci*. Proper dilution of the samples may be needed to get the desired results.

With the data analyzed from the collected samples, a "bacteria budget", removal efficiency of bacteria, bacteria content in the discharge and sediments, and growth or reduction of the bacteria within the separator units can be determined. In addition, analyses will be done to establish correlations among the removal efficiency of bacteria, time of the year (seasonal variability), and intensity of the rainfalls.

### *Task 3: Determine whether the bacteria are prone to be resuspended*

The purpose of task 3 is to determine the extent of bacteria survivability and help establish maintenance protocols for hydrodynamic separators. Bacteria and solids settled from the previous storm event(s) may be easily disturbed when a new stormwater flow through the hydrodynamic separator unit. Schillinger and Gannon (1995) reported that about 15-20% of fecal coliform cells present in untreated stormwater were adsorbed to larger suspended particles, most of which were greater than 30 µm in diameter. Other pollutants such as metals were found to be predominantly associated with mid-range and coarse particle sizes with a diameter of 50 µm or more (Sansalone and Tribouillard, 1999). This task will determine whether the bacteria are prone to be resuspended by conducting total bacteria number (spread plate count) and particle size analyses for the sump water samples and sediments samples collected.

Resuspension of bacteria adds extra loading to the hydrodynamic separator units and may reduce the treatment efficiency of the units. Therefore, maintenance strategies such as regular cleaning and routine checking may be necessary to enhance the units' treatment efficiency.

### *Task 4: Report research findings*

The purpose of task 4 is to get funding agency involved and updated on all the research findings through quarterly project meetings and quarterly progress reports. Quarterly reports summarizing the progress made within each quarter, a final draft report, and a final report summarizing all the research findings of this project will be prepared and submitted to the NETC Coordinator for distribution to the project technical committee. The reports will include relevant information such as initial selection & maintenance of the units, automatic/grab sampling techniques, laboratory methods used, results in texts, graphs and tables, summary of the project, activities in technology transfer, and recommendations for future study.

#### 4. Methodology:

Once the samples are shipped back to the lab, the following methods will be used to conduct various analyses to fulfill the research objectives.

Fecal coliform count Fecal coliform is an indicator organism to represent total pathogenic organisms present in various water. Fecal coliform count will be conducted by following Standard Method 9221E (Clesceri, 1998)

E. coli count *E. coli* is a member of fecal coliform group of bacteria. The presence of this organism in water indicates fecal contamination. It can be measured by following Standard Method 9221F (Clesceri, 1998)

Enterococci count Membrane filter test method (EPA Method 1600, 1997) will be used to measure the amount of *enterococci* in the samples.

Spread plate count will be used to estimate the amount of total bacteria in the samples by following Standard Method 9215 (Clesceri, 1998). Results are represented as Colony Forming Units (CFUs).

Particle size analysis Particle size in the collected water samples and solid samples will be analyzed by Scanning Electron Microscopy (SEM) located in Center for Advanced Materials at UMass Lowell with service charge. The center has special software that allows for quantitative determination of particle size and shape in water and solid samples. Figure 2 summarizes the proposed analyses for this project.

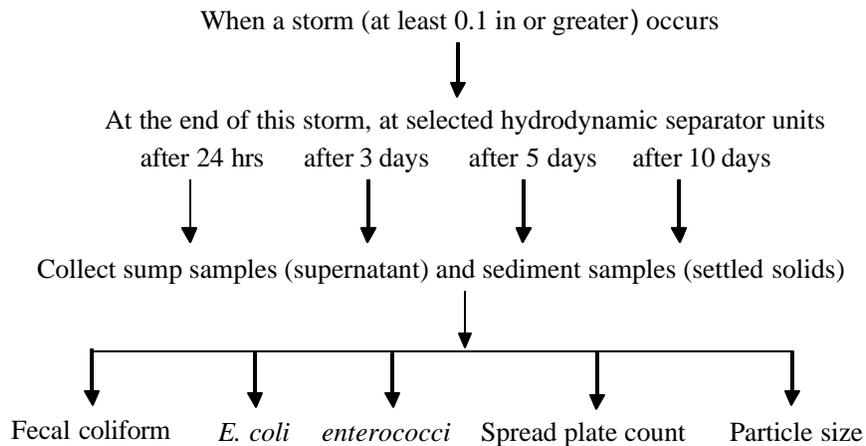


Figure 2. Analysis schematics

#### 5. Expected Results:

Through sample collection from the selected hydrodynamic separator units and sample analyses, the anticipated results from this project include:

