

TOWN OF RIVERHEAD

CONSULTANT SCOPE OF PROFESSIONAL SERVICES

YOUNG'S AVENUE LANDFILL POST CLOSURE MAINTENANCE AND MONITORING

The Town of Riverhead is currently soliciting Proposals from Professional Engineering firms for execution of the Town's NYSDEC recently approved Young's Ave. Landfill Post Closure Maintenance and Monitoring Plan (PCMMP) a copy of which is attached hereto.

1. SCOPE OF SERVICES

During the term of this Agreement, the selected consultant shall provide Professional Engineering Services required to perform all NYSDEC required monthly, post storm event and all other inspections required by the PCMMP and prepare monthly, quarterly and annual reports for submission to DEC per the PCMMP. Other services shall include performing quarterly and baseline ground water and methane gas sampling, analysis and reporting. It is the Town's intention that the selected consultant will be responsible to assuring timely completion of all required inspections, sampling. Testing, analysis and reporting to assure continued compliance with the Town's DEC approved PCMMP.

Task I – Required inspections.

Perform all DEC required inspections and preparing resulting reports and recommendations for any deficiencies found during inspections. Inspection must be completed on a timely basis and resulting reports submitted to the Local regional office of the NYSDEC attention Nick Romero, Division of Solid Waste with copy to the Office of the Town Engineer, 1295 Pulaski Street, Riverhead, NY. Schedules of required inspections and scope of in sections are contained in the accompanying PCMMP.

Task II – Methane Gas and Ground Water Sampling, Analysis and Reporting.

Under this task, the consultant shall schedule, coordinate and supervise quarterly, baseline and special gas and water sampling events as specified by the DEC. Within three weeks of each required sampling event the consultant shall contact Mr. Eric Lenio or other designated DEC official with notice of intent to sample and schedule accordingly such that the DEC representative, at his or her option, can be present during the sampling activities. Sampling shall be in accordance with the scheduling and sampling procedures approved by DEC and contained in the attached appendix # 1. Sampling locations consist of 6 on site methane gas probes, 5 pairs of ground water sampling well each pair consisting of one shallow well and one deep well. Two well sets are located on the landfill site and 3 sets are off site in close proximity to the landfill. See attached maps for precise well and probe locations. Upon completion of sampling the consultant shall immediately forward samples to the consultant's analytical laboratory for analysis and shall maintain a proper chain of custody. Upon receipt of sample laboratory analysis results the consultant shall perform a comparison of result values against previous sampling events and historical area ground water sample results which will be provided to the consultant.

Part III - Reporting

The selected consultant will be required to prepare and submit all inspection reports, post repair reports, water and gas sampling results and analytical reports comparing water and gas sample results to previous and historical sampling result values. All reporting documents will be provided to the Town Engineer electronically both by disc and email to the Town Engineer.

Part IV – Fee Proposal

Summary of fee Proposal

Responding consultant shall provide a cost breakdown for providing the services as described above in conformance with the follow breakdown **TO BE PROVIDED IN A SEPARATE SEALED ENVELOPE**. Costs for services currently anticipate and identified above and in appendixes should be provide in the seal cost proposal along with hourly rates for personnel anticipate to be utilized on this project. Any additional service that may be required above and beyond the tasks outline above will be negotiated with the selected firm as they may arise and will be based on the hourly rates provided.

Task I	Monthly, post storm and as needed inspections	Provide cost per inspection event to include all reports and recommended repairs
Part II	Methane Gas and Ground Water Sampling, Analysis and Reporting	Provide total cost per cycle to include 4 quarterly and one baseline per cycle
Part III	Reporting	Provide annual cost to provide all reports

Project detailed cost breakdown for each task listed in table above - Please use Bid Sheet. The breakdown should include sufficient detail of staff hours and pay rates for each subpart to allow the Town to understand and analyze how the cost was derived. **PLEASE NOTE, FEE PROPOSAL AND BACK UP IS TO BE PROVIDED IN A SEPARATE SEALED ENVELOPE AND, THE TECHNICAL QUALIFICATIONS AND EXPERIENCE PROPOSAL SHALL NOT INCLUDE ANY FEE INFORMATION.**

2. TERM OF AGREEMENT

The Agreement shall commence upon execution of a professional services agreement between the consultant and the Town of Riverhead based upon the scope of services and conditions of this document and shall run through the term of one complete cycle defined as four quarterly and one baseline sampling event per the attached DEC approved sampling schedule which would amount to 15 months for five quarters (one quarterly baseline and four subsequent quarterly sampling events). The term of this agreement can be extended upon mutual agreement for a maximum of 3 sampling cycles.

3. PAYMENT

For these services Town of Riverhead will pay Consultant an agreed upon fee for each inspection performed including all costs to prepare and submit said inspection reports, and for each quarterly or baseline sampling event in accordance with cost per event agreed upon by the town and the consultant. Total fee shall not exceed the agreed upon maximum fee unless additional services are agreed upon by the Town. The Town will require the submission of documentation, including time records for staff working on this project solely for the purposes of verification of completion of the project or a portion of the project. The Town shall not have any liability for any other expenses or costs incurred by Consultant except for expenses expressly provided for and agreed upon by the Town.

Consultant shall not incur any expenses on Town's behalf except for those items expressly agreed upon and provided by the consultant and included in the final agreement between the Town and the Consultant. Invoices for services and reimbursable expenses shall contain the following statement signed by Consultant, or if this Agreement is with a firm, an officer or authorized representative of the firm: "I hereby certify, to the best of my knowledge and belief, that this invoice is correct, and that all items invoiced are based upon actual costs incurred or services rendered consistent with the terms of the professional services agreement." Each invoice for reimbursable expenses shall be supported by: (a) an itemized description of expenses claimed; (b) pertinent information relative to the expenses; and (c) attached receipts. Invoices shall reference this Agreement or otherwise be identified in such a manner as Town may reasonably require. Notwithstanding the above, the Town and Consultant agree that travel, meals, lodging, paper, mail expense or postage shall not be reimbursable expenses and the Town shall not be liable for same.

4. RIGHTS TO DOCUMENTS OR DATA

All information and data, regardless of form, generated in the performance of, or delivered under, this Agreement, as well as any information provided to Consultant by Town, shall be and remain the sole property of Town. Consultant shall keep all such information and data in confidence and not disclose or use it for any purpose other than in performing this Agreement, except with Town's prior written approval. In the event that the legal right in any data and information generated in the performance of this Agreement does not vest in Town by law, Consultant hereby agrees to assign and assigns to Town such legal rights in all such data and information. Final payment shall not be due hereunder until after receipt by Town of such complete document and data file, or a certification that there is no such information created by the services performed under this agreement, and receipt of all information and data which is the property of Town. These obligations shall survive the termination of this Agreement. The consultant shall provide the Town Engineer copies of any and all inspection reports, sampling results, reports and any other data generated from the contracted services. All documents, data, etc. shall be forwarded to the Town Engineer as a mailed hard copy as well as electronically either by disc or email.

5. PUBLICITY

Consultant shall not, without the prior written consent of Town, in any manner advertise or publish the fact that Town has entered into this Agreement with Consultant. Consultant shall not, without the prior written consent of the Town, provide, release or make available for inspection any document, data, written material of any kind without the prior written consent of at least three members of the Town Board or by resolution of the Town Board.

6. ASSIGNMENT AND SUBCONTRACTING

Performance of any part of this Agreement may not be subcontracted nor assigned without, in each case, the prior written consent of at least three members of the Town Board or by resolution of the Town Board, with the exception of the sub-contract for testing services.

7. TERMINATION

This Agreement may be terminated at any time by either party upon 30 days written notice to the other party. In the event of such termination, Town shall have no further obligation to Consultant except to make any payments which may have become due under this Agreement.

8. RECORDS

Consultant shall keep accurate records of the time spent in the performance of services hereunder. The Town shall, until the expiration of seven years after final payment under this Agreement, have access to and the right to examine any directly pertinent books, documents, papers and records of

Consultant involving transactions related to this Agreement.

9. ADDITIONAL SERVICES

The post closure maintenance and monitoring of the Young's Ave Landfill is being performed as required by NYSDEC Part 360 regulations and although the current PCMMP has been approved by DEC it is possible that the continued maintenance and monitoring of the landfill could require additional professional services due to any storm damage, erosion, out of range sample results, unanticipated settling or any other unanticipated occurrence. If additional testing is required the consultant and the Town will agree upon the cost of such required additional services based on the fee schedule and anticipated level of effort, hourly rates and equipment rates set forth in the fee schedule. The Consultant upon execution of a Professional Services Agreement entered into as described above. Under no circumstances shall any additional professional service be provided without a written purchase order or purchase order change order being issued by the Town at the hourly rates agreed to herein.

10. NOTICES

Any notice shall be considered as having been given: (i) to Town of Riverhead if mailed by certified mail, postage prepaid to Town of Riverhead, Attention: Drew Dillingham, Town Engineer, 200 Howell Avenue, Riverhead, NY 11901; or (ii) to Consultant if mailed by certified mail, postage prepaid.

11. COMPLIANCE WITH LAWS

Consultant shall comply with all applicable federal, state, and local laws and ordinances and regulations in the performance of its services under this Agreement. Consultant will notify Town immediately if Consultant's work for Town becomes the subject of a government audit or investigation. Consultant will promptly notify Town if Consultant is indicted, suspended or debarred. Consultant represents that consultant has not been convicted of fraud or any other felony arising out of a contract with any local, state or federal agency. In carrying out the work required hereunder Consultant agrees not to make any communication to or appearance before any person in the executive or legislative branches of the local, state or federal government for the purpose of influencing or attempting to influence any such persons in connection with the award, extension, continuation, renewal, amendment or modification of any contract or agreement. Consultant may perform professional or technical services that are rendered directly in the preparation, submission or negotiation activities preceding award of a Town agreement/contract or to meet requirements imposed by law as a condition for receiving the award but only to the extent specifically detailed in the statement of work. Professional and technical services are limited to advice and analysis directly applying Consultant's professional or technical discipline.

12. INSURANCE, INDEMNITY AND LIABILITY

Consultant shall carry Comprehensive General Liability Insurance in the amount of One Million Dollars naming the Town of Riverhead additionally insured and, if applicable, worker's compensation insurance. Consultant hereby indemnifies and holds the Town, its departments, officers, agents and employees, harmless against any and all claims, actions or demands against Town, its departments, officers, agents and employees and against any and all damages, liabilities or expenses, including counsel fees, arising out of the acts or omissions of Consultant under this Agreement.

13. CONFLICT OF INTEREST

Consultant hereby represents and covenants that neither it nor any of its employees or representatives has or shall have, directly or indirectly, any agreement or arrangement with any official, employee or representative of the Town of Riverhead which any such official, employee, representative shall receive

either directly or indirectly anything of value whether monetary or otherwise as the result of or in connection with any actual or contemplated application before any department of the Town, contract with the town for sale of any product or service. Consultant further represents and covenants that neither it nor any of its employees or representatives has offered or shall offer any gratuity to the Town, its officers, employees, agents or representatives with a view toward obtaining this Agreement or securing favorable treatment with respect thereto. Consultant further represents that it will not engage in any activity which presents a conflict of interest in light of its relationship with Town.

14. DISCLOSURE

The Town shall have the right, in its discretion, to disclose the terms and conditions of this Agreement (as it may be amended from time to time), including but not limited to amounts paid pursuant hereto, to agencies of the local, state and federal government.

15. DISPUTES

If Consultant fails to perform any of its obligations hereunder in accordance with the terms hereof, then after reasonable notice to Consultant not to exceed thirty (30) days, and an opportunity for Consultant to cure such failure, (except in case of emergency), the Town may (but shall not be obligated to) cure such failure at the expense of the Consultant, and the amount incurred by the Town in connection with such cure shall be payable by Consultant to Town on demand. Notwithstanding the above, any dispute arising under this Agreement which is not settled by Agreement of the parties may be settled by appropriate legal proceedings. Pending any decision, appeal or judgment in such proceedings or the settlement of any dispute arising under this Agreement, Consultant shall proceed diligently with the performance of this Agreement in accordance with the decision of Town.

16. FORM OF PROPOSAL

The consultant shall submit 5 copies of their proposal responding to this request to the office of the Town Clerk located at 200 Howell Avenue, Riverhead by 4:00 Pm on June 6, 2019 . The proposal shall contain the following information and is to be formatted accordingly;

- I) Company Profile/History
- II) Past Landfill Maintenance and Monitoring Experience.
- III) Past experience with the investigation, closure, capping maintenance and monitoring of municipal landfills.
- IV) Familiarity with the Town of Riverhead Young's Ave. Landfill.
- V) Experience with coordinating and working closely in good relations with the New York State DEC regional solid waste department and staff.
- VI) Project detailed cost breakdown for each task listed in section 1 above. A completed Bid Form. The breakdown should include sufficient detail of staff hours and pay rates for each subpart of section 1 to allow the Town to understand and analyze how the cost was derived. **PLEASE NOTE, FEE PROPOSAL, *USE FEE PURPOSAL BID FORM* IS TO BE PROVIDED IN A SEPARATE SEALED ENVELOPE AND, THE TECHNICAL QUALIFICATIONS AND EXPERIENCE PROPOSAL SHALL NOT INCLUDE ANY FEE INFORMATION.**

17. CONSULTANT SELECTION CRITERIA

Upon receipt of proposals, the Town of Riverhead will assemble a review committee consisting of appropriate personnel with sufficient knowledge of this project to effectively review the proposals, rank firms qualifications and make a recommendation to the Town Board. The initial phase of the Proposal review will be QUALIFICATIONS DRIVEN. The reviewing personnel will make a recommendation on

the ranking of firms based on the qualifications and experience of the firm and the proposed project staff as related to similar landfill post closure maintenance and monitoring projects. Once the technical review is done and only after the firms are ranked based on qualifications and experience on similar projects the fee proposals will be opened and compared. If the selected firm's fee proposal significantly exceeds that of the second firm's fee proposal, the Town will undertake to negotiate with the selected firm without disclosure of the remaining firm's fee proposals. If these negotiations are successful and a mutual agreement is reached between the town and consultant, a final recommendation will be made to the town board to retain the selected firm. In the event that negotiations fail to result in a mutually agreeable fee than the Town will revert to the second ranking firm and similar negotiations. Upon reaching a fee agreement with a firm, this RFP will be converted into a Professional Services Agreement (PSA) and, upon acceptance of form and contact by both parties, will be subject to a Town Board Resolution authorizing the Town Supervisor to sign the agreement and forward it to the firm for signing by a duly authorized official of the firm. Once fully executed copies of the PSA will be provided to the firm, the Office of the Town Engineer will prepare a purchase order and notice to proceed will be issued to the firm by the Town Engineer.

18. SUBMISSION

Please submit 5 copies of your proposal and any supporting documentation to the Office of the Town Clerk, 200 Howell Ave. Riverhead, NY 11901 by 4:00 PM on June 6, 2019. Any questions or clarifications should be directed to Drew Dillingham, PE, Office of the Town Engineer, 1295 Pulaski Street, Riverhead, NY 11901 or by email to: dillingham@townofriverheadny.gov

Note: Responding firm are hereby advised that under no circumstance should ANY billable work take place until such time as the firm has in its possession a fully executed PSA, a Purchase Order for the full amount of the agreed upon fee AND a written notice to proceed. In addition firms are hereby advised that absolutely NO additional fees beyond the agreed upon fee will be paid including such work as may be directed verbally or in writing by ANY Town official without that direction being accompanied by a executed Town Board Resolution and/or PSA modification AND a Purchase Order Modification for the additional services requested. THE TOWN SHALL NOT BE RESPONSIBLE FOR PAYING ANY ADDITIONAL FEES OR DIRECT EXPENSES THAT ARE PERFORMED PRIOR TO OBTAINING A PSA MODIFICATION AND PURCHASE ORDER MODIFICATION.

19. ATTACHEMNTS

The complete RFP package consists of this 6 page document, a bid form (3 pages), Notice to Bidders, a copy of the Town's approved Post Closure and Maintenance and Monitoring Plan, approved sampling plan and schedule.

YOUNG'S AVENUE LANDFILL POST CLOSURE MAINTENANCE AND MONITORING BID FORM

NAME OF PROPOSER: _____

	TASK DESCRIPTION	Identification of Staff And Equipment	LABOR AND EQUIPMENT SUBTOTALS	TOTAL COST (Labor and Equipment)
Task I	Monthly, post storm and as needed inspections	Identify staff necessary to conduct inspection(s) and hourly rate: Project Manager: _____ Remediation Engineer: _____ Environmental Engineer: _____ Other: _____ *if applicable List Equipment (brief description ie. Grundfos Pump): _____ _____ _____	Identify # hours for all staff members identified: Project Manager: _____ Remediation Engineer: _____ Environmental Engineer: _____ Other: _____ List equipment and the hourly (hr) or daily(day) rate for equipment necessary to complete task: _____ Rate _____ _____ Rate _____ _____ Rate _____	TASK I _____ PER EVENT
Task II Part A	Methane Gas and Ground Water Sampling, Analysis for Baseline	Identify staff necessary to conduct inspection(s) and hourly rate: Project Manager: _____ Remediation Engineer: _____ Environmental Engineer: _____ Other: _____ *if applicable List Equipment (brief description ie. Grundfos Pump): _____ _____ _____	Identify # hours for all staff members identified: Project Manager: _____ Remediation Engineer: _____ Environmental Engineer: _____ Other: _____ List equipment and the hourly (hr) or daily(day) rate for equipment necessary to complete task: _____ Rate _____ _____ Rate _____ _____ Rate _____ Cost of Laboratory Services:	TASK II Part A _____ PER EVENT

			6 NYCRR 360-2.11 d (6) _____ QA/QC 10 wells _____ Filtered Baseline Metals _____ Others: _____	
Task II Part B	Methane Gas and Ground Water Sampling, Analysis - 4 quarterly	Identify staff necessary to conduct inspection(s) and hourly rate: Project Manager: _____ Remediation Engineer: _____ Environmental Engineer: _____ Other: _____ *if applicable List Equipment (brief description ie. Grundfos Pump): _____ _____ _____	Identify # hours for all staff members identified: Project Manager: _____ Remediation Engineer: _____ Environmental Engineer: _____ Other: _____ List equipment and the hourly (hr) or daily(day) rate for equipment necessary to complete task: _____ Rate _____ _____ Rate _____ _____ Rate _____ Cost of Laboratory Services: 6 NYCRR 360-2.11 d (6) _____ QA/QC 10 wells _____ Filtered Baseline Metals _____ Others: _____	TASK II Part B _____ PER EVENT
Task III Part A	Provide cost per report of inspection event referenced in A, such report to include all recommended repairs Reports to be filed with DEC See Specifications	Identify staff necessary to conduct inspection(s) and hourly rate: Project Manager: _____ Remediation Engineer: _____ Environmental Engineer: _____	Identify # hours for all staff members identified: Project Manager: _____ Remediation Engineer: _____ Environmental Engineer: _____ Other: _____	TASK I Part A _____ PER REPORT

Task III Part B	Methane Gas and Ground Water Sampling, Analysis Baseline Report See Specifications	Identify staff necessary to conduct inspection(s) and hourly rate: Project Manager: _____ Remediation Engineer: _____ Environmental Engineer: _____ Other: _____	Identify # hours for all staff members identified: Project Manager: _____ Remediation Engineer: _____ Environmental Engineer: _____ Other: _____	TASK II Part B _____ PER REPORT
Task III Part C	Provide cost per Methane Gas and Ground Water Sampling (4 quarterly (routine samples with comparison to previous and historical sampling) See Specifications	Identify staff necessary to conduct inspection(s) and hourly rate: Project Manager: _____ Remediation Engineer: _____ Environmental Engineer: _____ Other: _____	Identify # hours for all staff members identified: Project Manager: _____ Remediation Engineer: _____ Environmental Engineer: _____ Other: _____	TASK II Part C _____ PER REPORT

TOWN OF RIVERHEAD
REQUEST FOR PROPOSALS

Sealed proposals for the Youngs Avenue Landfill Maintenance and Monitoring RFP must be submitted to the Office of the Town Clerk at Riverhead Town Hall, 200 Howell Avenue, Riverhead, New York no later than 4:00 pm on June 6, 2019 and will be publicly opened and read aloud on June 7, 2019 at 11:00 am in the Office of the Town Clerk.

Specifications may be examined and/or obtained on or about May 16, 2019 by visiting the Town of Riverhead website: www.townofriverheadny.gov and click on Bid Requests.

Each proposal must be submitted on the Form provided and in a sealed envelope clearly marked, "Youngs Avenue Landfill Maintenance and Monitoring". .

Please take further notice, that the Town Board reserves the right to reject in whole or in part any or all RFP's, waive any informality in the proposals submitted and accept the proposal which is deemed most favorable in the interest of the Town of Riverhead. The Town Board will use its discretion to make judgmental determination as to its best estimate of a successful request for proposal. Note: RFP responses must be delivered to the Office of the Town Clerk at the address and times listed above. The Town may decline to accept, deem untimely and/or reject any RFP response/proposal that is not delivered to the Office of the Town Clerk.

Comments and/or questions from prospective bidders must be submitted in writing to dillingham@townofriverheadny.gov no later than 4:00 pm est, May 24, 2019.

BY ORDER OF THE RIVERHEAD TOWN BOARD
DIANE M. WILHELM, TOWN CLERK
Riverhead, New York 11901

Dated: May 7, 2019



Post Closure Monitoring and Maintenance Operations Manual For Youngs Avenue Landfill

Presented to:

TOWN OF RIVERHEAD

ENGINEERING DEPARTMENT

200 Howell Avenue
Riverhead, New York 11901

Prepared by:

SCS ENGINEERS OF NEW YORK, PC

140 Route 303
Valley Cottage, New York 10989
845-353-5727

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File No. 13206007.00

Offices Nationwide
www.scsengineers.com

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1 INTRODUCTION

The Riverhead Landfill (Landfill) is an existing municipal solid waste landfill located in and owned by the Town of Riverhead, Suffolk County, New York. The Landfill ceased accepting waste in 1993. Landfill reclamation activities were attempted from 2000 through 2006. After excavating almost 1.2 million cubic yards of materials, reclamation activities were suspended in May 2006 after it became apparent that considerable additional waste remained on the site.

The Town has elected to close the landfill in accordance with the 1994 Court Order Stipulation and NYSDEC regulations. The closure construction commenced in January 2008 and the geomembrane cap materials were essentially complete by December. Additional time in March through June of 2009 was needed to establish vegetation.

This Post-Closure Monitoring and Maintenance Operations (PCMMO) Manual was prepared per the requirements of New York Code of Rules and Regulations, 6 NYCRR 360-2.15(k)(7). This document will provide all information needed to effectively monitor and maintain the facility for a minimum 30-year post closure period.

2 BACKGROUND

2.1 SITE DESCRIPTION

The Riverhead Landfill is situated within a 72 – acre Town owned property in Baiting Hollow, Town of Riverhead, and Suffolk County, New York. The Landfill is owned and was operated by the Town of Riverhead.

The Landfill is bounded by Youngs Avenue to the north, wooded property to the east and west, and a residential development towards the southeast and southwest. An open pond and freshwater wetland system is adjacent to the southern boundary of the Landfill property. The Landfill footprint, as delineated on the Construction Plans, is approximately 30 acres. The Town has used the remaining 42 acres for sand mining and composting operations. The sand borrow has been used by the Town for road construction, backfill and landfill cover material.

The Landfill commenced waste acceptance in 1967 and is unlined. There are no leachate collection systems installed at the landfill. Annual waste receipt information is not available. The Landfill ceased waste operations on October 8, 1993. Daily cover material was clean sand. Yard waste activities are operated by the Town at the northwest corner of the site.

On October 5, 1994, a stipulation was imposed upon the Town of Riverhead by the New York State Department of Environmental Conservation (NYSDEC) for operational violations of the Part 360 regulations applicable to the Landfill. The stipulation included requirements for the submittal of a Closure Investigation Report (CIR), a Closure Plan (CP), a Solid Waste Management Plan (SWMP), and a Reclamation Feasibility Study Report.

2.2 LANDFILL COVER SYSTEM

Select cap construction contract drawings and details are provided in Appendix A. Major features of the facility are shown on Drawing No. 1, Site Plan in Appendix D, which indicates all major features of the landfill closure. The typical cap cross section consists of the following from bottom to top:

- 6 inches of gas venting sand (screened reclaimed sand).
- 40-mil textured linear low-density polyethylene (LLDPE) geomembrane.
- 8 oz. non-woven geotextile.
- 15 or 21 inches of barrier protection layer (BPL) with cap drains.
- 9 inches of topsoil.
- Vegetation.

The 6-inch thick gas venting layer is constructed to collect and transmit landfill gas (LFG) to designated points such as the vertical gas vents.

The 40-mil textured linear low-density polyethylene (LLDPE) geomembrane precludes precipitation migration into the landfill and considers settlement, erosion and seepage forces in the overall stability of the final cover system.

The geomembrane is installed on a minimum four percent slope to promote gravity drainage and a 33 percent maximum slope to ensure stability. The geomembrane is anchored in a trench at the perimeter of the landfill limits.

An 8 oz. non-woven geotextile was installed over the LLDPE geomembrane as protection from the deleterious materials found in the reclaimed sand.

The 15 or 21-inch thick barrier protection layer (BPL) was installed directly over the geotextile. The BPL serves to protect the underlying geomembrane, to accommodate stormwater infiltrating through the overlying vegetative support layer, and provide adequate moisture retention to support long-term vegetative growth. The BPL will also protect the geomembrane from frost action and root penetration and resist erosion. Reclaimed stockpiled sand was used for the barrier protection layer.

The BPL layer was installed in either a 15 (final cover system A) or 21-inch (final cover system B) thick layer as shown on the drawings. The BPL is 15 inches thick in the steeper portions of the landfill towards the south of the site. The BPL is 21 inches thick in the flatter portions of the landfill towards the front of the site. The 21-inch thick BPL will provide additional protection for the geomembrane should future development occur at the site. The thicker layer of BPL provides greater protection of the underlying geomembrane during placement and provides additional moisture retention to sustain vegetative growth. The drainage sand was placed in one lift using low ground pressure equipment.

Cap drains were installed within the BPL to prevent the build-up of excess pore pressures. The cap drains consist of 6-inch diameter corrugated, slotted polyethylene collection pipes. A polyester sleeve is fitted around all sections of collection pipe to prevent soil particles from entering the pipe and creating obstructions.

The slotted collection pipes discharge into 6-inch diameter corrugated, solid polyethylene pipes. The discharge pipes convey runoff into the sideslope diversion swales, channels or the downdrain inlets. The exposed ends of the discharge pipes are fitted with a wire mesh to prevent animal access.

A toe drain was constructed at the anchor trench around the perimeter of the closure area. The toe drain is designed to drain run-off above the geomembrane in the BPL layer and discharge to the existing perimeter channels or surrounding soils without saturating the overlying soil layers. The 20-foot wide strip of tri-planar geocomposite drain was placed directly over the geomembrane and discharges at the outer edge of the vegetative support layer, and is protected by a rip-rap cover.

2.2.1 Temporary Erosion Control

An erosion control “blanket” was installed after hydroseeding in most areas. The erosion control blanket is a two season rolled erosion product consisting of straw and coconut fibers. The erosion control blanket was also used to stabilize the basin sideslopes and areas outside the limit of final cap with slopes steeper than 3H:1V until vegetation was established.

2.2.2 Permanent Erosion Control

Several erosion control features were incorporated into the landfill design to prevent the migration of soils off-site. Diversion berms and channels reduce sheet flow distances, thereby limiting the potential for slope erosion.

Permanent turf reinforcement mat was installed in all diversion berms and drainage channels to prevent erosion.

Rip rap was utilized on all drainage and erosion control structures where high flow velocities increase the potential for soil erosion. Rip rap has been placed at the outfalls of the drainage structures to prevent scouring of the soils and undermining of the structures.

A 9-inch thick vegetative support layer was constructed over the BPL. The vegetative support layer is comprised of onsite compost mixed with reclaimed sand and offsite topsoil as necessary for the purposes of vegetative support.

The vegetative support layer was seeded with a mixture of Canary Grass, Smooth Brome, Birdsfoot Trefoil, and clovers on the sideslopes. The areas around the walking path and the top mound area inside the walking path was seeded with a mixture of Ryegrass, Creeping Red Fescue, Windward Chewings and Alice White Clover (see Appendix B).

2.3 STORMWATER MANAGEMENT SYSTEM

As part of the closure project, a system of controls was constructed to handle stormwater. The system was designed for the 25-year, 24-hour storm event and to retain and infiltrate water on-site without the need for an off-site discharge point. The components of the proposed system include the following:

- Youngs Avenue Pipe Storm System
- Open Channels
- Drainage Swales
- Cap Drains
- Pipe Downchutes and manholes
- Infiltration Basins
- Culverts

2.3.1 Youngs Avenue Pipe Storm System

A pipe storm drain system is installed along Youngs Avenue. The storm drain collects and conveys water from the northern portion of the landfill and Youngs Avenue to Basin No. 3. The system includes four rectangular drainage structures and a culvert entrance connected by 18-inch reinforced concrete pipe (RCP). Water is conveyed to Basin No. 3. The system is sized to handle the 25-year peak stormwater flow rates.

2.3.2 Open Channels

There are three main open channels, the East Access Road Channel, South perimeter berm access road channel and the Main Access Road Channel. Each has a trapezoidal cross-section with an 8-ft wide bottom. The channels convey water to Basin No. 1. The channel lining is either grassed, turf reinforcement mat or rip rap based on slope and location.

The bench channel at the landfill bench is also trapezoidal in section. The channel is located adjacent to the landfill walking path and has inlets to convey water into the downchutes.

Two smaller V-shaped channels were installed along either side of the west side access road. The lower west channel was installed at the western edge of the cap limits south of the west side access road. The west side access roads drain stormwater via a channel to the Basin 3 or via the lower west downchute to an existing stormwater pond.

2.3.3 Drainage Swales

Drainage swales were installed within the landfill cap area and conduct surface water into the downchute inlets. The drainage swales are lined with geomembrane and a 4-inch diameter slotted pipe covered by topsoil and permanent turf reinforcement mat.

2.3.4 Cap Drains

As previously mentioned, cap drains were installed within the BPL to prevent the build-up of excess pore pressures. The cap drains consist of 6-inch diameter corrugated, slotted polyethylene collection pipes. The cap drains discharge stormwater into the open channels or at the edge of cap limits.

2.3.5 Pipe Downchutes and Manholes

To minimize the potential for erosion on the steep landfill sideslopes, pipe downchutes and diversion swales were installed within the capped area. The downchutes consist of 24-inch HDPE pipes buried above the cap geomembrane. The downchutes are connected to the diversion swales and bench channels via pipe culverts.

Each downchute outlet has energy dissipation and erosion protection. Downchutes 1 and 2 have rock outlet protection (i.e., a rip-rap apron) and discharge directly into Basin No. 1. Downchutes 3 and 4, which discharge to the East Access Road Channel, and Downchute 5, which discharges in the Main Access Road Channel, are constructed with stilling wells.

2.3.6 Infiltration Basins

The system includes three infiltration basins to retain stormwater and eliminate the need for an off-site discharge point. Each infiltration basin has been designed to infiltrate and retain the 100-yr, 24-hr storm.

2.3.7 Culverts

There are three culverts proposed for the landfill, which include:

- 18-inch RCP under the East Side Access Road
- 24-inch RCP conveying water from the West Channel to Basin No. 1
- 3-ft RCP conveying water from the East Channel to Basin No. 1.

Each is adequate to handle the anticipated 25-year peak stormwater flow rates.

2.4 LANDFILL GAS MONITORING SYSTEM

2.4.1 Landfill Gas Vents

During cap construction, twenty-six (26) gas venting pipes with risers were installed. The gas vent pipes were constructed of 6-inch diameter schedule 40 PVC pipe. Solid PVC pipe was installed through the landfill cover materials, with perforated PVC pipe installed into the refuse. A riser extends a minimum of 3 feet above the final elevation of the cover and a gooseneck with screen was installed.

2.4.2 Horizontal Gas Vent Trench

During cap construction, a perimeter venting system was installed along the southeast perimeter of the landfill. The southeast boundary area was considered to have a low but potential pathway for gas migration. A housing development is located east and the south of the east property line. The perimeter gas system provides for venting of any subsurface gas laterally transmitted beyond the landfill limits in this area.

The collectors were installed at the outside toe of slope of the east valley created by the reclamation activities along access road prior to filling the east valley with reclaimed sand. Two levels of horizontal collectors were installed. The first collector was installed at approximate Elevation 25 to avoid high groundwater. The second collector was installed up the existing outer sideslope halfway between elevation 25 and the final grade.

The horizontal collector is constructed of 6-inch perforated, corrugated HDPE pipe installed in a 2-foot by 2-foot stone filled trench. The perforated pipe transitions to solid pipe and elbows up the existing slope until the pipe daylights at a 6-inch PVC riser pipe with gooseneck. The lower and upper horizontal collectors have separate solid pipe and risers. Risers to be monitored are labeled GT-1 through GT-6 as shown on Drawing No. 1 in Appendix D.

2.4.3 Perimeter Gas Monitoring Probes

Six (6) landfill gas monitoring probes were installed along the east property line and one on the north side along Youngs Avenue (see Drawing No. 1 in Appendix D). Gas monitoring probes were constructed of 2-inch schedule 40 PVC pipe in an 8-inch borehole. The monitoring probes were drilled to groundwater. The perforated portion of the probe starts 8 feet below grade to approximately 2 feet above groundwater. The probe is enclosed in a steel well casing with a

hinged lockable lid and surrounded by a concrete housekeeping pad. Drilling and installation logs for the LFG probes are provided in Appendix C.

2.5 ANCILLARY SYSTEMS

The ancillary systems have been installed to provide access to and security for the Landfill. Ancillary systems present at the Site include roads, fences, gates, and locks. Two main access gates are provided at the north side of the facility along Youngs Avenue. These gates are provided with locks. The remainder of the site is enclosed by a 6-foot chain link fence. The northeast main gate provides public access to a parking area for the passive park as further described below. The public parking area is located on final cap. The northwest gate provides access to the former yard waste operations area.

The main access road travels south from the northeast gate and public parking area, along the west side of the main landfill mound area to the south end of the site and Basin No. 1. A pad type maintenance area is provided at the south end of the main access road at Basin No. 1. This area can be used for materials and equipment storage. There is a south access road at the toe of the south landfill slope and at Basin 1. There is access to Basin 1 via a ramp at the end of the main access road.

A crash gate is installed due south of the public parking area to prevent public access by vehicle to the remainder of the site. The east access road branches off the main access road north of the landfill mound area to provide access to the east property boundary including the groundwater monitoring wells and landfill gas monitoring probes.

The west access road branches off the main access road north or the east access road to provide access to the western portion of the boundary and Basin No. 3. There is another crash gate located at the western end of the west access road, off the landfill cap, to prevent access from the western portion of the site onto the landfill cap. The crash gates are closed and locked at all times.

Access roads within cap limits are constructed of 12-inches of recycled concrete aggregate over barrier protection material. Steep portions of the main access road and east access road also have confinement reinforcement installed.

2.6 PLANNED USES

6 NYCRR 360.2.15(k)(viii) requires a description of the planned uses of the Landfill.

2.6.1 Present Uses

The Town intends to use the capped portion of the landfill as a passive park. A paved parking area is provided at the north side of the facility off Youngs Avenue. There are approximately 1.3 miles of paved walking paths forming two loops around the landfill. The lower loop travels around a bench mid-slope of the landfill on the east side and along the main landfill access road on the west side. The upper loop travels around the upper plateau of the landfill offering scenic

views of the surrounding landscape. An overall drawing of the facility is provided in Drawing No. 1 in Appendix D.

The use of the facility as a passive park will not disturb the integrity of the final cover, liners or other components of the containment system or the function of the monitoring or environmental control systems.

2.6.2 Future Uses

The Town may expand recreational use of the capped area in the future in flat areas. If this is planned, the Town will submit such plans for NYSDEC approval to include provisions for cap protection at that time.

2.7 RELATED DOCUMENTS

The following documents were utilized for the preparation of this document.

- Reclamation Feasibility Study, Phases I & II, Young & Young, May 1996.
- Hydrogeologic Investigation Report, Young & Young, December 1998.
- Draft Closure Investigation Report, Young & Young, May 1999.
- Landfill Reclamation Field Investigation Report, Young & Young, March 29, 2000.
- Question 1 – Landfill Volume Reclaimed, FPM Group, July 2006.
- Question 2 – Remaining Landfill Volume, FPM Group, July 2006.
- Closure Plan and Engineering Report, SCS Engineers, September 2007.
- Construction Quality Assurance Plan, SCS Engineers, September 2007.
- Landfill Closure Project Specifications and Construction Drawings 1 through 24, SCS Engineers, November 2007 (Closure Documents).

Additional information for the actual products used during construction and the final survey record drawing can be found in the Landfill Closure Construction Quality Assurance Certification Report, prepared by SCS Engineers of New York, PC dated April 2010.

2.8 CONTACTS

In accordance with the requirement of 6 NYCRR 360-2.15(k)(7)(vi), the name address and telephone number of the office to contact on post-closure monitoring and maintenance concerns during post closure is:

Town Engineer
Town of Riverhead, Engineering Department
200 Howell Avenue
Riverhead, New York 11901
631-727-3200x279
Fax 631-466-0866

Additional emergency telephone number as follows:

EMERGENCY TELEPHONE NUMBERS

Location	Phone No.
NYSDEC: Environmental Spills Unit	(800) 457-7363
NYSDEC Hazardous Waste Unit	(631) 444-0240
NYSDEC, Division of Solid Waste and Hazardous Materials Carl E. Fritz, Environmental Engineer II	(631) 444-0395
Poison Control Center	(516) 542-2323
Suffolk County Department of Health	(631) 853-3000
Suffolk County Emergency Control Center (fire, explosion, medical emergency)	(631) 852-4851
Community General Hospital Peconic Bay Medical Center Ambulance	(631) 548-6000 911
Fire Department	911
Police Department	911

TOWN OF RIVERHEAD EMERGENCY COORDINATORS

Ken Testa, Town Engineer	Office: 631-727-3200 ext. 279 Cell: 631-466-0866
Town Highway Department	631- 727-3200 ext. 228

2.9 RESOURCE REQUIREMENTS

In accordance with 6 NYCRR 360-2.15(k)(7)(iv), a description of the minimum personnel qualifications and number, and equipment needs are required. The Town will perform some requirements of this Plan with Town personnel and contract with a consultant(s) or others to provide portions of the work required.

2.9.1 Groundwater Monitoring

The Town will contract with a consultant for the groundwater monitoring. A technician trained in water quality sampling techniques must be employed to collect all groundwater and surface water samples and in accordance with standard operating procedures. A qualified laboratory has been contracted to analyze all samples and provide results. The results must be statistically analyzed for reporting to the NYSDEC, Region 1 office.

Equipment must be provided in accordance with standard water quality sampling techniques.

2.9.2 Landfill Gas Monitoring

The Town will contract with a consultant for landfill gas (LFG) monitoring. A technician trained in LFG monitoring and sampling must be employed to perform the LFG monitoring at the site. Technician must be trained in use of applicable equipment and in accordance with standard monitoring techniques.

SCS recommends use of a GEM 500 or 2000 gas analyzer to monitor for LFG in the perimeter probes, vents and horizontal collectors.

2.9.3 Other Maintenance Activities

Site inspections and any weeding, tree removal, erosion repair and other ‘non-laboratory’ maintenance and inspection will be performed by Town of Riverhead Engineering and/or Sanitation Department personnel. Mowing equipment and personnel will be required to meet the vegetation maintenance requirements described in Section 4. The Town will perform mowing of the landfill. Site inspectors will be required to perform inspections of the cap area in accordance with this Plan. Town personnel will perform other maintenance activities such as road and walking path repairs, barrier protection layer and topsoil replacement, vegetation and seeding repairs; cleaning of silt in basins or culverts; erosion repair, etc.

2.10 PLAN COMPONENTS

This PCMMO Manual satisfies the requirements of 6NYCRR 360-2.15(k)(7) under the corresponding report sections listed below.

6 NYCRR 360-2.15(k)(7)(ii): Section 3 – Environmental Controls Systems Monitoring

6 NYCRR 360-2.15(k)(7)(iii): Section 4 – Facility Maintenance Activities

6 NYCRR 360-2.15(k)(7)(iv): Section 2.5 – Resource Requirements

6 NYCRR 360-2.15(k)(7)(v): Section 5 – Contingency Plan

6 NYCRR 360-2.15(k)(7)(vi): Section 2.4 – Contacts

6 NYCRR 360-2.15(k)(7)(vii): Provided under separate cover by the Town.

6 NYCRR 360-2.15(k)(7)(viii): Section 2.2-Planned Use

3 MONITORING PLAN

The Monitoring Plan describes the measures for evaluating the performance and effectiveness of the environmental control systems at the closed Youngs Avenue Landfill. The environmental control systems include:

- Landfill Cover System.
- Stormwater Management System.
- Landfill Gas Monitoring System.
- Ancillary Systems.
- Groundwater Monitoring System.

Maintenance and repair activities are discussed in Section 4 or the Contingency Plan in Section 6.

3.1 LANDFILL COVER SYSTEM MONITORING

The Landfill Cover System has been installed to minimize surface infiltration of precipitation as described in Section 2.2

3.1.1 Summary of Landfill Cover System Monitoring Requirements

For monitoring, inspection, and maintenance purposes, the Landfill Cover System has been divided into the following items:

- Grass cover/topsoil layer; and
- Cover soil and geosynthetic cap components

Quarterly monitoring and inspection of landfill cover system is required for the first 5 years. The inspection frequency for years 6 through 30 is subject to reassessment.

The Landfill Cover System will also be inspected after each major rainfall event (i.e., 5-yr storm or 4.5 inches in 24 hours or larger). Inspections should be conducted by walking the Site and recording observations made, including (as applicable) observations related to items below:

Table 3.1. Landfill Cover System Inspection Conditions

Inspection Item	Not Satisfactory (NS) Condition
Vegetative growth	Bare spots, dead species, undesirable species. Investigate potential cause such as landfill gas migration, leachate, erosion, burrowing animals.
Woody vegetation	Greater than 1-inch in diameter
Evidence of erosion,	Erosion rills or gullies, sediment
Surface cracks	Presence or irregularities in cover system
Settlement and/or ponding	Ponded water or depressed cover soils
Slope stability	Bulging soil or cracks parallel to the slope
Animal burrows	Presence

Vandalism	Presence, unauthorized dumping, unauthorized vehicular tracks or disturbed cover soil.
Seepage	Liquids leaking from cover soils
Cap drains	Crushed, obstruction, erosion

See Section 4.1 for repairs, if needed. More comprehensive inspections will be conducted during periods when the grass is below a height of approximately 18 inches.

The grass cover/topsoil layer, and cover soil and cap components will be visually inspected using the Inspection Checklist Form FCS-1 in Appendix D. A description of deficiencies and problems will be provided on the Inspection Checklist Form DP-1 in Appendix D.

3.2 STORMWATER MANAGEMENT SYSTEM MONITORING

The Stormwater Management System has been installed to convey surface water off the landfill cap into the stormwater basins and is described Section 2.3.

3.2.1 Summary of Stormwater Management System Monitoring Requirements

Quarterly monitoring and inspection of stormwater management system is required for the first 5 years. The inspection frequency for years 6 through 30 is subject to reassessment.

The Stormwater Management System will also be inspected after each major rainfall event (i.e., 5-year storm or 4.5 inches in 24 hours or larger). A visual inspection of the complete system will be conducted during the monitoring events. Stormwater Management System components to be monitored include, but are not limited to, the following:

- Basins 1, 2 and 3
- Downchutes including inlet and outlet structures
- Downchute manholes
- Youngs Avenue pipe storm system.
- Open channels at roads
- Concrete inlet/outlet structures
- Lower west channel and downchute
- Diversion swales
- Cap drains

The stormwater management system will be inspected for the following:

Table 3.2. Stormwater Management System Inspection Conditions

Inspection Item	Not Satisfactory (NS) Condition
Silt accumulation	Presence
Erosion/Stability	Slope erosion rills or gullies, bulging soil or cracks parallel to the slope
Evidence of debris and/or obstructions	Presence of debris, blockages

Vegetation	Bare spots, dead species, undesirable species in vegetated channels. Overgrowth in other areas.
Connection of pipe	Leaking, broken connections
Blockages in pipes	Presence
Channel lining	Integrity, degradation, overgrowth
Standing water	Presence
Settlement	Ponded water or depressed areas
Cover grates	Broken, rust, deterioration
Vandalism	Presence, unauthorized dumping, unauthorized vehicular tracks or disturbed cover soil.
Cap Drains	Crushed, obstruction, erosion

The elements of the Stormwater Management System will be visually inspected using Inspection Checklist Forms SMS-1, SMS-2, SMS-3, SMS-4 and SMS-5 in Appendix D. A description of deficiencies and problems will be provided on the Inspection Checklist Form DP-1 in Appendix D.

3.3 LANDFILL GAS MONITORING SYSTEM

As previously mentioned in Section 2.4, 26 gas venting pipes with risers were installed within the landfill cap footprint, six horizontal vent trenches were installed along the southeast landfill boundary, and six (6) landfill gas monitoring probes were installed along the east property line and one on the north side along Youngs Avenue (see Drawing No. 1 in Appendix D).

3.3.1 Summary of Previous Landfill Gas Monitoring Results

As part of the Closure site investigation, Section 360-2.15(a)(2), an explosive gas investigation was performed to determine whether the site meets the requirements of subdivision 360-2.17(f). This investigation was performed in June 1994 as part of the Closure Investigation and the results were presented in the Draft Closure Investigation Report prepared by Young & Young, dated May 1999. The report summarized that if the landfill is capped with a low permeable barrier, the methane gas will flow in a lateral direction and there may be potential for off-site migration. The levels of methane recorded along the east boundary and south boundary indicate a potential for gas migration. The report concluded that the existing and potential release of contaminants is controllable and impacts are considered not significant. These migration concerns are addressed by the installation of landfill gas (LFG) perimeter probes as previously described.

3.3.2 Summary of Landfill Gas Monitoring Requirements

Quarterly inspection of the landfill gas monitoring system is required for the first 5 years. The inspection frequency for years 6 through 30 is subject to reassessment. A visual inspection of the complete system will be conducted during the monitoring events. The Landfill Gas Monitoring System components to be inspected include, but are not limited to, the following:

Table 3.3. Landfill Gas Monitoring System Inspection Conditions

Inspection Item	Not Satisfactory (NS) Condition
Damage/vandalism	Presence of unauthorized vehicular tracks or broken risers.
Settlement	Ponded water or depressed areas around riser
Accessibility	Height, overgrown vegetation
Stressed Vegetation	Investigate potential cause such as landfill gas migration, leachate, erosion, burrowing animals.

The elements of the Landfill Gas Monitoring System will be visually inspected using Inspection Checklist Forms LFG-1 and LFG-2 in Appendix D. A description of deficiencies and problems will be provided on the Inspection Checklist Form DP-1 in Appendix D.

The perimeter monitoring probes will be monitored for the presence of landfill gas migration. A portable combustible gas meter will be used to monitor for methane in the LFG. Five percent methane concentration indicates 100 percent of the lower explosive limit (LEL). If landfill gases are present in the perimeter probes or the horizontal collectors at concentrations exceeding 25 percent of the LEL (1.25 percent methane) procedures outlined in the Contingency Plan will be implemented.

Monitoring of the perimeter probes will be performed by connecting a portable combustible gas meter (GEM 500, et al) to the quick connect fitting located at the top of the PVC pipe. The monitoring will focus on obtaining data to include: static pressure, and LFG gas composition (CH₄, CO₂, O₂, and balance gas). The monitoring data shall be recorded on LFG Data Form in Appendix E.

3.4 ANCILLARY SYSTEM MONITORING

The ancillary systems provide access and security to the site. The ancillary systems include fences, gates, locks, roads and walking paths as described in Section 2.5.

3.4.1 Summary of Ancillary System Monitoring Requirements

Quarterly inspection of the ancillary system is required for the first 5 years. The inspection frequency for years 6 through 30 is subject to reassessment. A visual inspection of the complete system will be conducted during the quarterly monitoring event. Ancillary systems components to be monitored include, but are not limited to, the following:

- Roads.
- Fences.
- Guiderails.
- Walking Bridge System.
- Gates.
- Locks.

The ancillary systems will be inspected for the following:

Table 3.4. Ancillary System Inspection Conditions

Inspection Item	Not Satisfactory (NS) Condition
Condition of Asphalt/Gravel	Presence of potholes, cracking, erosion or undermining
Rutting, washouts	Presence
Guiderails, gates, bollard	Rotted, broken, uneven settlement, broken locks
Depressions/Settlement	Presence of ponded water or depressed areas
Chain link fence	Vandalism, broken, cut or knocked down
Walking bridge system	Vandalism, broken, rotted or erosion

A complete list of components to be checked is provided in the Inspection Checklist (Form AS-1 and AS-2), presented in Appendix D. A description of deficiencies and problems will be provided on the Inspection Checklist Form DP-1 in Appendix D.