- a “bacteria budget”, the removal efficiency of bacteria, bacteria content in the discharge and sediments, and growth or reduction of the bacteria within the separator units.
- correlations among the removal efficiency of bacteria, time of the year (seasonal variability), and intensity of the rainfalls.
- Particle size distribution and total bacteria number variation between storm events.
- bacteria survivability between storm events.
- recommendations for proper maintenance of hydrodynamic separator units.
- recommendations for future study.

Technology transfer plan

Findings will be disseminated through various channels (TV, radio stations, public educations, workshops, oral and poster presentations, and conferences) to transfer the knowledge to the public and potential users effectively and efficiently. Dr. Zhang plans to implement the research findings to the existing hydrodynamic separators in Massachusetts and Rhode Island by contacting officers at Massachusetts and Rhode Island Department of Transportation. Through personal communication with Chairperson Mr. Michael DeRotto, PI learned that more than 20 hydrodynamic separators have been installed in Rhode Island between 1997 and 2002. With such a wide application, PI is committed to incorporating the research results into practice.

**6. Schedule of Major Activities:**

Below is a time plan for the proposed study. The responsibility for each task is indicated by the initials: XZ - Xiaoqi Zhang (PI), GS- graduate student, US- undergraduate student.

| Project timeline   | Months |     |     |       |       |       |
|--|--------|-----|-----|-------|-------|-------|
|  | 1-3    | 4-6 | 7-9 | 10-12 | 13-15 | 16-18 |
| Task 1: Sampling site selection (XZ, GS)                                     |        |     |     |       |       |       |
| Task 2: Determine the removal efficiency for bacteria (GS, US)               |        |     |     |       |       |       |
| Task 3: Determine whether the bacteria are prone to be re-suspended (GS, US) |        |     |     |       |       |       |
| Task 4: (a) Draft final report (XZ)  |        |     |     |       |       |       |
| (b) Report research findings (XZ)  |        |     |     |       |       |       |

Note: quarterly progress reports (by XZ) will be submitted to the NETC Coordinator for distribution to the project technical committee at the end of each quarter.

**7a. Budget:** The following table is the budget request.

| Cost category               | Year 1 | Year 2 (6mo) | Total |
|-----------------------------|--------|--------------|-------|
| 1. Salaries and Wages       |        |              |       |
| - Principal Investigator    | 7800   | 3900         | 11700 |
| - MS student                | 16200  | 8100         | 24300 |
| - Undergraduate             | 3000   | 1500         | 4500  |
| Total salaries and wages    | 27000  | 13500        | 40500 |
| 2. Fringe benefits          | 284    | 142          | 425   |
| 3. Supplies                 | 3000   | 1500         | 4500  |
| 4. Equipment                | 0      | 0            | 0     |
| 5. Services and Consultants | 2400   | 0            | 2400  |
| 6. Travel                   | 1460   | 2500         | 3960  |
| 7. Other (publications)     | 0      | 502          | 502   |
| 8. Total direct             | 34144  | 18144        | 52287 |
| 9. Indirect                 | 18096  | 9616         | 27712 |
| 10. Total                   | 52240  | 27760        | 80000 |

**7b. Budget Justification:**

Salaries and Wages: Salary support is requested for the PI, one MS student, and one undergraduate student. During this 18 month project, 1.5 month summer support is requested for the PI @\$7800/mo (one month during year 1 and 0.5 month during year 2); support for a full time master’s student is requested @\$16,200/year; an undergraduate work-study student will be hired in the Summer @\$3000/3mo (3 mo. during year 1 and 1.5 mo during year 2).