3.5 GROUNDWATER MONITORING SYSTEM

The Riverhead Landfill has an existing groundwater monitoring system in place, which consists of five pairs of wells. Four of the well pairs were installed by the Suffolk County Department of Health Services (SCDHS) in 1982. The fifth pair was installed in 1998. The original four pairs each included a shallow well (70-80 feet below grade) and a deep well (270-300 feet below grade). The fifth pair of wells consists of a shallow well that is 40 feet below grade and a deep well that is 85 feet below grade. The nested well pairs are identified as follows (see Figure 3.1):

Table 3.5 Groundwater Sampling Points

Shallow	Deep	Year Installed
S-51576	S-73357	1974
S-73271	S-73270	1982/2009
S-73507	S-73432	1982
S-73509	S-73508	1982
S-112833	S-112834	1998

During cap construction well S73270, the deep well, was reinstalled. Documentation, drilling logs and completion reports for selected wells are provided in Appendix F.

3.5.1 Summary of Previous Groundwater Monitoring Results

According to the Draft Closure Investigation Report (CIR), prepared by Young & Young, dated May 1999, the Suffolk County Department of Health Services (SCDHS) conducted a leachate impact study between 1982 and 1987. This study indicated that a plume of "light to moderate" strength was moving to the north (down gradient) from the landfill.

In June 1992, the NYSDEC sampled three shallow and one deep monitoring well down gradient of the landfill. All of the wells were sampled for purgeable organics with concentrations below the method detection limits.

The NYSDEC sampled the nested well pair at the landfill (S-73270(D) and S-73271(S)) in 1993. The purgeable organics concentrations were below method detection limits.

Baseline groundwater sampling was conducted in 1994 and in 1998. The draft CIR concludes that the surface and groundwater sample analyses do not indicate a potential for significant threat to public health or the environment. With the exception of deep monitoring well S-73270, no contraventions to state or federal drinking water maximum contaminant levels are indicated. The metal concentrations measured in the deep monitoring well likely resulted from galvanic corrosion of the well casing and not landfill leachate. S-73270 is the only galvanized steel well casing in the monitoring well network.

The draft CIR also concludes that the data warrants waiver of further baseline and routine monitoring as provided in footnote (2) on Page 9 of the Technical Requirements set forth in the Stipulation of Settlement and recommends post-closure monitoring at the nested well pairs listed in Table 3.5 above.

3.5.2 Summary of Groundwater Monitoring Requirements

The two onsite well clusters will be monitored and sampled per the requirements below. These well clusters include:

- S-73270
- S-73271
- S-112833
- S-112834

Quarterly inspection of the groundwater monitoring system is required for the first 5 years. The inspection frequency for years 6 through 30 is subject to reassessment. A visual inspection of the complete system will be conducted during the monitoring events. A visual inspection of the complete system will be conducted during the monitoring events. The Groundwater Monitoring System components to be monitored include, but are not limited to, the following:

Table 3.6. Groundwater Monitoring System Inspection Conditions

Inspection Item	Not Satisfactory (NS) Condition
Damage/vandalism	Presence of unauthorized vehicular tracks or broken risers.
Settlement	Ponded water or depressed areas around riser
Accessibility	Height, overgrown vegetation
Stressed Vegetation	Investigate potential cause such as landfill gas migration, leachate, erosion, burrowing animals.

The elements of the Groundwater Monitoring System will be visually inspected using Inspection Checklist Forms GMS-1 in Appendix D. A description of deficiencies and problems will be provided on the Inspection Checklist Form DP-1 in Appendix D.

Groundwater samples will be collected on an annual basis for analysis of the Water Quality Analysis Tables Baseline Parameters listed in 6 NYCRR 360-2.11(d)(6) (see Section 3.5.3 for details).

3.5.3 Groundwater Sample Collection

At each sampling location, field personnel will note any conditions present at the sampling location which may be construed as having a potential impact upon the quality of the sample. Such observations may include nearby disturbances around the sampling point, integrity of the well, and ambient weather conditions.

After noting conditions that may affect the quality of the groundwater sample, an accurate water level measurement will be obtained. Measurements will be obtained utilizing a portable electronic water level indicator that has been decontaminated prior to use. The initial water level measurement will be recorded on well data and inspection forms. After recording the water level, the well will be purged of three to five standing well volumes or until evacuation, whichever comes first. The monitoring well will be purged by either bailing or by the use of a submersible pump. The purging methods utilized will be determined by the volume of water necessary to achieve the three to five well volume purges. Bailing is performed using a pre-cleaned Teflon or disposable bailer suspended from a new rope. The bailer is placed gently into the water column to avoid any unnecessary agitation. For monitoring wells that require the removal of greater volumes of purge water, a pre-cleaned, lubricant-free, submersible pump with polyethylene discharge tubing will be utilized. The pump will be adjusted so that the rate of pumping will minimize the drawdown in the well. Wells that are evacuated will be considered as purged. All wells will be allowed to fully recover prior to sampling.

Collection of groundwater samples will be with pre-cleaned or disposable Teflon bailers or other approved sampling devices (i.e., PVC or stainless steel sampling devices, including submersible pumps). Sampling equipment utilized will be constructed of inert materials designed to obtain samples with the minimum possible agitation.

After completion of purging and recharge, volatile organic samples will be collected on the same day the monitoring well has been purged. Volatile organics are required for baseline and expanded sampling events.

Following the volatile organic sampling, the parameter sampling order will be as follows: field measurements (including appearance) followed by the collection of unfiltered then filtered metals. The remaining parameters will then be collected.

Field measurements will include specific conductance, Eh, Ph, turbidity, and temperature. In addition, appearance will be included as part of field measurements. Appearance will include any unusual conditions such as color, odor, surface sheen, etc. All field measurements will be taken after the necessary instruments have been calibrated, according to the manufacturer's specification. Obtained measurements will be compared to previous sampling events to insure that measurements are within their normal range. Several rounds of sampling may be necessary to establish a normal range of measurements. Precision standards for measurements taken in the field are defined as follows: consecutive pH readings should agree within plus or minus 0.2 pH

units, specific conductance measurements should be within 2 percent of each other, and temperature readings should be within 1 degree Celsius of each other. Measurements found to be outside their normal range will be re-measured and noted on the well data field inspection forms.

3.5.4 Field Analytical Quality Assurance / Analytical Quality Control

Pre-cleaned laboratory supplied sample containers and decontaminated or pre-cleaned / disposable sample equipment and measuring instruments will be used. Field quality control samples will include equipment blanks, trip blanks, and field duplicates, when necessary.

When sampling requires analysis of volatile organics, one trip blank per day will be analyzed. Laboratory analysis of the trip blank will determine if any volatile organic contamination has occurred to the sample containers during transport. Trip blanks are 40-milliliters vials of organic-free water which are shipped to the site, and then back to the lab, along with the samples. The trip blanks remain unopened at all times. Trip blanks are not required under 6 NYCRR Part 360 during routine sampling events, but are required for annual baseline and contingency monitoring events.

Equipment blanks or rinsates will be used to determine if “other” sources may be contributing to sample contamination. Other sources of contamination may include preservatives, airborne contaminants, the sample containers themselves, improper decontamination procedures, or poor sampling practices. Equipment blank is created by pouring de-ionized water into or over the sampling equipment and into a sample bottle.

Field duplicates will be collected and analyzed at a frequency of 1 field duplicate per 20 samples. The duplicate is a second sample from a sample location, which is analyzed under a different identification. A comparison of the field sample and its duplicate determines the reproducibility of the analytical technique.

3.5.5 Sample Preservation and Transportation

Since multiple analyses will be performed, different types of containers and preservatives will be required. Multiple, pre-labeled containers containing any necessary preservatives, will be supplied by the laboratory for each sampling point. Immediately after sample collection, sample bottles will be placed in insulated coolers with ice and/or ice packs. Appropriate chain of custody forms will be signed and included with the sample shipment. The chain of custody forms will also include sample identification, sample date and time, and requested analyses. Sample coolers will be sealed, and delivered to the lab by overnight courier within 24 hours of collection. Upon receipt of the sample coolers, the date, time and temperature of the sample will be noted, as will the integrity of the sample cooler.

3.5.6 Corrective Measures

In the event that it is determined that an operating procedure is compromising the identification and / or quantification of an analyte or analytes in groundwater, surface water, or gas, corrective actions will be taken to restore the accuracy of the analyte or analytes. Compromising

procedures identified will be brought to the attention of the NYSDEC as will the proposal for corrective action.

3.5.7 Sample Analysis

Groundwater samples will be analyzed for the Water Quality Analysis Tables Baseline Parameters listed in 6 NYCRR 360-2.11(d)(6).

3.6 SURFACE WATER SYSTEM MONITORING

3.6.1 Summary of Previous Surface Water Monitoring Results

During the 1994 investigations discussed above, two surface water bodies were sampled. The north pond had been a stormwater control basin for Youngs Avenue and has since been eliminated. The south pond is part of a freshwater wetlands system (see Figure 3.1). Sampling of the south pond in 1994 showed relatively high hardness and low alkalinity, which is created by the dissolution of the calcium and magnesium compounds of sulfate, chloride and silicate. These compounds are typically present in the natural groundwaters of Long Island. Toxic metals and purgeable organic compounds were below detection limits in the samples from the south pond.

3.6.2 Summary of Surface Water Monitoring Requirements

The south pond (i.e., the pond/wetland outside the landfill site south boundary) is upgradient from the landfill and there is no surface water drainage that is conveyed to the south pond from landfill site. Therefore, based on the site configuration and the results of previous surface water sampling surface water sampling of the south pond will not be performed.

If the lower west pond is not filled in by the Town, it will be sampled annually 6 inches below the water surface and analyzed for the Water Quality Analysis Tables Baseline Parameters listed in 6 NYCRR 360-2.11(d)(6).

If standing water is present in the three stormwater infiltration basins during the annual sampling event of the lower west pond, the basins will also be sampled 6 inches below the water surface and analyzed for the Water Quality Analysis Tables Baseline Parameters listed in 6 NYCRR 360-2.11(d)(6).

3.6 MONITORING SCHEDULE

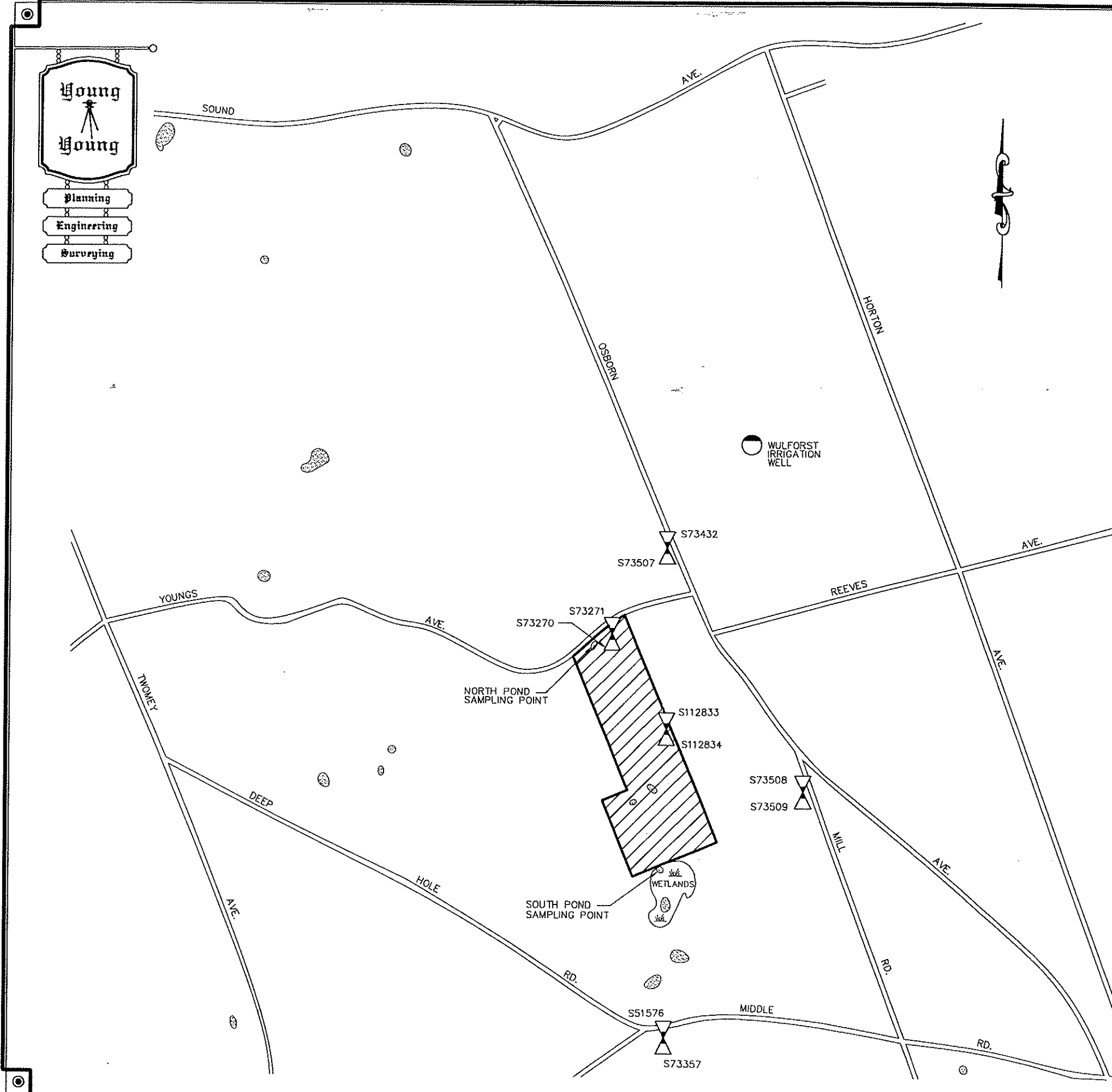
Table 3.7 provides the initial inspection and monitoring schedule for the Landfill. The frequency of sampling is per a letter prepared by FPM, dated September 27, 2006 (see Appendix G). For groundwater sampling and analysis frequency, sampling will be reevaluated after year 5. The LFG probe sampling will be reevaluated after year 1.

Table 3.7. Landfill Monitoring and Inspection Schedule

Inspection Activity	Schedule	Comments
Landfill Cover System	Quarterly, After major rain events	For first five years (2010 through 2014)
Stormwater Management System	Quarterly, After major rain events	For first five years (2010 through 2014)
Landfill Gas Monitoring System	Quarterly	For first five years (2010 through 2014)
Ancillary Systems	Quarterly	For first five years (2010 through 2014)
Groundwater Monitoring System	Quarterly	For first five years (2010 through 2014)
Monitoring/Sampling Activities	Schedule	Comments
Groundwater Baseline Sampling and Analysis	Once a year	For first five years (2010 through 2014)
Surface Water Baseline Sampling and Analysis	Once a year	For first five years (2010 through 2014)
LFG Probe Monitoring	Quarterly	For first year (Jan 2010 through Dec 2010)



Planning
Engineering
Surveying



Young & Young, Land Surveyors
400 Ostrander Avenue, Riverhead, New York 11901
516-727-2303

Alden W. Young, P.E. & L.S. (1908-1994)
Howard W. Young, Land Surveyor
Thomas C. Wolpert, Professional Engineer
Kenneth F. Abruzzo, Land Surveyor
John Schnurr, Land Surveyor

MONITORING WELL	DATES LAST SAMPLED
S51576(S)	JUNE 1994, OCT. 1998
S73357(D)	JUNE 1994, OCT. 1998
S73271(S)	JUNE 1994, OCT. 1998
S73270(D)	JUNE 1994, *
S73507(S)	JUNE 1994, OCT. 1998
S73432(D)	JUNE 1994, OCT. 1998
S73509(S)	JUNE 1994, OCT. 1998
S73508(D)	JUNE 1994, NOV. 1998
NORTH POND	JUNE 1994
SOUTH POND	JUNE 1994, OCT. 1998
WULFORST IRRIGATION WELL	JUNE 1994, OCT. 1998
S112833(S)**	OCT. 1998
S112834(D)**	OCT. 1998

* PROBLEM WELL, OCT. 1998
** WELL INSTALLED, SEPT. 1998

PLAN OF GROUNDWATER SAMPLING POINTS
PREPARED FOR YOUNGS AVENUE
LANDFILL CAPPING & CLOSURE PROJECT
TOWN OF RIVERHEAD

At: BAITING HOLLOW Town of: RIVERHEAD
Suffolk County, New York

Suff. Co. Tax Map:	600	80	2	6.1
	District	Section	Block	Lot

Figure 3.1

DATE : DEC. 2, 1998
SCALE : 1"=1200'
JOB NO. : 98-0286
SHEET NO. : 1 OF 1
(980286LOC.DWG)

THE LOCATION OF WELLS (W), SEPTIC TANKS (ST), OR OTHER STRUCTURES HEREON ARE FROM FIELD OBSERVATIONS AND OR DATA OBTAINED FROM OTHERS.
CERTIFICATION INDICATED HEREON SHALL RUN ONLY TO THE PERSON FOR WHOM THE SURVEY IS PREPARED AND ON HIS BEHALF TO THE TITLE COMPANY, GOVERNMENTAL AGENCY AND LENDING INSTITUTION LISTED HEREON, AND TO THE ASSIGNEES OF THE LENDING INSTITUTION. CERTIFICATIONS ARE NOT TRANSFERABLE TO ADDITIONAL INSTITUTIONS OR SUBSEQUENT OWNERS.
COPIES OF THIS SURVEY MAP NOT BEARING THE LAND SURVEYOR'S INKED SEAL OR EMBOSSED SEAL SHALL NOT BE CONSIDERED TO BE A VALID TRUE COPY.
UNAUTHORIZED ALTERATION OR ADDITION TO THIS SURVEY IS A VIOLATION OF SECTION 7209 OF THE NEW YORK STATE EDUCATION LAW.

4 FACILITY MAINTENANCE ACTIVITIES

Pursuant to 6 NYCRR 360-2.15(k)(iii), all facility maintenance activities are included herein. We note that maintenance activities are not included for a leachate collection system and an active landfill gas collection and control system since these facilities are not installed at this site.

Quarterly inspections will be performed to assure that hazards or potential hazards are identified and to ensure that the facility is functioning as intended as described in Section 3. Inspections will also be performed after major rain event (5-year storm, approximately 4.5 inches of rainfall per hour). Maintenance activities will largely involve the execution of minor repairs on an as needed basis, but may require that the Contingency Plan (Section 6) be activated.

4.1 LANDFILL COVER SYSTEM

The Landfill Cover System will be inspected on a quarterly basis and after each major rainfall event (i.e., 5-yr storm or 4.5 inches in 24 hours or larger) as described in Section 3.1 of the Monitoring Plan. As a result of the inspections, continued monitoring or repairs should be made to restore the cover system to its original condition as listed in Section 2 and as described below. Corrective actions taken should be noted on Form DP-1.

Minor tree removal and erosion repairs will be performed by Town maintenance personnel. Any significant damage identified during the periodic inspections will be reported to the DEC along with the intended repair method for review and approval by DEC.

If damage to the geosynthetic and underlying soil component is suspected, the affected area shall be exposed to allow for inspection and assessment of damage. After assessment of the damage the area must be stabilized to prevent further damage or erosion. The damage should be repaired as described in the Contingency Plan (Section 6).

4.1.1 Vegetative Growth Maintenance

Reseeding of the cover system shall be performed in accordance with specification Section 02936 (Closure Documents) and the seed or wildflower mix provided in Appendix B, as needed to replace distressed or dead vegetation. If seeding is not possible due to seasonal constraints, hay bales shall be installed above the sparsely vegetated areas to help control erosion.

Mowing of the vegetation will be required to maintain a healthy cover crop. Post-closure cover maintenance will include, but not limited to:

1. **Ten feet on both sides of all roads and walking paths and inside the upper walking path loop** will be mowed when the height exceeds 18 inches in accordance to the vegetation plan and specifications provided in Appendix B.
2. **All other areas of the cap** will be mowed as the height exceeds 18 inches after first frost in early October.

3. **All vegetated areas** will be inspected on an annual basis and woody plants greater than 1 inch in diameter will be removed.
4. **Re-vegetate areas** as needed and clearing of trees and brush at the boundary to limit infringement.
5. **Repair eroded or settled areas** by adding soil and topsoil and then reseeding. Heavy equipment and vehicular traffic should be limited to the access road to prevent damage to the cap.

4.1.2 Erosion

Erosion may indicate that some portion of the stormwater management system is not functioning correctly. If erosion is identified, the stormwater system in the vicinity of the problem area should be inspected. Areas on site which are consistently eroded by drainage will be repaired as follows:

1. Remove accumulated soils downslope of area
2. Add appropriate soils to the eroded area and compact.
3. Reseed.
4. Add hay bales, rip-rap or erosion blankets as appropriate.
5. Remove hay bales after grass has grown to height of 6 inches.

4.1.3 Surface Cracks

Cracks should be investigated for depth and length and orientation with respect to slope. Repair cracks not related to general slope movement by filling with like material, compacting and reseeding area.

4.2.4 Settlement, Ponding

Areas of differential settlement can be anticipated over the maintenance period. Minor areas which do not exhibit ponding or significant movement of the cover soils will be left alone and monitored periodically. Areas of minor ponding will be corrected by adding additional soil materials to promote drainage. Areas of settlement, where significant movement of cover soils or release of landfill gases are evident, may require excavation to examine the condition of the geomembrane. Repairs to the cap will be made where necessary.

4.2.5 Slope Stability

Slope movement is identified as large displacements or cracks in the soil mass. Bulging of the soils at the base of the potential failure may also appear. Further investigations may be warranted to determine the cause of the slope movement. Repair of large displacements is discussed in Section 6.5.

4.2.5 Animal Burrows

The cap will also be inspected for animal burrows or unwanted vectors. If burrow holes are observed, it should be determined if the geosynthetics have been damaged by hand excavation. Replace original soil materials, compact and reseed as necessary.

4.2.6 Vandalism

Vandalism should be reported to the Town and local authorities immediately. Damage should be repaired to original conditions.

4.2.7 Seepage

Hand excavate seepage area to the level of geosynthetics following the seepage path and check integrity of geomembrane. Replace saturated soils with clean soils, hand compact, reseed and install erosion control measures.

4.2 STORMWATER MANAGEMENT SYSTEM

The Stormwater Management System will be inspected on a quarterly basis and after each major rainfall event (i.e., 5-yr storm or 4.5 inches in 24 hours or larger) as described in Section 3.2 of the Monitoring Plan. As a result of the inspections, continued monitoring or repairs should be made to restore the stormwater feature to its original condition as listed in Section 2. Corrective actions taken should be noted on Form DP-1.

The stormwater features shall be maintained free of obstructions, damaged or failed sections will be repaired, and sediment build-up removed.

4.2.1 Maintenance Activities

The following activities should be performed on an annual basis:

- Silt removal from manholes
- Silt removal from basins
- Silt removal from swales or channels
- Silt removal from rip rap at channels and basins
- Mowing, weed removal around stormwater manholes, inlet and outlet structures.

4.3 LANDFILL GAS MONITORING SYSTEM

The Landfill Gas Monitoring System will be inspected on a quarterly basis as described in Section 3.3 of the Monitoring Plan.

4.4 ANCILLARY SYSTEMS

The Ancillary Systems will be inspected on a quarterly basis as described in Section 3.4 of the Monitoring Plan.

As a result of the inspections, repairs should be made on an as needed basis. Corrective actions should be noted on Form DP-1.

The ancillary features shall be maintained free of obstructions, damaged or failed sections will be repaired, and sediment build-up removed.

4.4.1 Maintenance Activities

The following activities should be performed on an annual basis:

- The Town will inspect the paved areas (parking and walkways) on an annual basis. The Town Highway department will perform repairs as necessary to seal cracks and maintain in a safe condition.
- Repair rutting, ponding, cracking, uneven settlement, potholes and damage or the road materials.
- Repair chain link fence, guiderails and gates.

4.5 GROUNDWATER MONITORING SYSTEM

During sampling events, the groundwater monitoring wells should be checked to assure that the locks, risers, caps and housekeeping pads are in good condition. Any evidence of damage or tampering should be reported and repaired.

As a result of the inspections, repairs should be made on an as needed basis.

4.6 MAINTENANCE SCHEDULE

A summary and schedule of all maintenance activities is provided in Table 4.1

Table 4.1 Summary of Maintenance Activities

Activity	Schedule	Comments
Landfill Cover System		
Cover System	Repairs as needed	
Vegetation Mowing		
- Along Walkways and Roads and inside upper loop area	As reaches height of 18 in.	To height of 6 inches
- Mow Entire Landfill Area	As reaches height of 18 in.	After first frost
Stormwater Management System		
Stormwater Features	Repairs as needed	
Silt removal from		
- Manholes	Once a year	
- Basins	Once a year	
- swales or channels	Once a year	
- rip rap at channels and basins	Once a year	
Mowing, weed removal around stormwater manholes, inlet and outlet structures.	Once a year	
Ancillary Systems		
Ancillary Systems	Repairs as needed	
Sealer on Asphalt Roads/Walkways	As needed	
Repair rutting, ponding, cracking, uneven settlement, potholes and damage or the road materials.	Once a year	
Repair guiderails and gates.	Once a year	
Landfill Monitoring System	Repairs as needed	
Groundwater Monitoring System	Repairs as needed	

4.7 FINANCIAL ASSURANCE

Post closure activities are required to have financial assurance mechanisms in place. Post closure activities include the continued maintenance and repair of the landfill cap, drainage and road systems as well as the ongoing environmental monitoring. Post closure activities are required for a 30-year period following closure. Financial assurance mechanisms will be submitted by the Town of Riverhead under separate cover.

5 REPORTING REQUIREMENTS

Quarterly reports of inspection and monitoring results will be submitted to the Town of Riverhead within 30 days of completion of the site visit for review and comment. The quarterly report will be forwarded to the NYSDEC and the annual report will be submitted to the NYSDEC by March 1 for annual data collected the previous calendar year. The initial report will be submitted by March 1, 2011 for data collected in 2010.

6 CONTINGENCY PLAN

6.1 STORMWATER

The stormwater systems are designed to maintain all surface runoff onsite. Should failure of any of onsite stormwater features occur that results in an offsite discharge, the Town Engineer will immediately be contacted and take the following actions. The Town Engineer will also be immediately contacted if there are any major failures of the stormwater features within the site.

Assessment of the Problem

The Town Engineer will identify the problem, determine the potential impact or harm to the environment and the cap system, and evaluate actions to contain the stormwater. It will be determined if additional engineering measures should be applied or if the area should be repaired to original status. Town forces or its contractors will be contacted to make any necessary repairs.

Notification

NYSDEC will be notified if the problem has affected the integrity of the cap system or has a potential impact or harm to the environment.

Mitigation of the Problem

The initial response action will be to stop the offsite discharge by closing off culverts or inlet structures. Structures could be put in place to divert stormwater around the affected device or to dam water from offsite migration or that could damage the cover geosynthetics.

Termination and Follow-up Activities

The Town Engineer will determine when the emergency is over and the stormwater system operations have returned to normal. The Town Engineer will confirm that the problem has been remedied. If the NYSDEC had been notified, the Town Engineer will notify them that stormwater operations have returned to normal.

6.2 EROSION CONTROL

Erosion of the cap soils, around stormwater collection devices, and at transitions between materials (e.g., soil to RCA at road edges) are a significant issue, if erosion causes exposure of the geomembrane liner, the runoff is no longer directed into the stormwater device or undermining of materials occurs. The Town Engineer will immediately be contacted and take the following actions.

Assessment of the Problem

The Town Engineer will assess the location of the exposed liner, the status of stormwater device and the transition area. The exposed geomembrane will be inspected for damage and the surrounding stormwater controls will be inspected for damage and effectiveness. It will be

determined if additional engineering measures should be applied or if the area should be repaired to original status. Town forces or its contractors will be contacted to make any necessary repairs.

Notification

NYSDEC will be notified if the problem has affected the integrity of the cap system and if repairs need to be made to the geomembrane that require oversight.

Mitigation of the Problem

The initial response action will be to stop future erosion in areas around the exposed membrane. Erosion control measures will be implemented such as hay bales or diversion berms. Care will be used to protect the geomembrane with staked erosion control materials. The area will be restored to original grade according to the procedures described for the construction of the cap system. The area will be reseeded and fertilized and erosion control blankets installed. Periodic visits will be made to ensure growth of vegetation and that no further erosion has occurred.

Termination and Follow-up Activities

The Town Engineer will determine when the emergency is over and area is no longer susceptible to erosion. The Town Engineer will confirm that the problem has been remedied. If the NYSDEC had been notified, the Town Engineer will notify them that operations have returned to normal.

6.3 DIFFERENTIAL SETTLEMENT

Settlement and subsidence will be monitored on a quarterly basis. Settlement that occurs will be assessed immediately upon discovery and will be evaluated for its effect on the overall drainage of the storm water from the capped landfill. The need for cover repairs due to subsidence or settlement will be dependent upon whether the function of the cap has been impaired. Those areas where the integrity has been impaired will be restored to ensure the overall functionality of the cap is maintained.

6.4 GEOSYNTHETIC REPAIRS

Damage to geomembrane layer or other cover materials must be repaired immediately. Repairs to the geosynthetics must be made in accordance with the Closure Document Specifications for geomembrane repair. The Town will coordinate repairs with the DEC to assure they completed properly and to allow inspection of the work. Repairs to the geosynthetics, gas vents, cap drains, stormwater structures, underlying soils and barrier protection soils on the side slopes will be performed by a contractor that has significant landfill construction experience and that is acceptable to the DEC. All repairs will be performed under the direction and supervision of a Professional Engineer. All repairs will inspected, documented and photographed and completed repair report will be submitted to the DEC by the Professional Engineer.

6.5 SLOPE STABILITY

Reclaimed sand was used as the barrier protection layer of the landfill cap. The permeability of the reclaimed sand was variable over the course of the project resulting in the potential for perched liquid in the barrier sand above the geomembrane. Large displacements should be repaired by the installation of additional cap drains. The additional cap drains promote drainage within the barrier layer. The installation of cap drains will be performed by a contractor with significant landfill construction experience and under the supervision of a Professional Engineer. The additional caps shall be installed in accordance with the Contract Documents and as follows:

1. Carefully excavate and remove existing saturated barrier protection material so as to not disturb or damage the geomembrane.
2. Install new 6-inch diameter, corrugated exterior, smooth interior slotted HDPE pipe wrapped in 3 ounce fabric.
3. Backfill with dry, native sand material, not the reclaimed sand removed from the saturated trench.
4. Minimum slope of cap drains on steep slopes in 5 percent.
5. Tie-in slotted cap drain with existing solid pipe sections for drainage to existing stormwater features or install new solid pipe section to a depth of approximately 1 foot below grade.
6. Cap drain installation will inspected, documented and photographed and completed will be submitted to the DEC by the Professional Engineer.

6.6 FIRES

It is unlikely that a fire within the landfill mass would occur. Brush fires may occur in extremely dry weather conditions. As a preventative measure to fires, the Town will:

1. Provide fire extinguishers accessible to Town forces for use in event of a vehicle or equipment fire.
2. Response to a fire emergency at the landfill that requires outside assistance will be made by the onsite observers by contacting "911" for dispatch of emergency personnel.

Public access will be restricted and care will be made to prevent the brush fire from spreading offsite.

6.7 LANDFILL GAS MIGRATION

Landfill gases in the perimeter monitoring probes found in concentrations exceeding 25 percent of the the lower explosive limit (e.g., 1.25 percent methane) during quarterly landfill gas monitoring as described in Section 3, will be handled as follows:

1. The perimeter probes will be monitored one day after the initial reading. If still greater than the LEL, the nearby offsite structures will be monitored for landfill gases. Offsite structures should be less than 25 percent of the LEL.
2. Within 2 days of detection of gases exceeding the limits in paragraph 1, the Town Engineer will notify the NYSDEC. NYSDEC will be informed of the measured concentrations and the actions taken to ensure public safety.
3. Within 7 days, the Town will install a vacuum blower with generator power and connect the horizontal trench collector risers to the blower to induce a vacuum on the horizontal trench collectors. The blower will free vent gas extracted from the horizontal trench collector risers. The gas quality of the vented gas will be monitored on a daily basis.
4. Within 15 days of the detection of exceedance of the limits specified in paragraph 1, the Town shall submit a schedule of implementation of the controls to the NYSDEC.

6.8 GROUNDWATER AND SURFACE WATER CONTAMINATION

In the event that a significant increase in existing water quality levels is detected for one or more of the baseline parameters, the well must be re-sampled within 30 days. The regulatory limits for groundwater baseline parameters are listed in Tables 6.1, 6.2 and 6.3 below. If the re-sampling results continue to exceed the baseline parameters, contingency monitoring should be initiated. Prior to initiating contingency monitoring for a monitoring well or wells, the Town may request that a compliance conference be held with NYSDEC to discuss the need and scope of contingency monitoring. After conferring and determining that contingency monitoring is warranted, the affected monitoring well(s) and the appropriate up-gradient well(s) will be sampled and analyzed for the expanded parameters at the next event.

If non-routine expanded parameters, or lead or cadmium are detected above the trigger value, a minimum of 2 independent confirmatory samples will be collected from the affected well(s) and appropriate up-gradient well(s) within 30 days of obtaining the results of the initial modified expanded parameters analysis. These samples will be collected within 2 weeks of one another, and may be collected on the same day but after separate well purging events. If the parameter(s) is not detected in either sampling event, the Department will be notified and it will be requested that the well be returned to the operational water quality monitoring. If an increase in the existing water quality values for any parameter in the up-gradient well(s) is detected, the existing water quality values for these parameters will be revised to be the arithmetic mean of the results for the contingency monitoring sampling events for the up-gradient well(s). After obtaining the analytical results from the sampling discussed above, the NYSDEC will be notified within 14 days of the significant detection for each sampling event.

The affected well(s) will then be re-sampled within 90 days and on a quarterly basis thereafter. In addition, all of the wells will be analyzed annually for the expanded parameters. The department may reduce this requirement based on site-specific conditions. A parameter may be removed from the contingency water quality monitoring program, pending approval from the Department, if the concentrations of the expanded parameters are shown at or below the existing water quality values for two consecutive sampling events.

Table 6.1. Regulatory Limits-Leachate Indicators

Parameter	Regulatory Limit ⁽²⁾
Field Parameters	
pH	6.5-8.5
Eh	-800
Field Observations ⁽¹⁾	
Turbidity	5 NTUs
Leachate Indicators	
Total Kjeldahl Nitrogen	
Ammonia	2 mg/L
Nitrate	10 mg/L
Chemical Oxygen Demand	
Biochemical Oxygen Demand (BOD ₅)	
Total Organic Carbon	
Total Dissolved Solids	500 mg/L
Sulfate	250 mg/L
Alkalinity	
Phenols	0.001 mg/L
Chloride	250 mg/L
Bromide	2 mg/L
Total Hardness as CaCO ₃	
Color	15 units
Boron	1 mg/L

Table 6.2. Regulatory Limits – Inorganic Parameters

Parameter	Regulatory Limit ⁽²⁾
Inorganic Parameters (mg/L)	
Aluminum (3)	0.2
Antimony	0.003
Arsenic	0.025
Barium	1
Beryllium (3)	0.003
Cadmium	.005 mg/L
Calcium	
Chromium	0.05
Chromium(Hexavalent)	0.05
Cobalt	
Copper	0.2
Cyanide	0.2
Iron	0.3 mg/L
Lead	0.025 mg/L
Magnesium (3)	35
Manganese	0.3 mg/L
Mercury	0.007
Nickel	0.10
Potassium	
Selenium	0.01
Silver	0.05
Sodium (3)	20 mg/L
Thallium (3)	0.0005
Vanadium	
Zinc (3)	5

(1) Any unusual Conditions (colors, odors, surface sheens, etc.) noticed during well development, purging, or sampling must be reported.

(2) from Table 1. Water Quality Standards Surface Waters and Groundwater for Class GA from NYCRR Part 703.5 unless noted otherwise.

(3) Regulatory limit from Table 3 Groundwater Effluent Limitations, Class GA from NYCRR Part 703.5 or from Table 5 of the New York State Groundwater Effluent Limitations (Class GA) from Division of Water Technical and Operational Guidance Series (1.1.1) reissue date June 1998.

Table 6.2. Regulatory Limits – Inorganic Parameters

Parameter	Regulatory Limit ⁽²⁾
Organic Parameters	
Acetone (3)	0.05 mg/L
Acrylonitrile (3)	0.005 mg/L
Benzene	0.001 mg/L
Bromochloromethane	0.005 mg/L
Bromodichloromethane (3)	0.05 mg/L
Bromoform; Tribromomethane (3)	0.05 mg/L
Carbon disulfide	0.06 mg/L
Carbon tetrachloride	0.005 mg/L
Chlorobenzene	0.005 mg/L
Chloroethane; Ethyl chloride	0.005 mg/L
Chloroform; Trichloromethane	0.007 mg/L
Dibromochloromethane; Chlorodibromomethane (3)	0.05 mg/L
1,2-Dibromo-3-chloropropane; DBCP	0.04 ug/L
1,2-Dibromoethane; Ethylene dibromide; EDB	6x10 ⁻⁴ ug/L
o-Dichlorobenzene; 1,2-Dichlorobenzene	0.003 mg/L
p-Dichlorobenzene; 1,4-Dichlorobenzene	0.003 mg/L
trans-1,4-Dichloro-2-butene	0.005 mg/L
1,1-Dichloroethane; Ethylidene chloride	0.005 mg/L
1,2-Dichloroethane; Ethylene dichloride	0.0006 mg/L
1,1-Dichloroethylene	0.005 mg/L
1,1-Dichloroethene	0.005 mg/L
Vinylidene chloride	
cis-1,2-Dichloroethylene; cis-1,2-Dichloroethene	0.005 mg/L
trans-1,2-Dichloroethylene; trans-1,2-Dichloroethene	0.005 mg/L
1,2-Dichloropropane	0.001 mg/L
Propylene dichloride	
cis-1,3-Dichloropropene	0.004 mg/L
trans-1,3-Dichloropropene	0.004 mg/L
Ethylbenzene	0.005 mg/L
2-Hexanone; Methyl butyl ketone (3)	0.05 mg/L
Methyl bromide; Bromomethane	0.005 mg/L
Methyl chloride; Chloromethane	0.005 mg/L
Methylene bromide; Dibromomethane	0.005 mg/L
Methylene chloride; Dichloromethane	0.005 mg/L
Methyl ethyl ketone; MEK; 2-Butanone(3)	0.05 mg/L
4-Methyl-2-pentanone; Methyl isobutyl ketone	
Styrene	0.005 mg/L
1,1,1,2-Tetrachloroethane.	0.005 mg/L
1,1,2,2-Tetrachloroethane	0.005 mg/L

Tetrachloroethylene; Tetrachloroethene; Perchloroethylene	0.005 mg/L
Toluene	0.005 mg/L
1,1,1-Trichloroethane; Methylchloroform	0.005 mg/L
1,1,2-Trichloroethane	0.005 mg/L
Trichloroethylene; Tri- chloroethene (3)	0.005 mg/L
Trichlorofluoromethane; CFC-11	0.005 mg/L
1,2,3-Trichloropropane	0.04 ug/L
Vinyl acetate	
Vinyl chloride; Chloro-ethene	0.002 mg/l
Xylenes	0.005 mg/L

(1) Any unusual Conditions (colors, odors, surface sheens, etc.) noticed during well development, purging, or sampling must be reported.

(2) from Table 1. Water Quality Standards Surface Waters and Groundwater for Class GA from NYCRR Part 703.5 unless noted otherwise.

(3) Regulatory limit from Table 3 Groundwater Effluent Limitations, Class GA from NYCRR Part 703.5 or from Table 5 of the New York State Groundwater Effluent Limitations (Class GA) from Division of Water Technical and Operational Guidance Series (1.1.1) reissue date June 1998.

Appendix A
Construction Plans and Details

Appendix B

**Vegetation and seeding Specifications and Mowing
Plan**

**Terry Contracting &
Materials, Inc.**

New York
840 West Main St. Riverhead, NY 11901
(631) 727-0170/Fax: (631) 727-0410

Connecticut
611 Access Road Stratford, CT
(203) 375-8450/Fax: (203) 375-8410

SUBMITTAL FORM

Project: Young's Avenue Landfill Closure

Owner: Town of Riverhead

Engineer: SCS Engineers, P.C.

Attention: Lisa K. Wilkinson, PE

Date Submitted: 06/10/2009

Submittal No: (44A) COMBINE INTO
ONE SUBMITTAL WITH OTHER

Description: 02936 Seeding 44A
02936 1.5C/D Operation and Maintenance Data
Planting and Maintenance Plan

- ☐ NO EXCEPTIONS NOTED
☐ MAKE CORRECTIONS NOTED
☒ REJECTED: RESUBMIT SEE REMARKS
☐ SEE LETTER DATED
☐ NOT REQUIRED FOR REVIEW

Review is for general compliance with contract documents. No responsibility is assumed for correctness of dimensions, details, field verifications, fabrication, process or techniques of construction. Contractor is responsible for the coordination of his work with that of all other trades.

By: LKW Date: 6/16/09

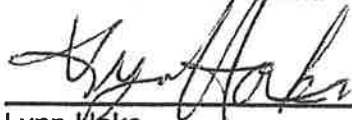
Checked

By: _____ Date: _____
SCS ENGINEERS

Miscellaneous Information:

We are submitting the planting and maintenance plan for each of the different seed mixes, as well as the Bayberry seedlings. We have also included a drawing showing the locations of each seed mix and Bayberry seedlings. The drawing is not exact, it is provided for information purposes only. TCM will adhere to the specifications, contract documents and discussions with SCS for exact locations and quantities for each seed mix.

The enclosed is being submitted for your approval based on the contract requirements unless otherwise noted herein.


Lynn Hoke

Terry Contracting & Materials, Inc.

06/10/09
Date

Terry Contracting & Materials, Inc.

840 West Main Street
Riverhead, NY 11901
Phone: 631-727-0170 & Fax: 631-727-0410

611 Access Road
Stratford, CT 06615
Phone: 203-375-8450 & Fax: 203-375-8410

PLANTING AND MAINTENANCE PLAN

Date: April 24, 2009
Project: Youngs Avenue Landfill Closure
Address: Youngs Avenue
Riverhead, New York 11901

For the Youngs Avenue Landfill Closure project, Terry Contracting and Materials will plant fifty Bayberry Seedlings and spread a total of four unique seed mixes. All planting will be located in the areas designated by the proposed planting plan dated 06/08/2009.

Bayberry Seedlings –

Description:

A woody, deciduous, eastern North American shrub (*Myrica pensylvanica*) having aromatic foliage and small globose fruits with a waxy covering.

Maintenance:

1. There is no maintenance required.

Winter Side Slope Mix –

Description:

A seed mix designed for quick establishment, erosion control and no maintenance. This mix also includes species that have deep roots, reseed themselves and produce good color. They flower in spring-early summer and fruit in late summer-fall.

Maintenance:

1. Mowing of these areas is not recommended.

Spring Side Slope Mix –

Description:

A seed mix designed for quick establishment, erosion control and no maintenance. This mix also includes a species that has deep roots, one with rhizomes and several species that reseed themselves and produce good color.

Maintenance:

1. Mowing of these areas is not recommended.

MOWING IS REQUIRED
FOR CAP INSPECTION AND
MAINTENANCE; PROVIDE

MOWING SEASON AFTER FLOWERING AND RESEEDING OCCURS
AND MOWING HEIGHT.

Terry Contracting & Materials, Inc.

840 West Main Street
Riverhead, NY 11901
Phone: 631-727-0170 & Fax: 631-727-0410

611 Access Road
Stratford, CT 06615
Phone: 203-375-8450 & Fax: 203-375-8410

Picnic & Field Mix –

Description:

A seed mix designed for low maintenance, color and accessibility for people who wish to use the grass areas.

Maintenance:

1. Grass should be mowed every 30-40 days during the spring-summer months and every 50-60 days during fall and spring months. Grass clippings must be removed.

NOT PRACTICAL

Wild Flower Mix –

Description:

A seed mix designed with multiple wild flowers selected for color, aesthetics and no maintenance. A list of species in this mix as well as the bloom season for each species is listed below.

FOR THIS SITE
PROVIDE MOWING
HEIGHT.

<u>%</u>	<u>SPECIES</u>	
21.2	Baby's Breath, Annual	SUMMER
16.9	Cornflower	SUMMER
16.9	Larkspur, Rocket	SUMMER
12.7	Flax, Blue	SPRING-SUMMER
8.5	Coreopsis, Lance-Leaved	SUMMER - FALL
8.5	Coneflower, Purple	SUMMER
4.2	Daisy, Ox-Eye	SUMMER
4.2	Poppy, Corn	SUMMER
2.1	Dame's Rocket	SUMMER
2.1	Black-Eyed Susan	SUMMER- FALL
1.1	Catchfly	SUMMER
1.1	Yarrow, White	SUMMER
0.5	Yarrow, Gold	SUMMER

Maintenance:

1. No maintenance will be required to maintain wild flowers.
2. Mowing of these areas is not recommended. Overgrowth may be trimmed to maintain a clean appearance.

PROVIDE SEASON /TIMING OF TRIMMING

**Terry Contracting &
Materials, Inc.**

New York
840 West Main St. Riverhead, NY 11901
(631) 727-0170/Fax: (631) 727-0410

Connecticut
611 Access Road Stratford, CT
(203) 375-8450/Fax: (203) 375-8410

SUBMITTAL FORM

Project: Young's Avenue Landfill Closure

Owner: Town of Riverhead

Engineer: SCS Engineers, P.C.

Attention: Lisa K. Wilkinson, PE

Date Submitted: 06/10/2009

Submittal No:

44A

COMBINE

Description:

02936

02936 1.5A

Seeding

Manufacturers and Suppliers Specs

☒ NO EXCEPTIONS NOTED
☒ MAKE CORRECTIONS NOTED
☐ REJECTED: RESUBMIT SEE REMARKS
☐ SEE LETTER DATED
☐ NOT REQUIRED FOR REVIEW

Review is for general compliance with contract documents. No responsibility is assumed for correctness of dimensions, details, field applications, fabrication, process techniques of construction. Contractor is responsible for the coordination of his work with that of other trades.

LLW

Date:

6/16/09

Checked

Date:

SCS ENGINEERS

Miscellaneous Information:

We are submitting the supplier's specifications for the winters side slope mix, picnic mix and the wild flower mix. We do not have the certification from the specific seed vendors for each seed species provided. Please let us know if this is necessary.

PROVIDE CERTIFICATIONS AS REQUIRED, INCLUDE SPRING MIX WITH THIS SUBMITTAL.

The enclosed is being submitted for your approval based on the contract requirements unless otherwise noted herein.

Lynn Hoke

Terry Contracting & Materials, Inc.

Date

06/10/09



LONG ISLAND CAULIFLOWER ASSOCIATION

139 Marcy Ave Riverhead NY 11901
Phone: 631 727 2212 www.licauliflower.com Fax: 631 727 4295
Carl Key CEO

Distributors of
Agricultural supplies for
Farm, Landscapers
and Home.
Grass and Vegetable
seeds, Containers and
Marketing supplies

DATE 6/6/09 CODE 1 GS SP PIC 5118
NAME TERRY PICNIC MIX Total Pounds 60
TOTAL BAGS 25# 1 50# 2
GERM/SELL BY DATE 85% 11/06

% Pure Seed	VARIETY	GERM %	# OF BAGS
47.53%	AFFIRMED RYEGRASS	91	0.58
24.25%	CREEPING RED FESCUE	85	0.30
24.55%	WINDWARD CHEWINGS	85	0.30
1.32%	ALICE WHITE CLOVER	95	0.02
2.22%	Inert		
0.06%	Crop		
0.07%	Weed		
100.00%	total		

PRODUCTION CARD

						%
28.8 LBS % Pure	AFFIRMED RYEGRASS	LOT #	846-7-05502			48%
11-06 seed	99.02% Germ	91 Inert	.98 Crop	.00 Weed	0.00	
15 LBS % Pure	CREEPING RED FESCUE	LOT #	23268			25%
08-06 seed	97.00% Germ	85 Inert	2.50 Crop	.25 Weed	0.25	
15 LBS % Pure	WINDWARD CHEWINGS	LOT #	M53-7-WF31			25%
11-06 seed	98.20% Germ	85 Inert	1.77 Crop	.00 Weed	0.03	
1.2 LBS % Pure	ALICE WHITE CLOVER	LOT #	LO-6-AL5			2%
06-07 seed	65.79% Germ	95 Inert	34.20 Crop	.00 Weed	0.09	
0 LBS % Pure		LOT #				0%
10-06 seed	0.00% Germ	0 Inert	.00 Crop	.00 Weed	0.00	
0 LBS % Pure		LOT #				0%



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Farm, Landscapers
and Home.
Grass and Vegetable
seeds, Containers and
Marketing supplies

LI CAULIFLOWER – LONG ISLAND WILDFLOWER MIX

NOT TREATED	LOT: LICM02228
99.64% PURE SEED	00.00% CROP
00.32% INERT	00.04% WEED
GERM 80%	DATE 11/08
FS-WF-LI	

<u>%</u>	<u>SPECIES</u>
21.20	Baby's Breath, Annual
16.90	Cornflower
16.90	Larkspur, Rocket
12.70	Flax, Blue
8.50	Coreopsis, Lance-Leaved
8.50	Coneflower, Purple
4.20	Daisy, Ox-Eye
4.20	Poppy, Corn
2.10	Dame's Rocket
2.10	Black-Eyed Susan
1.10	Catchfly
1.10	Yarrow, White
.50	Yarrow, Gold

SEEDING RATE

1 LB - 5000 SQ FT
8 LBS - 1 ACRE

Long Island

Cauliflower Assoc.