Dr. Zhang is expected to spend four weeks during year 1 and two weeks during year 2 on this project. Her time will spend on sampling site selection, setting up sampling protocols, training the graduate student with sampling, biological/sterilization and analytical techniques, equipment operation, data acquiring, and data analysis.

A graduate student is expected to spend 18 hours/wk on sampling site maintenance, instrument maintenance, trouble shooting, samplings, biological analyses, and data analysis. An undergraduate will be responsible for samplings, site maintenance, and biological analyses during the summer. He/she will be trained by and work closely with the graduate student.

Fringe benefits: Fringe benefit on the students and Dr. Zhang’s summer support is set at 1.05%.

Supplies: General laboratory supplies are needed, such as sampling bottles, coolers, reagents, chemicals, glassware, sterilized gloves, etc. Estimated laboratory supply request is \$3000/year for the 1<sup>st</sup> year and \$1500 for the second year.

Equipment: No

Services or Consultants: Particle size will be analyzed by Scanning Electron Microscopy (SEM) located in Center for Advanced Materials at UMass Lowell with service charge. The service fee is \$40 per sample; the estimated cost is \$2400 for 60 samples.

Travel: There is a request for travel in association with this project. During the first year, mileage reimbursement request is made for the graduate student to collect samples from the sampling sites. \$1460 is requested based on an estimated round trip of 50 miles, 4 trips/each storm for 20 storm events @ \$0.365. During the second year, request is made to support both Dr. Zhang and the graduate student to present the research results at one national/international conference. Conferences such as the International Water Association, Water Environment Federation, and American Society for Microbiology are targeted. It is estimated that each trip will cost \$1250/person.

Others (publication): During year 2, results will be submitted for journal publication. The anticipated page charge for publication (\$502) is requested.

Indirect cost rate: UML standard overhead rate of 53% is applied for all direct charges except equipment. During year 1, the total direct cost is estimated at \$34144; this brings the total indirect cost to \$18096. During year 2, the total direct cost is estimated at \$18144; this brings the total indirect cost to \$9616. The total budget request is \$52240 for year one and \$27760 for year 2. The total budget request for this 18 month project is \$80000.

**8. Facilities-** Environmental Engineering Laboratories (University of Massachusetts Lowell, Dr. Zhang's Laboratory)

Research will be conducted in the Environmental Engineering Laboratories (EEL) at the University of Massachusetts Lowell. The EEL are designed specifically for conducting environmental related research projects. The facility is located in the Engineering Building which is home of Department of Civil & Environmental Engineering. The laboratories consist of 4 individual rooms and one environmental chamber that allow for numerous experimental projects to operate simultaneously in controlled environments without the risk of cross contamination.

The facility is equipped with a variety of equipment to support research and teaching in the areas of soil and ground water remediation, water treatment, and biological wastewater treatment. Major instruments that will be involved in this proposed research and the EELs possess are:

- Water purification system consisting of a Barnstead LPRO (low pressure reverse osmosis system) with NANOpure II water deionization and a 40-liter storage reservoir.
- Perkin Elmer model 3030B Atomic Absorption (AA) spectrophotometer equipped with a HGA 6000 Graphite Furnace and model AS-60 Auto-Sampler.
- Hewlett Packard (HP) model 5890 gas chromatograph (GC) equipped with a flame ionization detector (FID) and a photo ionization detector (PID).
- HP model 5890 GC equipped with FID and an electron capture detector (ECD).
- VWR model 1227 Reciprocal Shaker bath used for temperature controlled kinetic studies.
- Agilent 8453 UV-Visible spectrophotometer
- Kendro Super T21 tabletop temperature-controlled high-speed centrifuge
- Hach model 2100N Turbidimeter.
- 1-temperature controlled environmental chamber.
- Autoclaves, optical microscopes and a video microscope/TV system.
- Hach COD digesters.