DATE 5/4/09 CODE _____ GS SP TSSLO LOT # 5095
 NAME TERRY SIDE SLOPE MIX *WINTER or SPRING* 7Total Pounds 500
 TOTAL BAGS _____ 25# 50# 10

GERM/SELL BY DATE 85% 11/06

% Pure Seed	VARIETY	GERM %	# OF BAGS
31.80%	RIVAL REED CANARYGRASS	75	3.20
28.80%	SMOOTH BROME VNS	80	3.20
20.84%	PARDEE BIRDSFOOT TREFOIL	90	3.20
1.97%	LADINO CLOVER VNS	90	0.20
1.32%	ALICE WHITE CLOVER	95	0.20
0.00%		0	0.00
14.70%	Inert		
0.32%	Crop		
0.25%	Weed		
100.00%	total		

PRODUCTION CARD

						%
<u>160</u> LBS	RIVAL REED CANARYGRASS	LOT #	846-7-0624			32%
<u>11-06</u> seed	99.38% Germ	75 Inert	.51 Crop	.03 Weed	0.08	
<u>160</u> LBS	SMOOTH BROME VNS	LOT #	H773			32%
<u>08-06</u> seed	90.00% Germ	80 Inert	9.00 Crop	.50 Weed	0.50	
<u>160</u> LBS	PARDEE BIRDSFOOT TREFOIL	LOT #	414836.CTD			32%
<u>11-06</u> seed	65.13% Germ	90 Inert	34.20 Crop	.47 Weed	0.20	
<u>10</u> LBS	LADINO CLOVER VNS	LOT #	7-906-WC			2%
<u>06-07</u> seed	98.65% Germ	90 Inert	1.20 Crop	.10 Weed	0.05	
<u>10</u> LBS	ALICE WHITE CLOVER	LOT #	LO-6-AL5			2%
<u>10-06</u> seed	65.79% Germ	95 Inert	34.20 Crop	.00 Weed	0.09	
<u> </u> LBS		LOT #				
<u>07-06</u> seed	0.00% Germ	0 Inert	.00 Crop	.00 Weed	0.00	

SEED SHORT _____

SEED OVER _____

MIXED BY _____

Wilkinson, Lisa

From: Wilkinson, Lisa
Sent: Monday, October 13, 2008 10:25 AM
To: Bob Terry
Cc: Kuniholm, Peter; Melissa (Terry Contracting); 'John Bokina'; Peterson, Kurt; Friedler, Brian; 'Carl Key'
Subject: RE: seed mix

Bob,

The seed mix is approved via this email in order to expedite application. However, a formal submittal in accordance with the specifications and as discussed in the meeting on Thursday is required. The submittal should include information and cut sheets on the equipment used to apply the seed mix, the certifications from the seed vendors, and the mix (below). Please submit all topsoil testing data asap and note that you are applying seed at your own risk without the topsoil test data submitted, reviewed and approved.

The Phase II plan for the warm season plantings should be submitted including the information requested above along with the planting and maintenance plan, operation and maintenance plan, methods for seeding after placement of erosion control blankets and method to establish new plantings after cool season planting, etc. Please provide SCS with sufficient time to review and approve this plan prior to the warm season seeding.

Please call with any questions.

Lisa K. Wilkinson, PE
SCS ENGINEERS, PC
140 Route 303
Valley Cottage, NY 10989
(845)353-5727
(845)353-5731 Fax

From: Carl Key [mailto:lica1901@hamptons.com]
Sent: Saturday, October 11, 2008 12:25 PM
To: Bob Terry
Cc: Kuniholm, Peter; Melissa (Terry Contracting); Wilkinson, Lisa; 'John Bokina'
Subject: FW: seed mix

It is important that cover crop be established ASAP. Your visit yesterday to my office gave us the opportunity to designate two different mixes based on the SLOPE of those areas to be seeded. Species to provide an astetic or diversified look for spring planting will be addressed this winter.

I apologize that I failed to include the Lbs/acre and the percentage of the two mixes.

10/23/2008

STEEP SLOPES:

*COVER CROP RYE	112# (28%)
*COVER CROP OATS	68# (17%)
*PER. RYE	145# (36.25%)
*ANN. RYE	45# (11.25%)
*BIRDS FOOT	30# (7.5%)

OTHER AREAS:

*COVER CROP RYE	112# (28%)
*COVER CROP OATS	68# (17%)
*BROOME GRASS	30# (7.5%)
*PER. RYE	135# (33.75%)
*ANN. RYE	35# (8.75%)
*BIRDS FOOT	20# (5%)

When I get the soil tests back I will look at the percent of calcium to magnesium ratio and cation exchange capacity of potash/mag./cal./ & na. If these are in relative balance I can then make a recommendation for spring seeded grasses and flowers that will establish under those conditions. The total exchangeable capacity along with organic matter are important for persistence and establishment.

If you could describe the equipment you use and your seeding protocol would be helpful to all concerned.

Thank You
Carl Key

From: Carl Key [mailto:lica1901@hamptons.com]

10/23/2008

Sent: Friday, October 10, 2008 1:56 PM

To: Bob Terry (bob@terrycontracting.com)

Cc: Peter Kuniholm (pkuniholm@scsengineers.com); Lisa Wilkinson (lwilkinson@scsengineers.com)

Subject: seed mix

Bob,

Here are the seed recommendations we discussed this morning to get some cover this fall.

Steep Slopes:

- *Cover Crop Rye
- *Cover Crop Oats
- *Perennial Ryegrass
- *Annual Ryegrass
- *Birdsfoot Trefoil

Other Areas:

- *Same As Above, But Include Some Broomegrass
-

My recommendations for any spring overseeding will be based on the soil tests. Once we get them back I'll evaluate and get back to you.

If you have any questions please call or e-mail me.

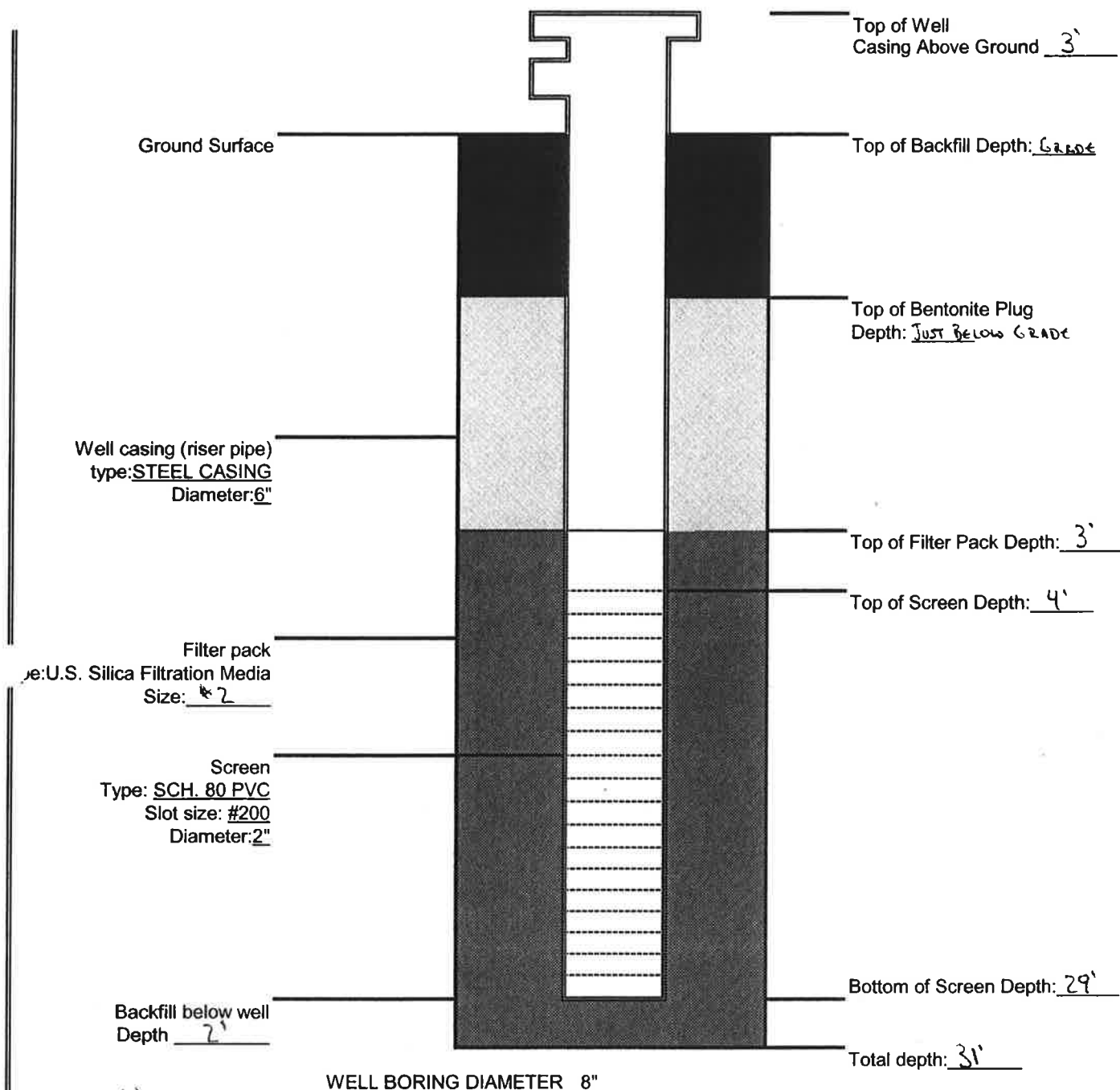
Thank You
Carl Key

Appendix C

LFG Perimeter Probe Documentation

SCS ENGINEERS, PC

GAS EXTRACTION WELL INSTALLATION RECORD



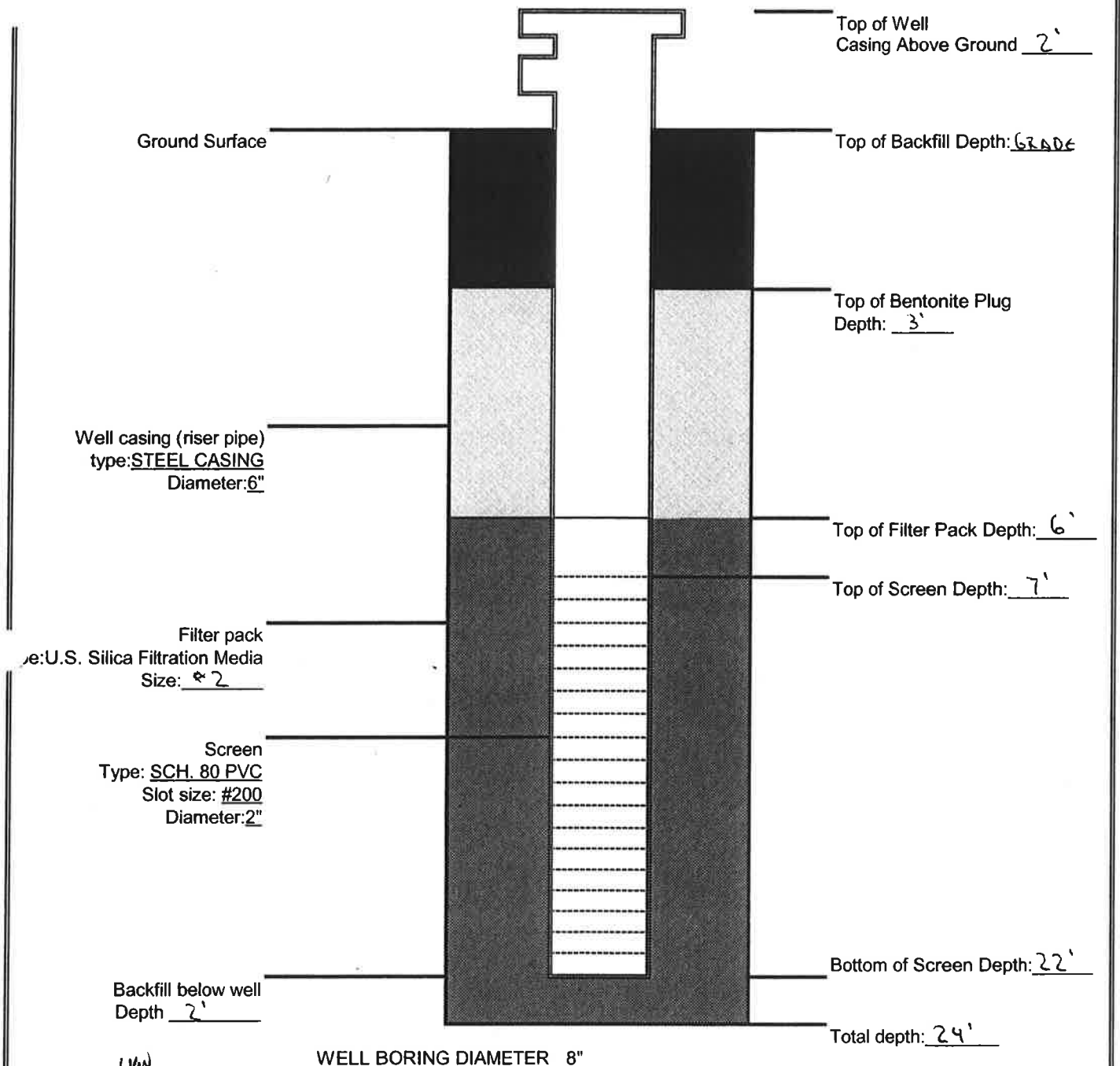
VW RIVERHEAD

PROJECT NAME: WARREN COURT FINAL CLOSURE CONSTRUCTION
 PROJECT NUMBER: 13206007.01
 DATE STARTED: 1/13/10
 DATE COMPLETED: 1/13/10
 INSTALLED BY: CASOLA
 INSPECTED BY: BJF

WELL NUMBER: GP#2
 BORING DEPTH: 31'
 SOLID PIPE LENGTH: 4'
 SLOTTED PIPE LENGTH: 25'
 SCREEN SLOT SIZE: #200
 TOTAL WELL LENGTH: 29'

SCS ENGINEERS, PC

GAS EXTRACTION WELL INSTALLATION RECORD

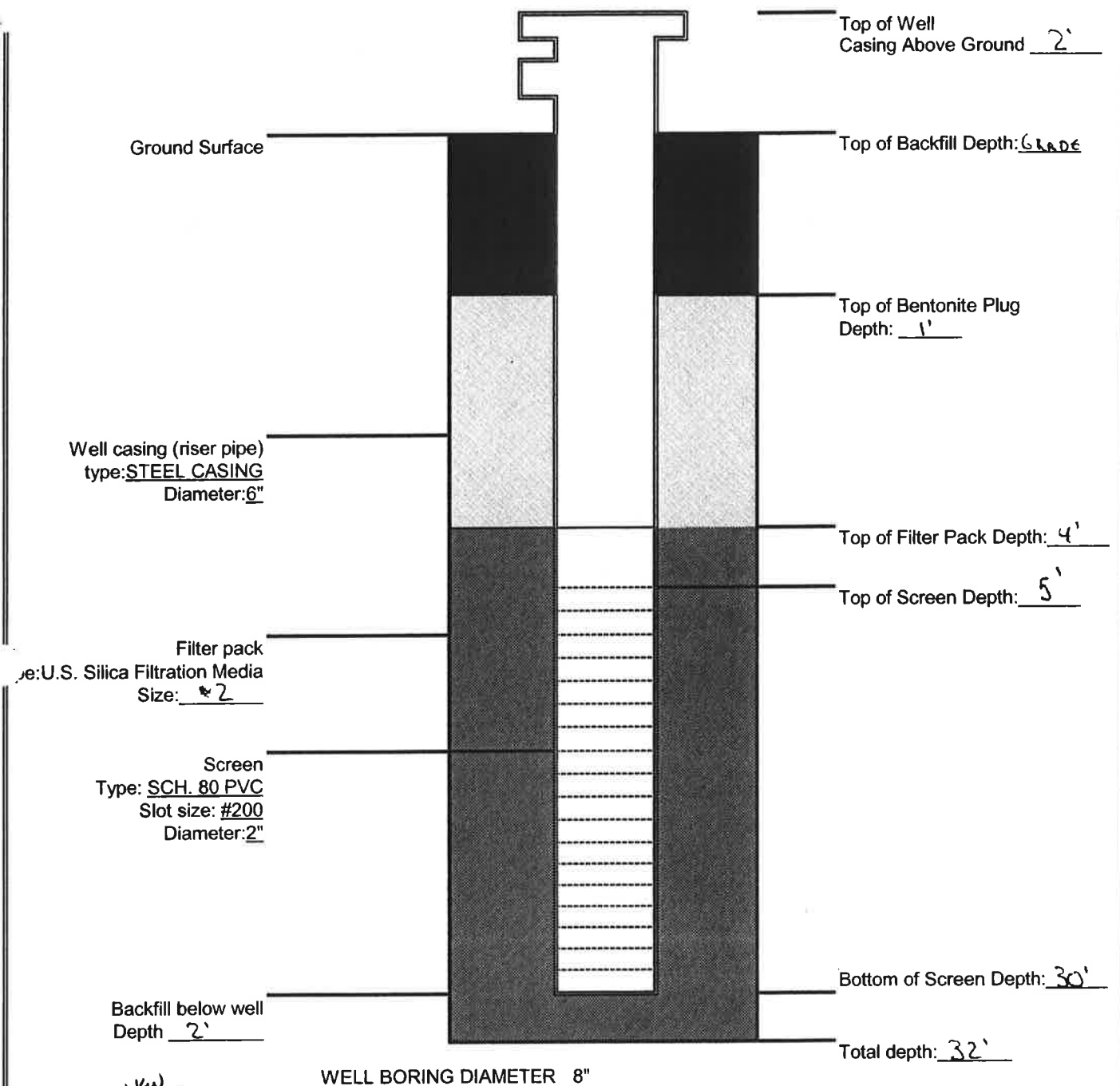


PROJECT NAME: WARREN COURT FINAL CLOSURE CONSTRUCTION
 PROJECT NUMBER: 13206007.01
 DATE STARTED: 1/14/10
 DATE COMPLETED: 4/14/10
 INSTALLED BY: CASOLA
 INSPECTED BY: BJF

WELL NUMBER: 6P44
 BORING DEPTH: 25'
 SOLID PIPE LENGTH: 7'
 SLOTTED PIPE LENGTH: 15'
 SCREEN SLOT SIZE: *200
 TOTAL WELL LENGTH: 22'

SCS ENGINEERS, PC

GAS EXTRACTION WELL INSTALLATION RECORD

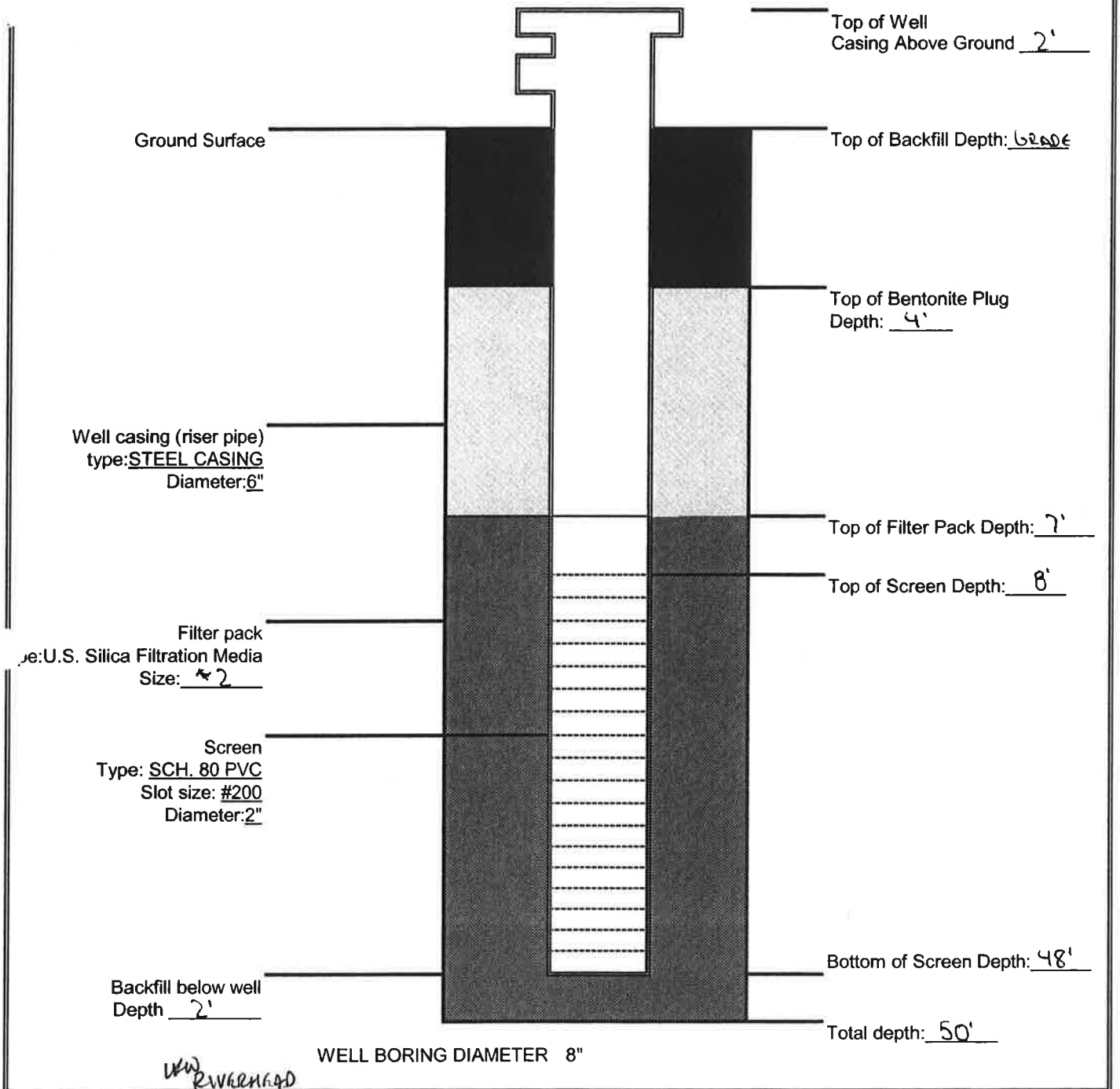


PROJECT NAME: WARREN COURT FINAL CLOSURE CONSTRUCTION
 PROJECT NUMBER: 13206007.01
 DATE STARTED: 11/14/10
 DATE COMPLETED: 11/14/10
 INSTALLED BY: CASOLD
 INSPECTED BY: BJF

WELL NUMBER: GP#5
 BORING DEPTH: 30'
 SOLID PIPE LENGTH: 5'
 SLOTTED PIPE LENGTH: 25'
 SCREEN SLOT SIZE: #200
 TOTAL WELL LENGTH: 30'

SCS ENGINEERS, PC

GAS EXTRACTION WELL INSTALLATION RECORD



PROJECT NAME: WARREN COURT FINAL CLOSURE CONSTRUCTION
 PROJECT NUMBER: 13206007.01
 DATE STARTED: 1/14/10
 DATE COMPLETED: 1/14/10
 INSTALLED BY: CASOLA
 INSPECTED BY: BJF

WELL NUMBER: 6P-6
 BORING DEPTH: 50'
 SOLID PIPE LENGTH: 8'
 SLOTTED PIPE LENGTH: 40'
 SCREEN SLOT SIZE: #200
 TOTAL WELL LENGTH: 48'

SCS ENGINEERS DAILY FIELD REPORT

Project: Young's Ave L.F. Closure Project number: 13206007.01

Owner: Town of Riverhead, New York Contractor: Terry Contracting

Date: 11/13/10 Contract Day: 11/14/10 Contract Duration 360

Weather

Temperature: (AM) 20° (PM) 30° Rain ~ Rainfall (inches) ~

Description of weather: COLD, WINDY

List of Equipment on site: (A) active (I) idle

Cat 980 Loader

Cat 330 D WELL DRILLER

Cat D6M dozer

Cat D6M dozer

Doosan 480 excavator

Personnel on site:

No. of Superintendents	No. of Skilled	No. of Laborers
(1)	(1)	
Description of Construction Activity		
<u>ON SITE 8³⁰ AM. CASOLA ON-SITE @</u>		
<u>9³⁰ AM. START DRILLING @ 10 AM GP#1 (SEE WELL LOGS)</u>		
<u>CASOLA DRILLER GP#1, GP#2, GP#3 (SEE LOGS) OFF-SITE</u>		
<u>@ 5pm.</u>		
<u>WALKED SITE TO CHECK PUNCHLIST</u>		
<u>11/14/10 - ON-SITE @ 8 AM. CASOLA START DRILLING GP#4</u>		
<u>AND FINISHED GP#5 AND GP#6 BY 330 PM. NO</u>		
<u>PROBLEMS. STATED THAT TERRY WAS TO PROVIDE CORKS</u>		
<u>AND CONCRETE PADS FOR ALL MONITORING WELLS.</u>		

WALKED SITE AND DISCUSSED ON PHONE WITH LISA
TERRY'S PUNCHLIST.