EEL are also equipped with standard equipment such as dissolved oxygen meters, pH meters, specific ion probes, analytical balances, Damon/IEC Division CU-5000 centrifuge, COD racks, TKN apparatus, jar stirrers, ovens, muffle furnace, fume hoods, and incubators.

In addition, the Environmental Engineering Program faculty are also part of Center for Complex Environmental Systems. The center is a multi-disciplinary research, technical assistance, and training organization that focus on environmental science and technologies. The Center has several associated laboratories, including an analytical and wet chemistry laboratory, a biochemistry laboratory, an environmental microbiology laboratory, a site remediation laboratory, and a GIS laboratory for visualization of earth processes. The center provides an access for Environmental Engineering faculty to additional analytical equipment and services including plasma emission, mass spectral inductively coupled plasma (ICP) spectrophotometers, Instrumental Neutron Activation Analysis (INAA), NMR, HPLC, and GC-MS. The biological facility has Denaturing Gradient Gel Electrophoresis system (DGGE), GeneSys UV/Vis scanning spectrophotometer (for analysis of nucleic acids, Fe(II), nitrate, sulfate, ammonium, etc.) and sterile hoods. Dr. Zhang has full access to the facilities.

The Civil and Environmental Engineering Department employs a full-time technician, who is also a computer maintenance professional, to provide maintenance on analytical and mechanical equipment. These technical assistances are valuable asset in performing research on an innovative, educational system of experiments.

## 9. References:

- Clesceri, L.S., Greenberg, A. E., Eaton, A.D. 1998. Standard Methods for the Examination of Water and Wastewater. 20th edn, American Public Health Association/American Water Works Association/Water Environment Federation, Washington, DC.
- Feachem, R.G., Bradley, D. J., Garelick, H., and Mara D.D. 1983. *Sanitation and Disease: Health Aspects of Excreta and Wastewater Management*, Published for the World Bank by John Wiley & Sons, New York.
- Oliveri, V.P., Kruse, C.W., Kawata, K., and Smith, J.E. 1977. Microorganisms in urban stormwater. EPA report no. EPA-600/2-77-087.
- EPA, 1978, Microbiological Methods for Monitoring the Environment: Water and Wastes. EPA #: 600878017, Washington, D.C.
- EPA, 1997. Method 1600: Membrane filter test method for Enterococci in Water.
- EPA, 1999. Stormwater Technology Fact Sheet: Hydrodynamic Separators. United States, Report #: 832-F-99-017. Washington, D.C.
- EPA, 2000. Water quality conditions in the unites states: a profile from the 1998 national Water Quality Inventory Report to Congress, Office of Water, Washington, DC  
<http://www.epa.gov.305b/98report/98summary.html>
- Sansalone, J. J., and Tribouillard, T. 1999. Variation in characteristics of abraded roadway particles as a function of particle size: implications for water quality and drainage. *Transportation Research Record*, 1690, 153-163.
- Schillinger, J.E.,

# XIAOQI (JACKIE) ZHANG, Ph.D., E.I.T.

Assistant Professor  
Department of Civil & Environmental Engineering  
University of Massachusetts Lowell  
Lowell, MA 01824

Tel: (978) 934-2287  
Fax: (978) 934-3052  
E-mail: jackie\_zhang@uml.edu

## EDUCATION

|       |                                   |                               |      |
|-------|-----------------------------------|-------------------------------|------|
| Ph.D. | Environmental Engineering         | University of Cincinnati      | 1999 |
| M.S.  | Environmental Engineering         | Tsinghua University (Beijing) | 1994 |
| B.S.  | Civil & Environmental Engineering | Tongji University (Shanghai)  | 1989 |

## EMPLOYMENT

|                     |  |              |
|---------------------|--|--------------|
| Assistant Professor | University of Massachusetts Lowell                       | 2002-present |
| Assistant Professor | University of Missouri – Rolla, Rolla, MO                | 1999 - 2002  |
| Process Engineer    | Carollo Engineers, Santa Ana, CA                         | 1999         |
| Civil Engineer      | Shenzhen Civil and Architectural Design Institute, China | 1994 - 1995  |
| Civil Engineer      | Dalian Civil and Architectural Design Institute, China   | 1989 - 1991  |

## ACADEMIC EXPERIENCE

### Assistant Professor (tenure-track)

*University of Massachusetts Lowell*

*2002-present*

#### **Research Interests:**

Biofilm-based wastewater treatment processes, biofilm structures, properties of extracellular polymeric substances (EPS), heavy metal removal mechanisms by biofilms; biological and chemical phosphorus removal.

#### **Current funding:**

- PI, Copper removal by biofilms. Massachusetts Water Resources Research Center/USGS, \$150,935, 9/2003- 8/2005.
- PI, Degradability and degradation kinetics of biofilm extracellular polymeric substances. Independent University Alumni Association at Lowell, Inc. \$2500. 3/2003-3/2004.
- Co-PI, Environmental Technologies for Concentrated Animal Feed Operations (CAFOs), EPA, \$1,995,600. 4/2001- 5/2003.

#### **Pending Proposals:**

- PI, SGER: Degradability and degradation kinetics of biofilm extracellular polymeric substances. \$83,965, NSF, 9/2003-3/2005.
- PI, Cellular response to copper contamination: effects of copper on the production of extracellular polysaccharides. \$140,036, NSF, 6/2003-6/2005.

#### **Courses taught:**

- 14.460 (undergraduate-level) Water Resources Engineering
- 14.578 (Graduate-level) Biological Wastewater Treatment

#### **Workshop attended:**

- How to engineer engineering education, Bucknell Univ. July 2002.

### Assistant Professor (tenure-track)

*University of Missouri-Rolla, MO*

*1999-2002*

#### **Student Supervision:**

Advisor: 2 M.S. (Thesis); 2 M.S. (non-thesis); 12 undergraduates  
Committee member: 2 Ph.D., 2 M.S. (1 in U. Alberta, Canada)

#### Courses Taught:

- CE 261 (undergraduate-level), Introduction to Environmental Engineering and Science
- CE/EnvE 461(graduate-level), Biological Principles in Environmental Engineering
- CE/EnvE 401(graduate-level), Environmental Aquatic Chemistry

#### Funded Project:

- PI, Heavy Metal Absorption by Biofilm Exopolymers, \$27,820, Missouri Research Board, June 2000 – Dec. 2001.

#### Services:

- Environmental Air Pollution Faculty Search Committee, Dept. of Civil Eng. (2000)
- Scholarship Committee, Dept. of Civil Eng., UMR (Since 2000)
- ABET/Assessment Committee, Dept. of Civil Eng., UMR (Since 2000)
- UMR Research Board Proposal Reviewer (Since 2002)

#### Workshops Attended:

- 12<sup>th</sup> Annual Teaching Renewal Conference, Feb 14-16, 2002, Columbia, MO.
- University of Missouri New faculty Teaching Scholars Program, Oct 2001-May 2002.
- Research Development Workshop-Industry Funding, UMR, Nov 29, 2001.
- Career & Life Balance Workshop, UMR, Nov 5-6, 2001.
- New Faculty Forum, UMR, Oct 24-Dec. 7, 2000.
- NSF Regional Grants Conference, Purdue University, October 12-13, 2000
- MOREnet Consortium Conference and Educational Technologies, Osage Beach, MO, April 6-7, 2000