List of Subcontractors

CASOLA DRILLING

List of Materials Delivered

Contract Issues/Conflicts

Description: _____

Field Representative [Signature] Date 11/13/10

Appendix D
Inspection Forms

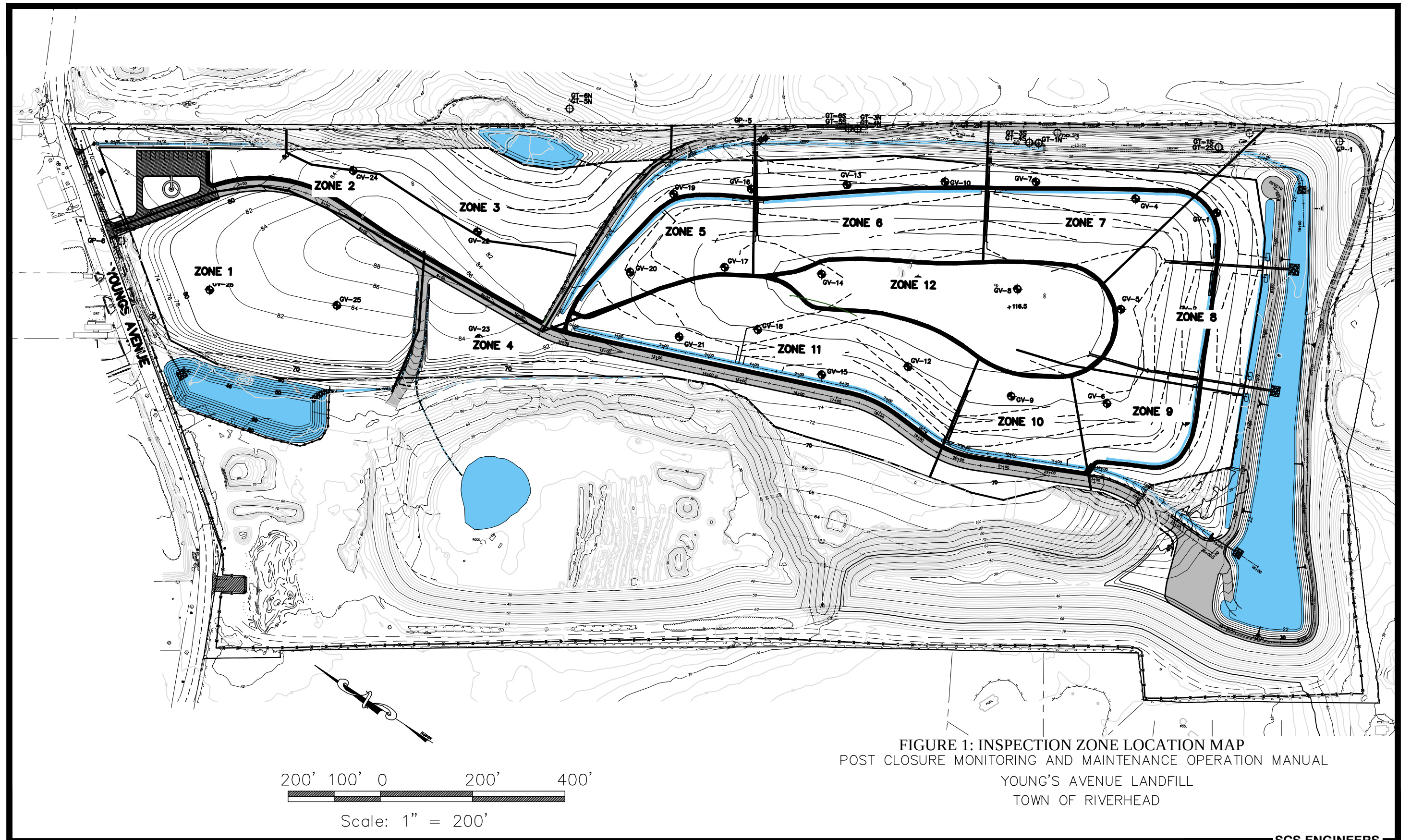


FIGURE 1: INSPECTION ZONE LOCATION MAP
POST CLOSURE MONITORING AND MAINTENANCE OPERATION MANUAL
YOUNG'S AVENUE LANDFILL
TOWN OF RIVERHEAD

FORM FCS-1

INSPECTION CHECKLIST

FINAL COVER SYSTEM

YOUNGS AVENUE LANDFILL, RIVERHEAD, NEW YORK

(Reference Drawing No. 1, Figure 1, Section 3.1, 4.1)

Item No.	Item Title	Zone Number											
		1	2	3	4	5	6	7	8	9	10	11	12
1	Vegetative Growth												
2	Woody Vegetation												
3	Erosion												
4	Surface Cracks												
5	Settlement, Ponding												
6	Slope Stability												
7	Animal Burrows												
8	Vandalism												
9	Seepage												
10	Cap Drains												

Notes:

- 1 Use a check in the box to indicate that the specific item in the area has been inspected and no problems were noted.
- 2 Use "NS" (Not Satisfactory) where problems are noted. Mark location of NS condition on Drawing No. 1.
- 3 For boxes checked NS, provide, on Form DP-1, a description of the deficiency. Attach additional sheets, as necessary.

Date:

Inspector's Initials:

FORM SWS-1**INSPECTION CHECKLIST****STORMWATER BASINS****STORMWATER MANAGEMENT SYSTEM****YOUNGS AVENUE LANDFILL, RIVERHEAD, NEW YORK****(Reference Drawing No. 1, Section 3.2, 4.2)**

Item No.	Inspection item	Check Box	Item No.	Inspection item	Check Box
Basin No. 1			Basin No. 2		
1	Silt Accumulation		1	Silt Accumulation	
2	Slope Erosion/Stability		2	Slope Erosion/Stability	
3	Debris		3	Debris	
4	Vegetation		4	Vegetation	
Inlet Structure 1			Basin No. 3		
1	Debris/Silt Blockage		1	Silt Accumulation	
2	Connection to Pipe		2	Slope Erosion/Stability	
3	Erosion around Structure		3	Debris	
4	Spalling Cracking, etc		4	Vegetation	
Inlet Structure 2			Inlet Structure 1		
1	Debris/Silt Blockage		1	Debris/Silt Blockage	
2	Connection to Pipe		2	Connection to Pipe	
3	Erosion around Structure		3	Erosion around Structure	
4	Spalling Cracking, etc		4	Spalling Cracking, etc	
Inlet Structure 3			Inlet Structure 2		
1	Debris/Silt Blockage		1	Debris/Silt Blockage	
2	Connection to Pipe		2	Channel Lining	
3	Erosion around Structure		3	Erosion around inlet	
4	Spalling Cracking, etc		4	Vegetation	
Inlet Structure 4					
1	Debris/Silt Blockage				
2	Connection to Pipe				
3	Erosion around Structure				
4	Vegetation				

Notes:

- 1 Use a check in the box to indicate that the specific item in the area has been inspected and no problems were noted.
- 2 Use "NS" (Not Satisfactory) where problems are noted. Mark location of NS condition on Drawing No. 1.
- 3 For boxes checked NS, provide, on Form DP-1, a description of the deficiency. Attach additional sheets, as necessary.

Date:

Inspector's Initials:

FORM SWS-2**INSPECTION CHECKLIST****STORMWATER MANHOLES****STORMWATER MANAGEMENT SYSTEM****YOUNGS AVENUE LANDFILL, RIVERHEAD, NEW YORK****(Reference Drawing No. 1, Section 3.2, 4.2)**

Landfill Downchute Manholes				
Item No.	Inspection Item	Manhole Number		
		DC-3	DC-4	DC-5
1	Debris/Silt Accumulation Inside			
2	Pipe connections to manhole			
3	Silt Accumulation at Discharge			
4	Settlement			
5	Vandalism			
6	Weep holes			
7	Grates			
8	Spalling, Cracking			
9	Erosion Around Structure			

Youngs Avenue Manholes					
Item No.	Inspection Item	Manhole Number			
		MHB	MHC	MHD	MHE
1	Debris/Silt Accumulation				
2	Pipe connections to manhole				
3	Flow Through Manhole				
4	Settlement				
5	Vandalism				
6	Grates				
7	Other				

Notes:

- 1 Use a check in the box to indicate that the specific item in the area has been inspected and no problems were noted.
- 2 Use "NS" (Not Satisfactory) where problems are noted. Mark location of NS condition on Drawing No. 1.
- 3 For boxes checked NS, provide, on Form DP-1, a description of the deficiency. Attach additional sheets, as necessary.

Date:

Inspector's Initials:

FORM SWS-3

INSPECTION CHECKLIST

STORMWATER OPEN CHANNELS WITHIN LIMIT OF FINAL CAP

STORMWATER MANAGEMENT SYSTEM

YOUNGS AVENUE LANDFILL, RIVERHEAD, NEW YORK

(Reference Drawing No. 1, Section 3.2, 4.2)

Item No.	Inspection item	Check Box	Item No.	Inspection item	Check Box
East Access Road Channel			South Berm Channel		
1	Overgrown Vegetation		1	Overgrown Vegetation	
2	Standing Water		2	Standing Water	
3	Sediment and Debris		3	Sediment and Debris	
4	Erosion/Washouts		4	Erosion/Washouts	
5	Culvert Inlet		5	Cap Drains	
6	Culvert Outlet				
East Channel Outlet Structure			Walkway Bench Channel		
1	Debris/Silt Blockage		1	Overgrown Vegetation	
2	Connection to Pipe		2	Standing Water	
3	Erosion around Structure		3	Sediment and Debris	
4	Spalling Cracking, etc		4	Erosion/Washouts	
			5	Cap Drains	
Main Access Road Channel			West Side Access Road Channel (N)		
1	Overgrown Vegetation		1	Overgrown Vegetation	
2	Standing Water		2	Standing Water	
3	Sediment and Debris		3	Sediment and Debris	
4	Erosion/Washouts		4	Erosion/Washouts	
5	Cap Drains				
Main Access Road Channel Outlet Structure			West Side Access Road Channel (S)		
1	Debris/Silt Blockage		1	Overgrown Vegetation	
2	Connection to Pipe		2	Standing Water	
3	Erosion around Structure		3	Sediment and Debris	
4	Spalling Cracking, etc		4	Erosion/Washouts	

Notes:

- 1 Use a check in the box to indicate that the specific item in the area has been inspected and no problems were noted.
- 2 Use "NS" (Not Satisfactory) where problems are noted. Mark location of NS condition on Drawing No. 1.
- 3 For boxes checked NS, provide, on Form DP-1, a description of the deficiency. Attach additional sheets, as necessary.

Date:

Inspector's Initials:

FORM SWS-4

INSPECTION CHECKLIST

STORMWATER OPEN CHANNELS OUTSIDE LIMIT OF FINAL CAP

STORMWATER MANAGEMENT SYSTEM

YOUNGS AVENUE LANDFILL, RIVERHEAD, NEW YORK

(Reference Drawing No. 1, Section 3.2, 4.2)

Item No.	Inspection item	Check Box	Item No.	Inspection item	Check Box
Parking Area Channel			Lower West Channel		
1	Overgrown Vegetation		1	Overgrown Vegetation	
2	Standing Water		2	Standing Water	
3	Sediment and Debris		3	Sediment and Debris	
4	Erosion/Washouts		4	Erosion/Washouts	
Parking Area Channel Outlet Structure			Lower West Downchute		
1	Debris/Silt Blockage		1	Overgrown Vegetation	
2	Connection to Pipe		2	Standing Water	
3	Erosion around Structure		3	Sediment and Debris	
4	Spalling Cracking, etc		4	Erosion/Washouts	
Inlet Channel to Basin No. 3					
1	Overgrown Vegetation				
2	Standing Water				
3	Sediment and Debris				
4	Erosion/Washouts				

Notes:

- 1 Use a check in the box to indicate that the specific item in the area has been inspected and no problems were noted.
- 2 Use "NS" (Not Satisfactory) where problems are noted. Mark location of NS condition on Drawing No. 1.
- 3 For boxes checked NS, provide, on Form DP-1, a description of the deficiency. Attach additional sheets, as necessary.

Date:

Inspector's Initials:

FORM SWS-5
INSPECTION CHECKLIST

DRAINAGE SWALES
STORMWATER MANAGEMENT SYSTEM
YOUNGS AVENUE LANDFILL, RIVERHEAD, NEW YORK
(Reference Drawing No. 1, Section 3.2, 4.2)

Item No.	Item Title	Drainage Swale Number												
		DS1	DS2	DS3	DS4	DS5	DS6	DS7	DS8	DS9	DS10	DS11	DS12	DS13
1	Overgrown Vegetation													
2	Channel Lining													
3	Standing Water													
4	Sediment and Debris													
5	Erosion/Washouts													
6	Rip Rap													
7	Downchute Inlet													
8	Vandalism													
9	Seepage													

Notes:

- 1 Use a check in the box to indicate that the specific item in the area has been inspected and no problems were noted.
- 2 Use "NS" (Not Satisfactory) where problems are noted. Mark location of NS condition on Drawing No. 1.
- 3 For boxes checked NS, provide, on Form DP-1, a description of the deficiency. Attach additional sheets, as necessary.

Date:

Inspector's Initials:

FORM LFG-1**INSPECTION CHECKLIST
LANDFILL GAS MONITORING SYSTEM****GAS VENT RISERS****YOUNGS AVENUE LANDFILL, RIVERHEAD, NEW YORK
(Reference Drawing No. 1, Section 3.3, 4.3)**

Item No.	Item Title	GAS VENT NUMBER												
		GV1	GV2	GV3	GV4	GV5	GV6	GV7	GV8	GV9	GV10	GV11	GV12	GV13
1	Damage/Vandalism													
2	Settlement													
3	Accessibility													
4	Stressed Vegetation													

Item No.	Item Title	GAS VENT NUMBER													
		GV14	GV15	GV16	GV17	GV18	GV19	GV20	GV21	GV22	GV23	GV24	GV25	GV26	
1	Damage/Vandalism														
2	Settlement														
3	Accessibility														
4	Stressed Vegetation														

Notes:

- 1 Use a check in the box to indicate that the specific item in the area has been inspected and no problems were noted.
- 2 Use "NS" (Not Satisfactory) where problems are noted. Mark location of NS condition on Drawing No. 1.
- 3 For boxes checked NS, provide, on Form DP-1, a description of the deficiency. Attach additional sheets, as necessary.

Date:

Inspector's Initials:

FORM LFG-2

INSPECTION CHECKLIST
LANDFILL GAS MONITORING SYSTEM

HORIZONTAL GAS VENT TRENCH RISERS AND GAS PROBES

YOUNGS AVENUE LANDFILL, RIVERHEAD, NEW YORK
(Reference Drawing No. 1, Section 3.3, 4.3)

Item No.	Item Title	HORIZONTAL GAS VENT TRENCH RISER NUMBER											
		GT1S	GT2S	GT1N	GT2N	GT3S	GT4S	GT3N	GT4N	GT5S	GT6S	GT5N	GT6N
1	Damage/Vandalism												
2	Settlement												
3	Accessibility												
4	Stressed Vegetation												

Item No.	Item Title	GAS PROBE NUMBER					
		GP1	GP2	GP3	GP4	GP5	GP6
1	Damage/Vandalism						
2	Settlement						
3	Accessibility						
4	Stressed Vegetation						

Notes:

- 1 Use a check in the box to indicate that the specific item in the area has been inspected and no problems were noted.
- 2 Use "NS" (Not Satisfactory) where problems are noted. Mark location of NS condition on Drawing No. 1.
- 3 For boxes checked NS, provide, on Form DP-1, a description of the deficiency. Attach additional sheets, as necessary.

Date:

Inspector's Initials:

FORM AS-1**INSPECTION CHECKLIST FORM
ANCILLARY SYSTEMS
ACCESS ROADS****YOUNGS AVEUNE LANDFILL, RIVERHEAD, NEW YORK
(Reference Drawing No. 1, Section 3.4, 4.4)**

Description	Check Box	Status/Comments
Main Access Road (including parking area, south perimeter berm road):		
- <i>Condition of asphalt/gravel</i>		
- <i>Rutting, washouts</i>		
- <i>Guide rails, gates, bollards</i>		
- <i>Depressions/settlement</i>		
- <i>Walking bridge system</i>		
East Access Road (including south perimeter road):		
- <i>Condition of gravel</i>		
- <i>Rutting, washouts</i>		
- <i>Guide rails</i>		
- <i>Depressions/settlement</i>		
- <i>Culvert – inlet and outlet structure</i>		
West Side Access Road		
- <i>Condition of gravel</i>		
- <i>Rutting, washouts</i>		
- <i>Gate</i>		
- <i>Depressions/settlement</i>		

Notes:

- 1 Use a check in the status/comments box to indicate that the specific item in the area has been inspected and no problems were noted.
- 2 Use “NS” (Not Satisfactory) in the status box where problems are noted. Mark location of NS condition on Drawing No. 1.
- 3 For boxes checked NS, provide, on Form DP-1, a description of the deficiency. Attach additional sheets, as necessary.

Date:

Inspector's Initials:

**FORM AS-2
INSPECTION CHECKLIST FORM**

**ANCILLIARY SYSTEMS
YOUNGS AVEUNE LANDFILL, RIVERHEAD, NEW YORK
(Reference Drawing No. 1, Section 3.4, 4.4)**

Description	Check Box	Status/Comments
Site Access :		
- <i>Front gates</i>		
- <i>Fence</i>		
Lower Walking Path (along main access road and bench):		
- <i>Condition of asphalt</i>		
- <i>Rutting, washouts</i>		
- <i>Depressions/settlement</i>		
Upper Walking Path (landfill mound area)		
- <i>Condition of asphalt</i>		
- <i>Rutting, washouts</i>		
- <i>Depressions/settlement</i>		

Notes:

- 1 Use a check in the status/comments box to indicate that the specific item in the area has been inspected and no problems were noted.
- 2 Use "NS" (Not Satisfactory) in the status box where problems are noted. Mark location of NS condition on Drawing No. 1.
- 3 For boxes checked NS, provide, on Form DP-1, a description of the deficiency. Attach additional sheets, as necessary

Date:

Inspector's Initials:

FORM GMS-1

**INSPECTION CHECKLIST
GROUNDWATER MONITORING SYSTEM**

**YOUNGS AVENUE LANDFILL, RIVERHEAD, NEW YORK
(Reference, Figure 3.1, Section 3.5.2, 4.3)**

Item No.	Item Title	WELL NUMBER			
		S-73271	S-73270	S-112833	S-12834
1	Damage/Vandalism				
2	Settlement				
3	Accessibility				
4	Vegetation				

Notes:

- 1 Use a check in the box to indicate that the specific item in the area has been inspected and no problems were noted.
- 2 Use "NS" (Not Satisfactory) where problems are noted.
- 3 For boxes checked NS, provide, on Form DP-1, a description of the deficiency. Attach additional sheets, as necessary.

Date:

Inspector's Initials:

FORM DP-1

**DESCRIPTION OF DEFICIENCIES AND PROBLEMS
YOUNGS AVEUNE LANDFILL, RIVERHEAD, NEW YORK**

Form No.	Location	Description of Deficiency	Corrective Action Required	Corrective Action Taken
FCS-1	Zone 2, sideslope	Dead Vegetation	Investigate cause, reseed	No indications of LFG or leachate, reseeded in accordance with 4.1.1
SWS-1	Basin 1, SE corner	Debris	[to be completed and submitted with subsequent quarterly report]	[to be completed and submitted with subsequent quarterly report]

Date:

Inspected by:

Page of

Weather

Inspector Signature:

FORM DP-1
DESCRIPTION OF DEFICIENCIES AND PROBLEMS
YOUNGS AVEUNE LANDFILL, RIVERHEAD, NEW YORK

Form No.	Location	Description of Deficiency	Corrective Action Required	Corrective Action Taken

Date:

Inspected by:

Page of

Weather

Inspector Signature:

Appendix E
Monitoring Forms

LFG PERIMETER PROBE MONITORING DATA

Date: _____ Staff: _____
 Weather Conditions: _____ Wind Speed: _____ mph
 Barometric Pressure: _____ Wind Direction: _____

Field Calibration - Gas Composition Meter

Meter Manufacturer: _____ Meter Model No.: _____ Meter Serial No.: _____
 Date/Time (Must be within 2 hours of reading date/time): _____ Performed By: _____

Calibration Gas

Zero Gas Composition				Manufactured By:	Manufacture Date:	Expiration Date:	Lot / ID Number	Comments
CH ₄ (%)	CO ₂ (%)	N ₂ (%)	O ₂ (%)					
0.0 (Fresh Air)	0.0 (Fresh Air)	79.1 (Fresh Air)	0.0 (Span Gas)	Fresh Air	NA	NA	NA	Span gas used as zero gas for O ₂ sensor.
Span Gas Composition				Manufactured By:	Manufacture Date:	Expiration Date:	Lot / ID Number	Comments
CH ₄ (%)	CO ₂ (%)	N ₂ (%)	O ₂ (%)					
50.0	35.0	15.0	20.9 (Fresh Air)					Fresh air used as span gas for O ₂ sensor.

Reading After Calibration

Zero Gas Reading			Span Gas Reading		
CH ₄ (%)	CO ₂ (%)	O ₂ (%)	CH ₄ (%)	CO ₂ (%)	O ₂ (%)

Sample Location	Date	Time	CH ₄	CO ₂	O ₂	Balance	Static	Comments
Perimeter Probes								
GP-1								
GP-2								
GP-3								
GP-4								
GP-5								
GP-6								

Appendix F

Groundwater Well Background Information

County SuffolkWell Number S-112833**COMPLETION REPORT—LONG ISLAND WELL**

OWNER Town of Riverhead		*LOG Ground Surface		
ADDRESS 200 Howell Ave., Riverhead, NY 11701		EL. _____ ft. above sea		
LOCATION OF WELL Riverhead Landfill - MoniWell No. MW-1S S/S Youngs Ave., W/S Osborn Ave., Baiting Hollow		_____ ft.		
DEPTH OF WELL BELOW SURFACE 40 feet		DEPTH TO GROUNDWATER FROM SURFACE		
SCH.40 FJPVC CASINGS		TOP OF WELL		
DIAMETER 4 in. 4 (stickup) in. in. in.				
LENGTH 20 ft. 2 ft. ft. ft.				
SEALING Cement Grout				See coring log for S-112834
CASINGS REMOVED None				
SCH.40 FJPVC SCREENS				
MAKE Bedrock				
OPENINGS 20 slot				
DIAMETER 4 in. in. in. in.				
LENGTH 20 ft. ft. ft. ft.				
DEPTH TO TOP FROM TOP OF CASING 22 feet				
PUMPING TEST				
DATE N/A		TEST OR PERMANENT PUMP?		
DURATION OF TEST days hours		MAXIMUM DISCHARGE gallons per min.		
STATIC LEVEL PRIOR TO TEST ft. in. below top of casing		LEVEL DURING MAXIMUM PUMPING in. below top of casing		
MAXIMUM DRAWDOWN ft.		Approximate time of return to normal level after cessation of pumping hours min.		
PUMP INSTALLED				
TYPE N/A	MAKE	MODEL NUMBER		
MOTIVE POWER	MAKE	H.P.		
CAPACITY g.p.m. against ft. of discharge head				
NUMBER OF BOWLS OR STAGES ft. of total head				
DROP LINE		SUCTION LINE		
DIAMETER N/A in.		DIAMETER N/A in.		
LENGTH ft.		LENGTH ft.		
METHOD OF DRILLING ☐ rotary ☐ cable tool ☒ other Auger		USE OF WATER Monitoring Well		
WORK STARTED 9/23/98		COMPLETED 9/23/98		
DATE 12/15/98	DRILLER Delta Well & Pump Co., Inc.	REGISTRATION NO. 1299		
* NOTE: Show log of well materials encountered, with depth below ground surface, water bearing beds and water levels in each, casings, screens, pump, additional pumping tests and other matters of interest. Describe repair job. See instructions as to Well Driller's Registration and Reports.				