#### REFEREED JOURNAL PUBLICATION

1. Wang, J., Burken, J. G. and **Zhang, X.** (2003) Effects of Seeding Materials and Mixing Strength on Struvite Precipitation. (in preparation)
2. Xie, L. and **Zhang, X.** (2003) Examination of Exopolysaccharides in Copper-laden Wastewater Biofilms by Enzyme-linked Lectinsorbent Assay. (in preparation)
3. Withers, A. and **Zhang, X.** (2003) Copper sorption by biofilm extracellular polymeric substances. (In preparation)
4. **Zhang, X.** and Bishop, P. L. (2003) Biodegradability of Biofilm Extracellular Polymeric Substances. *Chemospher.* **50**, 63-69.
5. **Zhang, X.** and Bishop, P. L. (2001) Spatial Distribution of Extracellular Polymeric Substances in Biofilm. *J. Environ. Eng.* **127**(9), 850-856.
6. **Zhang, X.**, Bishop, P. L. and Kinkle, B. K. (1999) Comparison of Extraction Methods for Quantifying Extracellular Polymers in Biofilms. *Wat. Sci. and Tech.* **39**(7), 211-218.
7. **Zhang, X.** Bishop, P. L. and Kupferle, M. (1998) Measurement of Polysaccharides and Protein in Biofilm Extracellular Polymers. *Wat. Sci. and Tech.* **37**(5), 345-348.

#### BOOK CHAPTER

Bishop, P. L., Yu, T., **Zhang, X.**, Palsdottir, G. and Ebihara, T. (2003) The Effect of Biofilm Heterogeneity on Metabolic Processes. *Biofilms in Wastewater Treatment: An Interdisciplinary Approach*. Wuertz, S., Wilderer, P., Wimpenny, J. And Bishop, P. (editors), Elsevier Publishers.

#### DISSERTATION AND THESIS

- (1999) Ph.D. Dissertation "Biofilm extracellular polymeric substances (EPS)-methodology development, spatial distribution and property investigation," funded by NIEHS/EPA, USA.
- (1994) M.S. Thesis "Heavy Metal Recovery from Electroplating Waste Sludges," funded by National EPA, China.

#### INVITED SPEECH

**Zhang, X.** (2001) Monitoring the Shift of Exopolysaccharides in Biofilms during Copper Removal.

## CONFERENCE PRESENTATIONS AND PROCEEDINGS (Selected)

1. Wang, J., Burken, J. G. and **Zhang, X.** (2003) Effects of Seeding Materials and Mixing Strength on Struvite Precipitation. *WEF annual conference*. (Submitted)
2. Xie, L. and **Zhang, X.** (2002) Examination of Exopolysaccharides in Wastewater Biofilm by Enzyme-Linked Lectinsorbent Assay (ELLA). *ASM, 102<sup>nd</sup> General meeting*, Salt Lake City, Utah.
3. Xie, L. and Zhang, X. (2001) Measurement of Exopolysaccharides in Wastewater Biofilms by Enzym linked lectinsorbent assay (ELLA). *Mid-America Environmental Engineering Conference*. St. Louis, Missouri, USA.
4. Withers A. J. and **Zhang, X.** (2001) Copper Absorption by Biofilm Extracellular Polymeric Substances. *Missouri Branch, American Society for Microbiology and Midwest Microbiology Educators Conference*. St. Louis, MO.
5. Withers, A. J. and **Zhang, X.** (2000) Heavy Metal Removal by Biofilm EPS. *Mid-America Environmental Engineering Conference*. Columbia, Missouri, USA.
6. **Zhang, X.** and Bishop, P. L. (2000) Biodegradability of biofilm extracellular Polymeric Substances. *IWA-EPS conference*. Mulheim, Germany.
7. Withers, A. J. and **Zhang, X.** (2000) Heavy metal adsorption by biofilm EPS. *ASM Conference on Biofilms 2000*. Big Sky, MT.
8. **Zhang, X.** and Bishop, P. L. (2000) Biodegradability of biofilm by its own producers. *1<sup>st</sup> World Congress of the International Water Association*. Paris. France.
9. **Zhang, X.**, Bishop, P. L. and Yu, Y. (1999) Spatial Distribution of Extracellular Polymeric Substances in Biofilms. *WEFTEC'99 1999 conference proceedings (CD-ROM)*.
10. **Zhang, X.** Bishop, P. L., and Kinkle, B. K. (1998) Extraction of Extracellular Polymers from Biofilms using Five Different Methods. *Proceedings of 71st Water Environment Federation Annual Conference*, pp. 13-28.

## CONSULTING EXPERIENCE

### Process Engineer

*Carollo Engineers, Santa Ana, CA*

1999

- **Clark County Sanitation District Wastewater Treatment Plant Expansion Project (\$1M)**  
Investigated, analyzed, evaluated various process options for its 60 MGD wastewater treatment plant expansion; set forth the design parameters, criteria and concepts necessary for preparation of detailed design.
- **Nitrogen Removal For City of Redlands**  
Evaluated plant operations, created a plan evaluating and discussing methods for nitrogen removal to achieve compliance with 1998 Waste Discharge Requirements.

### Civil Engineer

*Shenzhen Civil and Architectural Design Institute, China*

1994 - 1995

*Dalian Civil and Architectural Design Institute, China*

1989 - 1991

- **Shongxia Wastewater Treatment Plant Design (\$1M)**  
Participated in the preliminary design of Shongxia wastewater treatment plant; duties included planning, unit design, pump station design, and coordination with clients.
- **Master Planning of Shahe County Water and Drainage Systems (\$3M)**  
Project leader with full responsibility in designing water supply, sewer discharge, storm drainage and hydrant systems for Shahe County with a population of 200,000.
- **Master Planning of Ganjing County Storm Drainage System (\$2M)**  
Responsible for the study of storm drainage system for Ganjing County with a population of 150,000.

Analyzed existing drainage condition and developed alternatives for system modification.

- **Community Water and Drainage Systems (3M)**  
Project leader in inspecting and designing water supply, sewer discharge, storm drainage and hydrant systems for 4 newly developed communities with a total population of 200,000.
- **Pacific Plaza (awarded project) (\$10M)**  
Participated in the preliminary design of water supply, sewer discharge, storm drainage and hydrant systems for a 30-story multi-functional business center.
- **Residential Buildings**  
Project leader in designing interior/exterior drinking water supply, sewer discharge and hydrant systems for an area with 20 residential buildings.
- **Office Building and High School Design**  
Project leader in planning and designing water, drainage and hydrant systems for Honghai Office Building and Xingwang High School.

#### HONORS AND AWARDS

- Who's Who in Engineering Education, 2002-present
- EPA/NIEHS Superfund Basic Research Program Scholarship, 1996-1999.
- University Graduate Scholarship, University of Cincinnati, 1995-1999.
- University Research Fellowship, University of Cincinnati, 1995.
- Outstanding Student Fellowship, Tsinghua University, China, 1992.
- Outstanding Student Fellowship, Tongji University, China, 1987, 1988.
- Outstanding Student of the city of Harbin, China, 1982, 1983.

#### PROFESSIONAL REGISTRATION

- Engineer In Training (EIT) in Ohio, 1997.

#### PROFESSIONAL MEMBERSHIPS AND ACTIVITIES

- |   |            |
|---|------------|
| • International Water Association (IWA)                           | Since 1996 |
| • Water Environment Federation (WEF)                              | Since 1996 |
| • American Society for Microbiology (ASM)                         | Since 1997 |
| • Sigma Xi (Research Honorary Society)                            | Since 1998 |
| • Association of Environmental Engineering and Science Professors | Since 1999 |
| • Chi Epsilon   | Since 2000 |
| • American Society of Engineering Education                       | Since 2002 |
| • Reviewer for Biotechnology and Bioengineering                   | Since 2000 |
| • Reviewer for Chemosphere  | Since 2000 |
| • Reviewer for Journal of Environmental Engineering               | Since 2001 |
| • Reviewer for Water Environment Research                         | Since 2001 |
| • Panel reviewer for National EPA                                 | Since 2002 |

## Dr. Zhang's Related Research and Publications

### Related Research:

Dr. Zhang has been working with biological wastewater treatment systems for 8 years. She brings a unique background of civil engineering, environmental engineering, biochemical training, and industrial experience. The PI has extensive experience in biological sterilization techniques and analyses such as total suspended solids (TSS), volatile suspended solids (VSS), spread plate count, pour plate count, most probable number (MPN) for fecal coliform and *E. coli*, membrane filtration for *enterococci*, phospholipid analysis (for viable biomass), carbohydrate and protein analysis, DNA analysis, extraction of extracellular polymeric substances (EPS) in biofilms, biofilm slicing, image taking by scanning electron microscopy, etc.