ORIGINAL—Environmental Conservation Copy

APPENDIX E -

NEW YORK STATE DEPARTMENT OF
ENVIRONMENTAL CONSERVATION
COMPLETION REPORT - LONG ISLAND WELL (#S-112834)

County SuffolkWell Number S-112834**COMPLETION REPORT—LONG ISLAND WELL**

OWNER Town of Riverhead		*LOG Ground Surface	
ADDRESS 200 Howell Ave., Riverhead, NY 11701		EL. _____ ft. above sea	
LOCATION OF WELL Riverhead Landfill - MoniWell No. MW-1D S/S Youngs Ave., W/S Osborn Ave., Baiting Hollow		_____ ft.	
DEPTH OF WELL BELOW SURFACE 85 feet	DEPTH TO GROUNDWATER FROM SURFACE		
SCH.40 FJPVC CASINGS			
DIAMETER 4 in. 4 (stickup) in. _____ in. _____ in.			
LENGTH 70 ft. 2 ft. _____ ft. _____ ft.			
SEALING Cement grout	CASINGS REMOVED none		
SCH.40 FJPVC SCREENS			
MAKE Bedrock	OPENINGS 20 slot		
DIAMETER 4 in. _____ in. _____ in. _____ in.			
LENGTH 15 ft. _____ ft. _____ ft. _____ ft.			
DEPTH TO TOP FROM TOP OF CASING 72 feet			
PUMPING TEST			
DATE N/A		TEST OR PERMANENT PUMP?	
DURATION OF TEST _____ days _____ hours		MAXIMUM DISCHARGE _____ gallons per min.	
STATIC LEVEL PRIOR TO TEST _____ ft. _____ in. below top of casing		LEVEL DURING MAXIMUM PUMPING _____ in. below top of casing	
MAXIMUM DRAWDOWN _____ ft.	Approximate time of return to normal level after cessation of pumping _____ hours _____ min.		
PUMP INSTALLED			
TYPE N/A	MAKE	MODEL NUMBER	
MOTIVE POWER	MAKE	H.P.	
CAPACITY _____ g.p.m. against		_____ ft. of discharge head	
NUMBER OF BOWLS OR STAGES		_____ ft. of total head	
DROP LINE		SUCTION LINE	
DIAMETER N/A in.		DIAMETER N/A in.	
LENGTH _____ ft.		LENGTH _____ ft.	
METHOD OF DRILLING ☐ rotary ☐ cable tool ☒ other <u>Auger</u>		USE OF WATER Monitoring Well	
WORK STARTED 9/17/98		COMPLETED 9/22/98	
DATE 12/15/98	DRILLER Delta Well & Pump Co., Inc.	REGISTRATION NO. 1299	
* NOTE: Show log of well materials encountered, with depth below ground surface, water bearing beds and water levels in each, casings, screens, pump, additional pumping tests and other matters of interest. Describe repair job. See instructions as to Well Driller's Registration and Reports.			

ORIGINAL—Environmental Conservation Copy

APPENDIX C -

DELTA WELL & PUMP CO., INC.
CORING LOG FOR WELL NO. S-112834

DELTA WELL & PUMP CO, INC
97 UNION AVENUE, PO BOX 1309, RONKONKOMA, NY 11779

CORING LOG

Job Name	Town of Riverhead	Job No	510
Job Location	Riverhead Landfill	Well No	
	Youngs Avenue	DEC No	S-112834
Reference Point	Grade	SWL	
Date Started	9/17/98	Completed	9/18/98
		Driller	B. Devine

SAMPLE			length	BLOWS				FORMATION
core or tube	#	actual depth						
C	1	-2		5	5	10	22	Brown sand, fine, fine gravel stones
C	2	5-7		5	5	9	5	Light gray sand brown sand fine to medium dark gray sand fine paper, rubber, glass
C	3	10-12		5	2	2	3	Light brown sand fine light gray fine sand
C	4	15-17		8	7	5	5	Brown sand fine to medium
C	5	20-22		15	12	12	18	Light gray sand fine dark gray streaks
C	6	25-27		11	10	8	8	Gray sand brown sand fine to medium gravel
C	7	30-32		12	9	10	11	Dark gray sand fine to medium gravel
C	8	35-37		5	6	7	7	Gray sand fine to medium gravel
C	9	40-42		8	6	5	6	Gray sand fine to medium gravel
C	10	45-47		7	8	7	7	Gray sand fine to medium gravel
C	11	50-52		9	11	8	9	Gray sand fine to medium gravel stones
C	12	52-57		10	18	12	11	Gray sand fine to medium gravel
C	13	60-62		12	13	10	10	Gray sand fine to medium gravel
C	14	65-70		8	10	9	9	Gray sand fine to medium gravel
C	15	70-72		11	15	10	11	Gray sand fine to medium fine gravel
C	16	75-77		8	9	7	7	Gray sand fine to medium gravel
C	17	80-82		9	7	8	8	Light gray sand fine to medium
C	18	85-87		10	11	5	9	Light gray sand fine
C	19	87-89		15	17	12	11	Light gray sand tan sand fine silty sand
C	20	90-92		9	10	14	18	Brown sand fine tan silty clay sand
C	21	95-97		11	10	8	10	Gray sand fine to medium
C	22	100-102		8	9	9	9	Gray sand fine
C	23	105-107		9	10	11	11	Tan clay fine to medium gray sand fine gravel
C	24	110-112		10	18	11	14	Gray sand silty fine sand fine to medium gravel
C	25	115-117		20	27	31	42	Silty sand very fine tan light gray

SCS ENGINEERS, PC

December 15, 2008
File No 13206007.01

Mr. Robert Terry
Terry Contracting & Materials, Inc.
840 West Main Street
Riverhead, New York 11901

Subject: Groundwater Monitoring Wells
Youngs Avenue Landfill Closure
Riverhead, New York

Dear Bob:

Terry Contracting and Materials, Inc. (TCM), as part of the landfill closure, is required to properly abandon and reinstall two existing groundwater monitoring wells per Section 02620 of the contract documents. The existing shallow groundwater monitoring well, S-73271 (S), is located outside the footprint of the landfill cap and had not been damaged during construction. Therefore, this well does not to be abandoned and reinstalled. However, TCM is required to raise the well to meet new elevations and provide a protective casing per Specification Section 02620.

The existing deep groundwater monitoring well, S-73270(D), could not be located during construction of the cap. SCS has contacted Suffolk County Department of Health Services (SCDHS) and they require no further action on the abandonment of the deep well S-73270(D). However, the well is required to be replaced. On October 30, 2008, SCS Engineers met on site with Ralph Milito, SCDHS, to confirm a new location for 73270(D) outside the landfill cap. Mr. Milito's only requested that the new well be properly protected and be easily accessible for sampling.

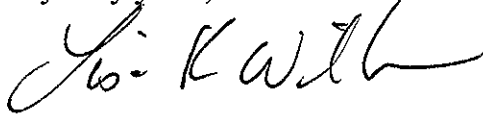
The new well shall be constructed to the depths indicated on the Well Completion Report from the previous well installation (see attached). The SCDHS requires that the well have a 2-inch diameter Schedule 80 PVC casing, Type 304 stainless steel screen, a five-foot screen at bottom, and the casing should extend a minimum of two feet above grade.

At the time of well installation SCS will identify the exact location. TCM should survey the final location of both existing and new well and include on the record drawings. We note TCM is required to develop the well per specification Section 02620 – 3.3.G.

Mr. Robert Terry
December 15, 2008
Page 2

Please call with any questions.

Very truly yours,

A handwritten signature in black ink, appearing to read "Lisa Wilkinson", written in a cursive style.

Lisa Wilkinson, PE
Project Manager

A handwritten signature in black ink, appearing to read "Peter F. Kupfer", written in a cursive style.

Peter F. Kupfer, PE
Vice President
SCS ENGINEERS, PC

cc: K. Testa
C. Fritz, NYSDEC
K. Peterson

WILLIAM
County

COMPLETION REPORT - LONG ISLAND WELL

73270 DEEP

7322
W-11 No.

OWNER S. C. D. H. S.			
ADDRESS Rabro Dr East Hempstead, N.Y.			
LOCATION OF WELL Riverhead Landfill			
DEPTH OF WELL BELOW SURFACE 305 ft.		DEPTH TO GROUND WATER FROM SURFACE 55 ft. ±	
CASINGS			
DIAMETER 2 in.	50 ft. 80	60 ft. 80	in.
LENGTH ft.	ft.	ft.	ft.
SEALING		CASINGS REMOVED	
SCREENS			
MAKE Iron Wirewound Jet Point		OPENINGS # 10 Slot	
DIAMETER 2" in.	in.	in.	in.
LENGTH 3 ft. 5' SCREEN 5'	ft.	ft.	ft.
DEPTH TO TOP FROM TOP OF CASING			
PUMPING TEST			
DATE		TEST OR PERMANENT PUMP?	
DURATION OF TEST days		MAXIMUM DISCHARGE gallons per min.	
STATIC LEVEL PRIOR TO TEST ft.		LEVEL DURING MAXIMUM PUMPING ft. in. below top of casing	
MAXIMUM DRAWDOWN ft.		Approximate time of return to normal level after cessation of pumping hrs. min.	
PUMP INSTALLED			
TYPE	MAKE	MODEL NO.	
MOTIVE POWER	MAKE	H.P.	
CAPACITY	g.p.m. against ft. of discharge head		
NUMBER BOWLS OR STAGES	ft. of total head		
DROP LINE		SUCTION LINE	
DIAMETER in.	DIAMETER in.		
LENGTH ft.	LENGTH ft.		
METHOD OF DRILLING ☐ rotary ☐ cable tool ☒ other Conv. Rotary		USE OF WATER	
WORK STARTED 8/5/82		COMPLETED 8/24/82	
DATE 8/30/82	DRILLER P. Bucher	LICENSE NO. -	

* LOG
Ground Surface
El. _____ ft. ab

Existing Grade
TOP OF WELL

Two
Foot
Above
2"

302'

11" Reducer

5'

*NOTE: Show log of well - materials encountered, with depth below ground surface, water bearing beds and water levels in each, casings, screens, pump, additional pumping tests and other matters of interest. Describe repair job. See Instructions as to Well Drillers' Licenses and Reports. Pages 5 - 7.

DUPLICATE - Retain

Rotary

Appendix G

FPM Letter

FPM Group, Ltd.
FPM Engineering Group, P.C.
formerly Fanning, Phillips and Molnar

CORPORATE HEADQUARTERS
909 Marconi Avenue
Ronkonkoma, NY 11779
631/737-6200
Fax 631/737-2410

September 27, 2006

Mr. Carl Fritz, Jr.
Environmental Engineer I
Division of Solid Waste
New York State Department of Environmental Conservation
SUNY – Building 40
Stony Brook, New York 11790

Re: Youngs Avenue Landfill
Riverhead, NY

Dear Mr. Fritz:

Thank you for meeting with Town representatives and FPM Group regarding initial planning aspects associated with capping the above-referenced landfill. Below is our understanding of the main points discussed during our September 25, 2006 meeting.

Traditional Cap

1. NYSDEC will allow a reduced setback/buffer zone from 100' to 50' in certain areas. Those areas include the northern boundary up by Youngs Avenue and a portion of the eastern boundary extending from Youngs Ave south to where the arc of the adjacent 21.4 acre open space parcel begins (see attached marked up Suffolk County Tax Map of the area). The southeast corner and southern boundary would retain a 100' buffer. The western boundary of the landfill is well within the property boundary (several hundred feet); therefore the typical 100' buffer/setback is already achieved.
2. NYSDEC will allow an increased slope from 1 on 3 to 1 on 2 ½ with slope stability analysis (e.g., use of geogrid to stabilize slopes).
3. NYSDEC will allow use of the reclaimed stockpiled sand for the soil gas layer with appropriate geotechnical testing (i.e., permeability analysis). The reclaimed sand can also be used for the barrier protection layer provided the glass in the sand can be engineered so as not to puncture the geomembrane. The placement of a geogrid on top of the membrane was discussed. It will afford some measure of protection to the geomembrane and will be a requirement if the Town decides to allow for steeper slopes. Additional screening may eliminate the need for concern.
4. NYSDEC will allow a reduced post cap environmental monitoring schedule including groundwater monitoring for once a year for the first five years. Depending on the levels found, this frequency could be reduced further. Methane monitoring will have to be quarterly for the first year and then may be reduced depending on the levels found. Note: additional monitoring wells to the typical methane monitoring network may be

required on the southeast corner of the landfill (i.e., in the area of the adjacent mid road condominium parcel).

5. NYSDEC will allow reshaping of the landfill to include moving material from the newly discovered northern portion and landfilling the material over the existing southern portion of the landfill excluding the reclaimed buffer zone area (e.g., refuse cannot be placed within the 100' or 50' outer perimeter area). Any area that has been reclaimed but not in the buffer zone can be used (this is expected to be small).
6. NYSDEC will allow the elimination of daily cover in reshaping the landfill.
7. As discussed and in accordance with the stipulation agreement, if closure involves a landfill cap, the Town can apply for variances so the cap includes the minimum requirements of a 12-inch gas venting layer with a maximum of 10% by weight passing through the #200 sieve after placement, a geomembrane barrier with a barrier protection layer of 12 inches of soil (note: alternatively it was discussed this 12" could be reclaimed sand if screened to ¼ " or 12" unscreened sand on top of a geogrid), and a minimum final 6" layer composed of any material that can be shown to be able to continually support growth.

Reclamation/Relandfill Hybrid (i.e., continue reclaiming the landfill by separating the sand, recyclables, and refuse and relandfilling only the refuse under a reduced cap. The recyclables would be recycled and the reclaimed sand would be used for the cap or other beneficial uses).

8. NYSDEC will not require an underliner system for the relandfilled portion. In the buffer zone, already reclaimed areas certified clean cannot be used for relandfill area.
9. NYSDEC may allow a modified cap if the landfill is fully reclaimed, however the specifics of the cap were not confirmed. Because the landfill material would be reclaimed and hazardous materials removed, the landfill is old producing less and less leachate and methane, and the draft Closure Investigation Report suggests no impact in 1999 before reclamation either from gas or groundwater and with no cap, we would like to propose covering the refuse with two feet of reclaimed sand and 6 inches of topsoil for a vegetative cover. No geomembrane would be installed. Also daily cover would not be required unless nuisance conditions occurred.
10. NYSDEC will allow a reduced environmental monitoring schedule. Because the refuse has been excavated, handled, and put back reducing methane generation and the material would be under a permeable cap (i.e., sand and topsoil cover only) allowing natural venting, no methane monitoring would be required. Again, because the landfill material would be reclaimed and hazardous materials removed, the landfill is old producing less and less leachate, and the draft Closure Investigation Report suggests no impact in 1999 before reclamation and with no barrier in place, we would request a reduced groundwater monitoring schedule of biannually for the first four years and then reducing the monitoring further if the levels show no concern.

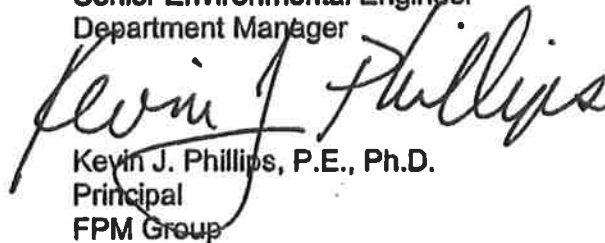
As you requested in the meeting, we are also assisting the Town in developing a Sampling and Analysis Plan (SAP) for the in-situ petroleum contaminated soil at the landfill. We are currently drafting the SAP, and upon receipt of a letter from NYSDEC to the Town with more specific plan requirements, we will finalize the plan for your review and approval.

Please review and provide your concurrence with the 10 points summarized above. If you should have any questions, please do not hesitate to call.

Very truly yours,



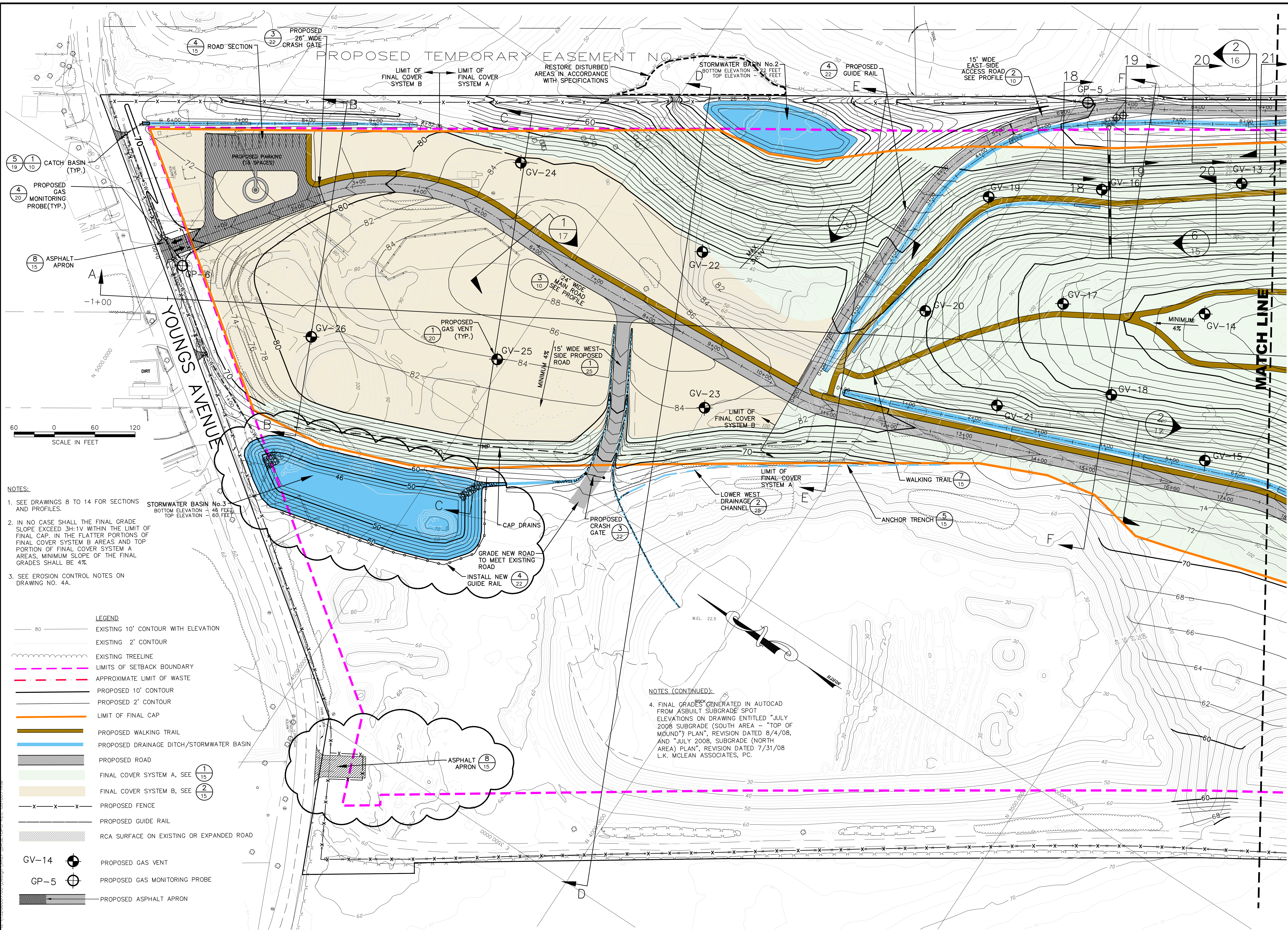
Kevin F. Loyst, P.E.
Senior Environmental Engineer
Department Manager



Kevin J. Phillips, P.E., Ph.D.
Principal
FPM Group

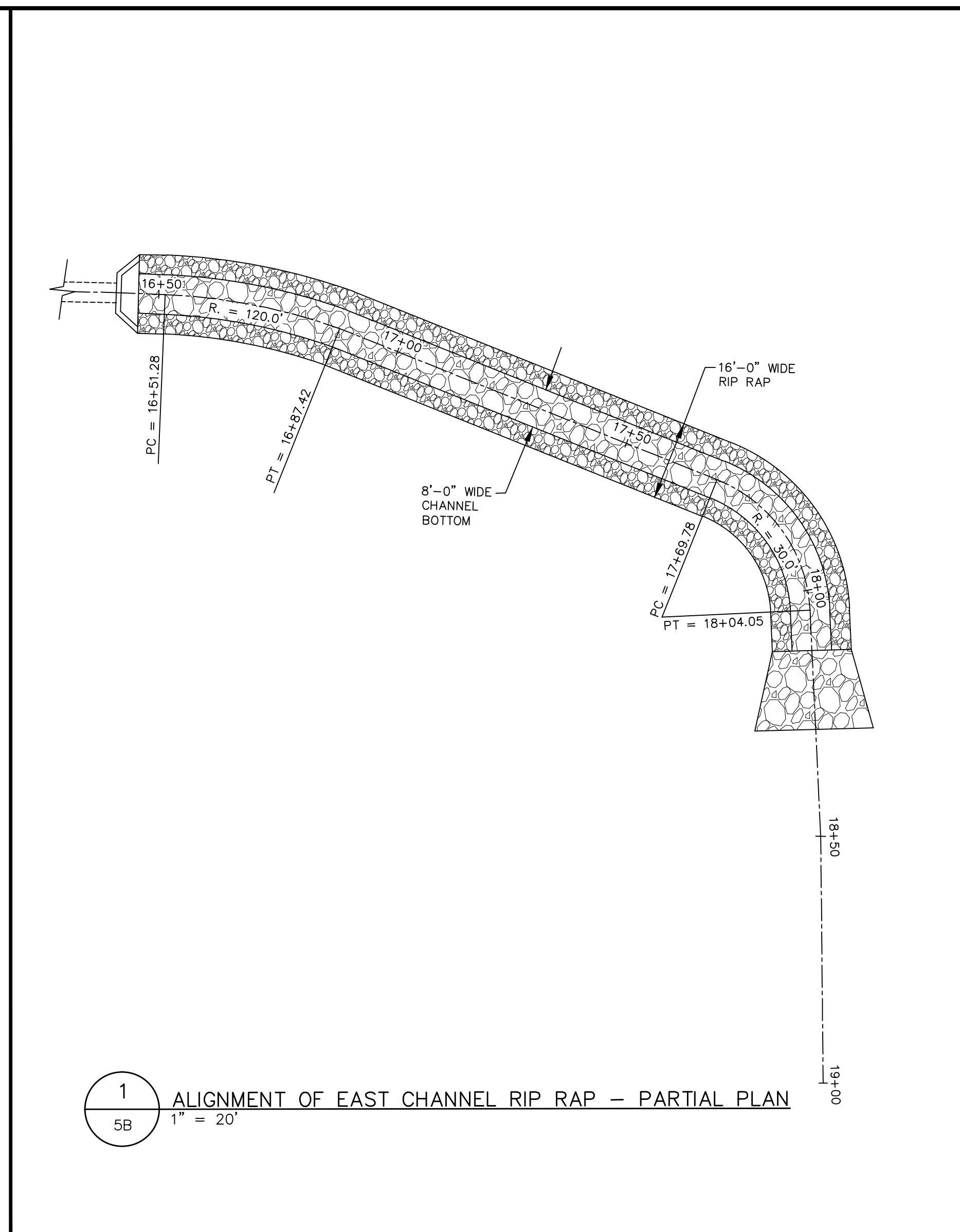
KFL/KJP:kfl
Attachment

cc: Ken Testa
Barbara Blass
Phil Cardinale



SCS ENGINEERS, PC STEARNS, CONRAD AND SCHMIDT CONSULTING ENGINEERS, INC. 140 ROUTE 303, VALLEY COTTAGE, NEW YORK 10889 PH. (646) 353-5727 FAX. (646) 353-5731 PROJ. NO. 1320506007.00 DWG. B7C S/M P TASK B7C LKW S/M P GPM PFK	CLIENT	TOWN OF RIVERHEAD 200 HOWELL AVENUE RIVERHEAD, NEW YORK 11901	
	CADD FILE:	DESIGN-P&P	
	DATE:	11/1/07	
	SCALE:	1" = 60'	
DRAWING NO.		5A of 24	
SHEET TITLE		FINAL GRADING PLAN AND LFG MANAGEMENT PLAN	
PROJECT TITLE		YOUNGS AVENUE LANDFILL CLOSURE PLAN	
NO.		REVISION	
A		ISSUED FOR BIDDING 11/1/07	
A		REV'D CAP. AREA-WEST SIDE 5/14/08	
A		top of landfill grading change 10/16/08	
A		west channel, and asphalt 01/07/09	
A		Revise Stormwater Basin #3 02/23/09	
A		Revise Southeast access road 04/29/09	

FILE: G:\13266007\01\FINAL DRAWINGS IN COA REPORT\GHT 5A-B-SITE PLANS.DWG, DATE: 02/20/2013 09:35:44AM BY: 6131KW XREFS: C:\Documents and Settings\SEAN PAKS\Desktop\Contract Drawings\Revisions\WEE\waste limit by 6pm



1
5B
ALIGNMENT OF EAST CHANNEL RIP RAP - PARTIAL PLAN
1" = 20'