The PI has successfully developed sulfate-reducing biofilms, nitrification biofilms, azo-dye biofilms, heterotrophic biofilms, and copper containing biofilms. Dr. Zhang's research has been funded by the University of Missouri, University of Massachusetts, EPA, Massachusetts Water Resources Research Center/USGS, and have several projects pending support from NSF.

In the past few years, the PI has been actively involved in studying heavy metal adsorption by biofilms. Research was mainly focused on determining the fate of heavy metals in a biofilm system, the dose-response relationship between heavy metals and EPS, and the maximum uptake of heavy metals by biofilms. Analyses such as Chemical Oxygen Demand, Dissolved Oxygen, pH, copper concentration, Total Solids (TS) and TSS of biofilms, bacteria number, EPS extraction, N-acetyl-glucosamine and N-acetyl-neuraminic acid in the EPS were done routinely.

The PI has also been actively involved in technology development for phosphorus removal from concentrated animal feed operations (CAFOs). The purpose for this research is to optimize the chemical dosage and phosphorus removal efficiency with the goal of recovering and reusing phosphorus in the long-run. Research is focusing on mimicking the feed in a typical anaerobic lagoon, precipitating phosphorus by forming struvite ( $Mg(NH_4)PO_3 \cdot 6H_2O$ ) with optimum chemical dosage, and studying the effects of seeding materials and mixing strength.

### Related Publications:

#### Referred Journal Publications (in preparation):

1. Wang, J., Burken, J. G. and **Zhang, X.** (2003) Effects of Seeding Materials and Mixing Strength on Struvite Precipitation.
2. Xie, L. and **Zhang, X.** (2003) Examination of Exopolysaccharides in Copper-laden Wastewater Biofilms by Enzyme-linked Lectinsorbent Assay.
3. Withers, A. and **Zhang, X.** (2003) Copper Sorption by Biofilm Extracellular Polymeric Substances.

**Referred Journal Publications:**

1. **Zhang, X.** and Bishop, P. L. (2003) Biodegradability of Biofilm Extracellular Polymeric Substances. *Chemosphere*. **50**, 63-69.
2. **Zhang, X.** and Bishop, P. L. (2001) Spatial Distribution of Extracellular Polymeric Substances in Biofilm. *J. Environ. Eng.* **127**(9), 850-856.
3. **Zhang, X.**, Bishop, P. L. and Kinkle, B. K. (1999) Comparison of Extraction Methods for Quantifying Extracellular Polymers in Biofilms. *Wat. Sci. and Tech.* **39**(7), 211-218.
4. **Zhang, X.** Bishop, P. L. and Kupferle, M. (1998) Measurement of Polysaccharides and Protein in Biofilm Extracellular Polymers. *Wat. Sci. and Tech.* **37**(5), 345-348.

**Book chapter:**

Bishop, P. L., Yu, T., **Zhang, X.**, Palsdottir, G. and Ebihara, T. (2003) The Effect of Biofilm Heterogeneity on Metabolic Processes. *Biofilms in Wastewater Treatment: An Interdisciplinary Approach*. Wuertz, S., Wilderer, P., Wimpenny, J. And Bishop, P. (editors), Elsevier Publishers.

**Dissertation and thesis:**

- (1999) Ph.D. Dissertation “Biofilm extracellular polymeric substances (EPS)-methodology development, spatial distribution and property investigation,” funded by NIEHS/EPA, USA.
- (1994) M.S. Thesis “Heavy Metal Recovery from Electroplating Waste Sludges,” funded by National EPA, China.