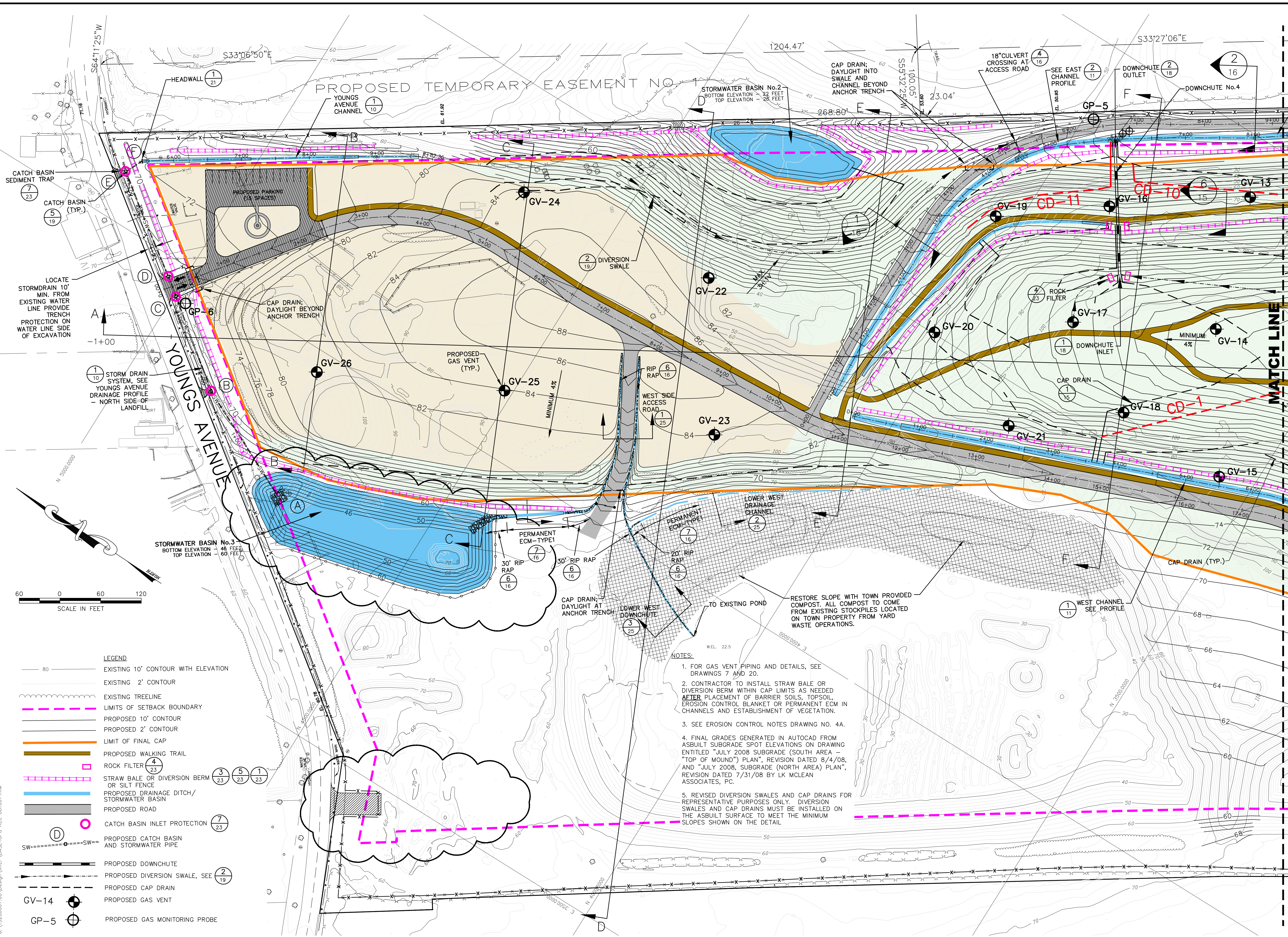
- NOTES:
- SEE DRAWINGS 8 TO 14 FOR SECTIONS AND PROFILES.
 - IN NO CASE SHALL THE FINAL GRADE SLOPE EXCEED 3H:1V WITHIN THE LIMIT OF FINAL CAP. IN THE FLATTER PORTIONS OF FINAL COVER SYSTEM B AREAS AND TOP PORTION OF FINAL COVER SYSTEM A AREAS, MINIMUM SLOPE OF THE FINAL GRADES SHALL BE 4%.
 - SEE EROSION CONTROL NOTES ON DRAWING NO. 4A.
 - FINAL GRADES GENERATED IN AUTOCAD FROM ASBUILT SUBGRADE SPOT ELEVATIONS ON DRAWING ENTITLED "JULY 2008 SUBGRADE (SOUTH AREA - "TOP OF MOUND") PLAN", REVISION DATED 8/4/08, AND "JULY 2008, SUBGRADE (NORTH AREA) PLAN", REVISION DATED 7/31/08 L.K. MCLEAN ASSOCIATES, PC.

- LEGEND
- EXISTING 10' CONTOUR WITH ELEVATION
 - EXISTING 2' CONTOUR
 - EXISTING TREELINE
 - LIMITS OF SETBACK BOUNDARY
 - APPROXIMATE LIMIT OF WASTE
 - PROPOSED 10' CONTOUR
 - PROPOSED 2' CONTOUR
 - LIMIT OF FINAL CAP
 - PROPOSED WALKING TRAIL
 - PROPOSED DRAINAGE DITCH/STORMWATER BASIN
 - PROPOSED ROAD
 - FINAL COVER SYSTEM A, SEE 1/15
 - FINAL COVER SYSTEM B, SEE 2/15
 - PROPOSED FENCE
 - PROPOSED GUIDE RAIL
 - RCA SURFACE ON EXISTING OR EXPANDED ROAD
 - SLOPE STABILIZATION
 - ENHANCED EROSION CONTROL MAT IN SELECTED AREAS OF SLOPE, NOT STEEPER THAN 2H:1V
 - GV-14 PROPOSED GAS VENT
 - GP-5 PROPOSED GAS MONITORING PROBE



SHEET TITLE		NO.		REVISION		DATE	
FINAL GRADING PLAN AND LFG MANAGEMENT PLAN							
PROJECT TITLE							
YOUNGS AVENUE LANDFILL CLOSURE PLAN							
CLIENT							
TOWN OF RIVERHEAD							
200 HOWELL AVENUE							
RIVERHEAD, NEW YORK 11901							
SCS ENGINEERS, PC							
STEARNS, CONRAD AND SCHMIDT							
CONSULTING ENGINEERS, INC.							
148 ROUTE 303 VALLEY COTTAGE, NEW YORK 0989							
PH. (845) 353-5727 FAX. (845) 353-5731							
PROJECT NO. 13266007.00							
DWG. BY: SAMP							
CHK. BY: GPM							
APP. BY: LKW							
PFC							
CADD FILE: DESIGN-P&P							
DATE: 11/1/07							
SCALE: 1" = 60'							
DRAWING NO.							
5B of 24							

FILE: G:\13206007\01\FINAL DRAWINGS IN COA REPORT\SHIT 6A-B - STORMWATER.DWG, DATE: 02/20/2013 09:35:52AM BY: 1612LW, REFS: G:\13206007\01\SCS Drawings\Contract Drawing Revisions\SHIT 6A-B-Site Plans rev4
G:\13206007\00\Design\REF\BASE\TOP\0 REC 08/07/10M

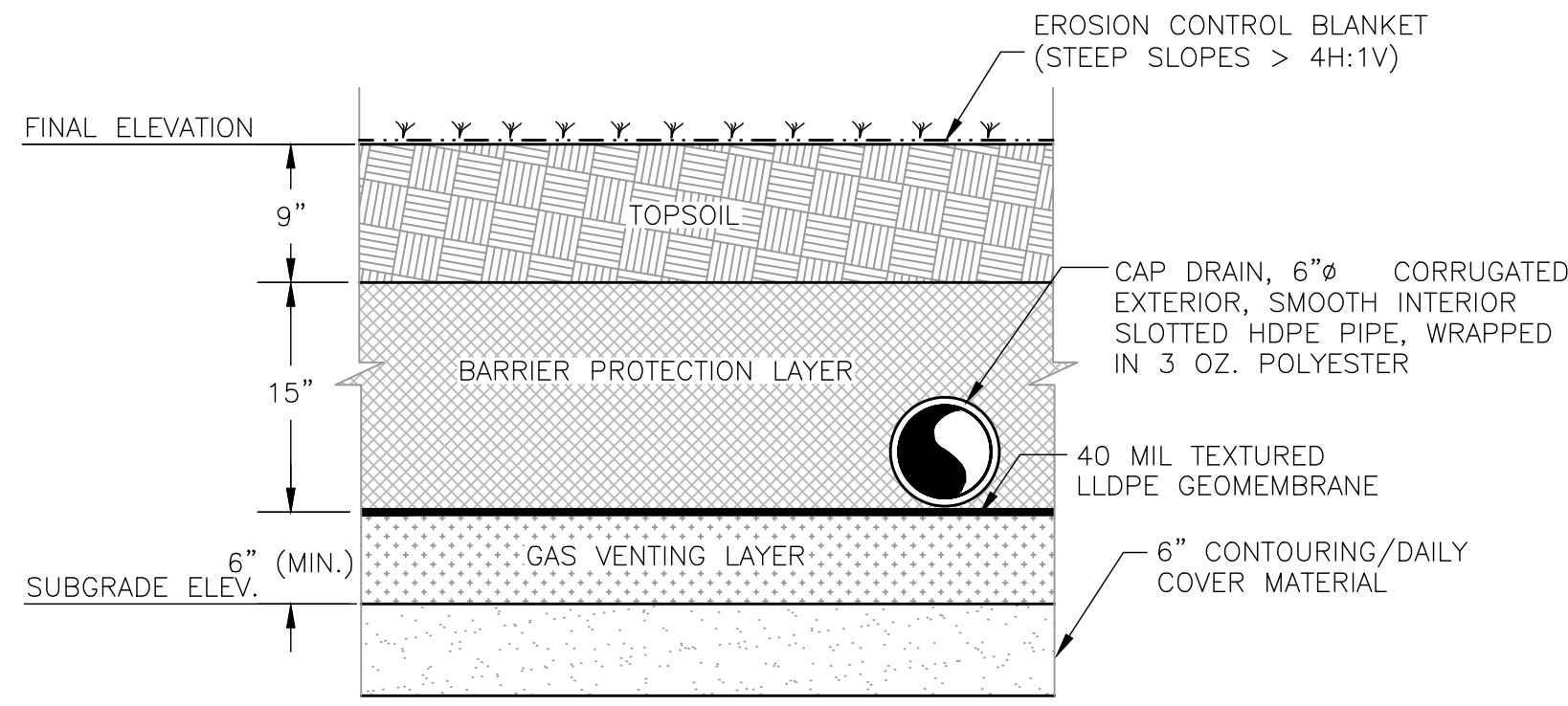


- LEGEND**
- 80 ——— EXISTING 10' CONTOUR WITH ELEVATION
 - EXISTING 2' CONTOUR
 - EXISTING TREELINE
 - LIMITS OF SETBACK BOUNDARY
 - PROPOSED 10' CONTOUR
 - PROPOSED 2' CONTOUR
 - LIMIT OF FINAL CAP
 - PROPOSED WALKING TRAIL
 - ROCK FILTER (4/23)
 - STRAW BALE OR DIVERSION BERM OR SILT FENCE
 - PROPOSED DRAINAGE DITCH/STORMWATER BASIN
 - PROPOSED ROAD
 - CATCH BASIN INLET PROTECTION (7/23)
 - SW=====SW===== PROPOSED CATCH BASIN AND STORMWATER PIPE
 - PROPOSED DOWNCHUTE
 - PROPOSED DIVERSION SWALE, SEE (2/19)
 - PROPOSED CAP DRAIN
 - PROPOSED GAS VENT
 - GV-14 ● PROPOSED GAS MONITORING PROBE
 - GP-5 ●

- NOTES:**
1. FOR GAS VENT PIPING AND DETAILS, SEE DRAWINGS 7 AND 20.
 2. CONTRACTOR TO INSTALL STRAW BALE OR DIVERSION BERM WITHIN CAP LIMITS AS NEEDED AFTER PLACEMENT OF BARRIER SOILS, TOPSOIL, EROSION CONTROL BLANKET OR PERMANENT ECM IN CHANNELS AND ESTABLISHMENT OF VEGETATION.
 3. SEE EROSION CONTROL NOTES DRAWING NO. 4A.
 4. FINAL GRADES GENERATED IN AUTOCAD FROM ASBUILT SUBGRADE SPOT ELEVATIONS ON DRAWING ENTITLED "JULY 2008 SUBGRADE (SOUTH AREA) - "TOP OF MOUND" PLAN", REVISION DATED 8/4/08, AND "JULY 2008, SUBGRADE (NORTH AREA) PLAN", REVISION DATED 7/31/08 BY LK MCLEAN ASSOCIATES, PC.
 5. REVISED DIVERSION SWALES AND CAP DRAINS FOR REPRESENTATIVE PURPOSES ONLY. DIVERSION SWALES AND CAP DRAINS MUST BE INSTALLED ON THE ASBUILT SURFACE TO MEET THE MINIMUM SLOPES SHOWN ON THE DETAIL

SCS ENGINEERS, PC STEARNS, CONRAD AND SCHMIDT CONSULTING ENGINEERS, INC. 140 ROUTE 303, VALLEY COTTAGE, NEW YORK 10989 PH: (845) 353-5727 FAX: (845) 353-5731		CLIENT TOWN OF RIVERHEAD 200 HOWELL AVENUE RIVERHEAD, NEW YORK 11901		SHEET TITLE STORMWATER AND EROSION CONTROL PLAN		NO.		REVISION		DATE	
PROJECT NO. 1.3206007.00		OWN. BY: SMP		PROJECT TITLE YOUNGS AVENUE LANDFILL CLOSURE PLAN		A		ISSUED FOR BIDDING		11/1/07	
DSK. BY: LKW		CHK. BY: GPM				A		Top of landfill grading change		10/16/08	
		APP. BY: PFFK				A		Additional Cap Drains		12/22/08	
						A		West channel / Road grades		01/07/09	
						A		Revise Stormwater Basin #3		02/23/09	
						A					

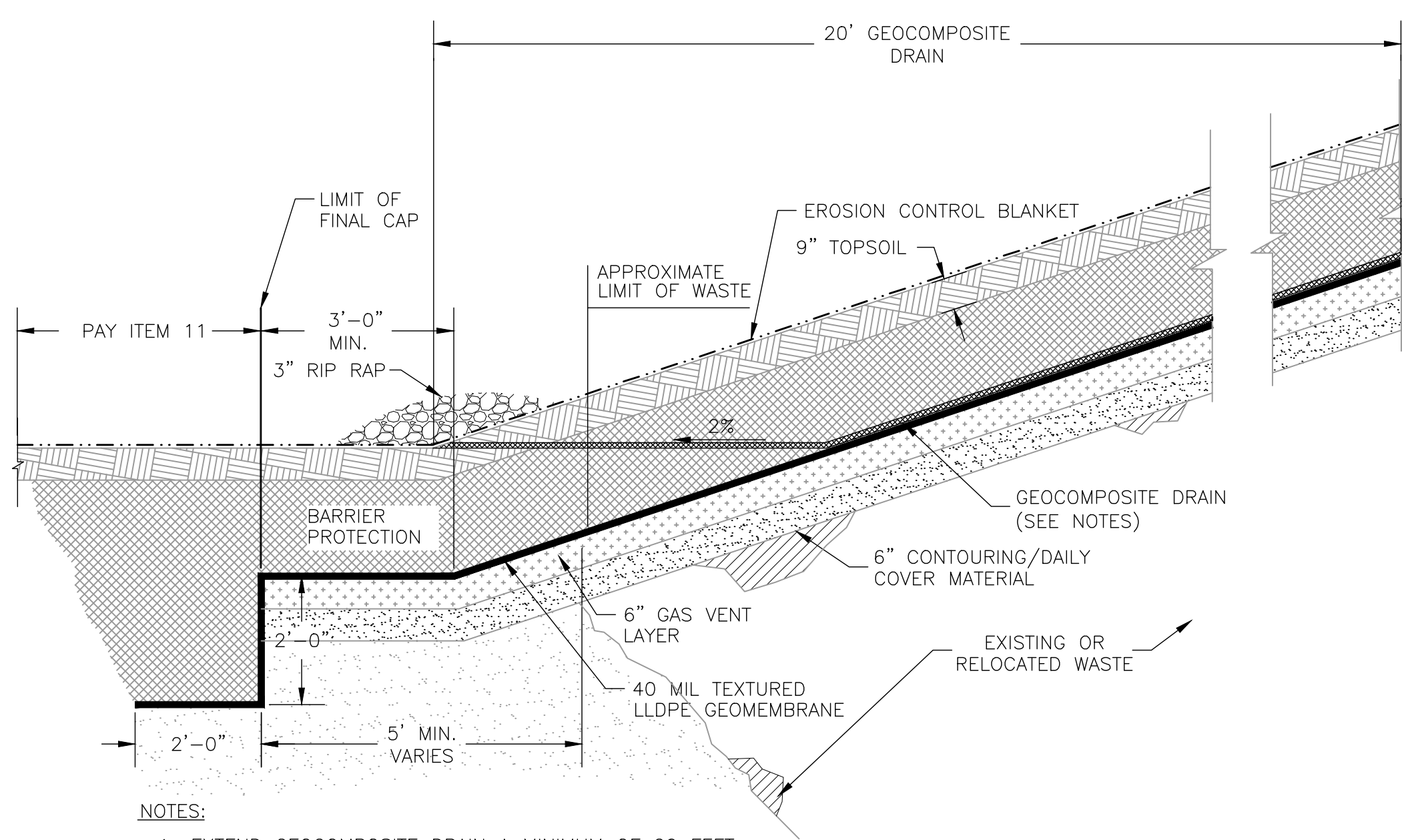
FILE: G:\13206007\01\FINAL DRAWINGS IN COA REPORT\SHT 15 - CAP DETAILS.DWG. DATE: 02/20/2013 09:42:37AM BY:1613LKW AREFS:



NOTES:

1. APPLIES TO STEEP AREAS OF LANDFILL AS INDICATED BY UNHATCHED AREAS ON DRAWING No.s 5A AND 5B
2. MINIMUM OF CAP DRAINS ON STEEP SLOPES IS 5% AND 2% MIN. ON FLAT SLOPES.

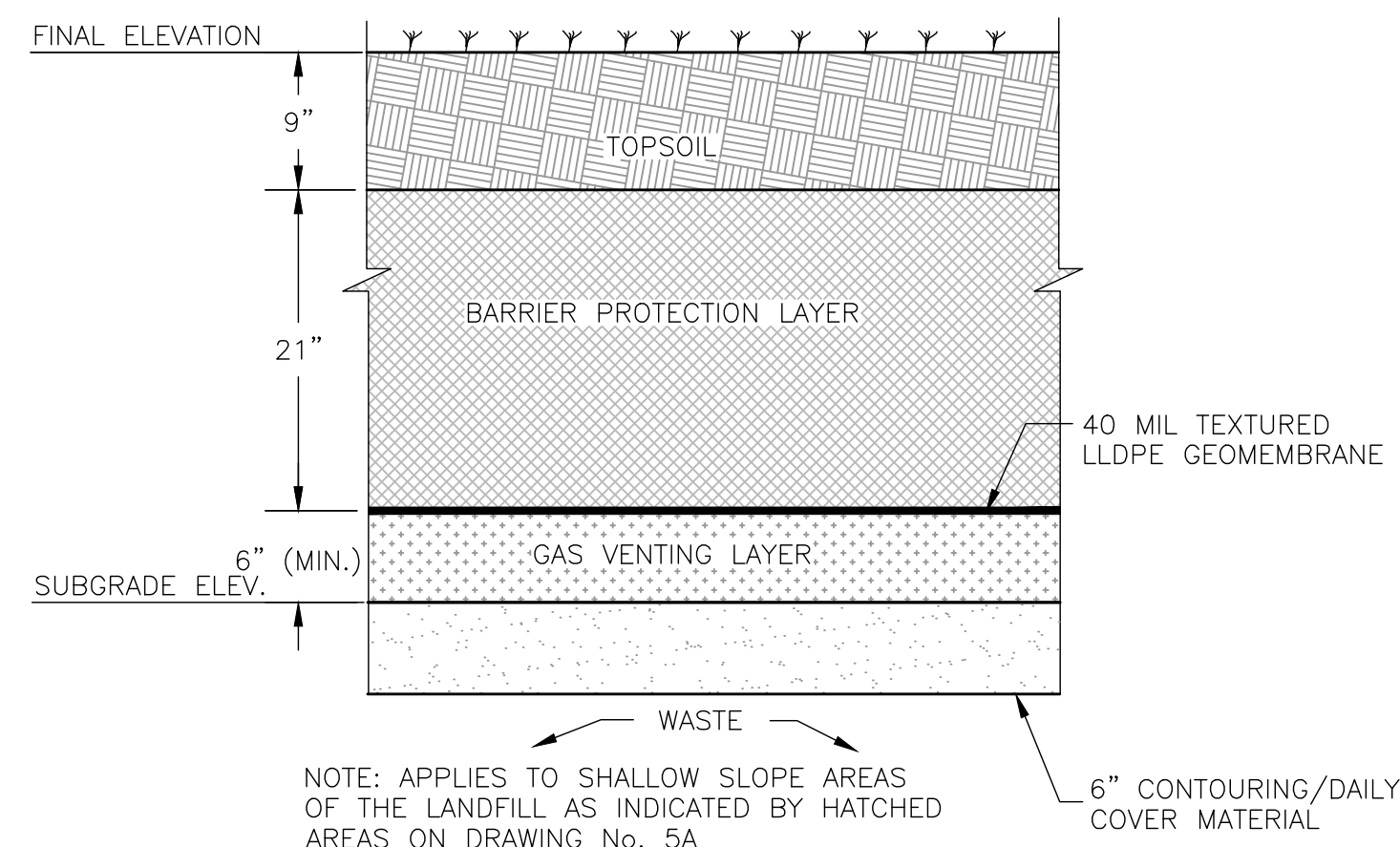
1
15
FINAL COVER SYSTEM A
1"=1'-0"



NOTES:

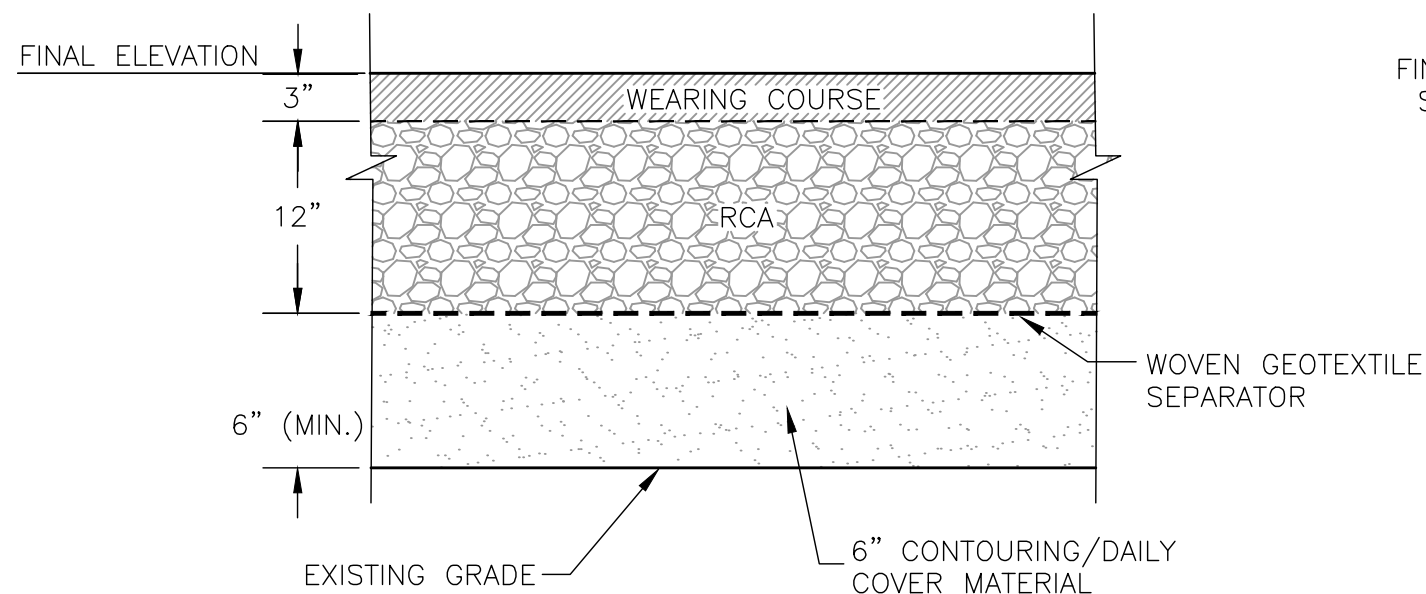
1. EXTEND GEOCOMPOSITE DRAIN A MINIMUM OF 20 FEET UPSLOPE FROM DAYLIGHT POINT. PAYMENT LIMIT TO BE 20 FEET.
2. AT ROADS, WRAP COMPOSITE AROUND CAP DRAIN, EXTEND CAP DRAIN 5' BEYOND EDGE OF ROAD, DAYLIGHT CAP DRAINS BEYOND ANCHOR TRENCH.

5
15
ANCHOR TRENCH DETAIL
1"=2'-0"

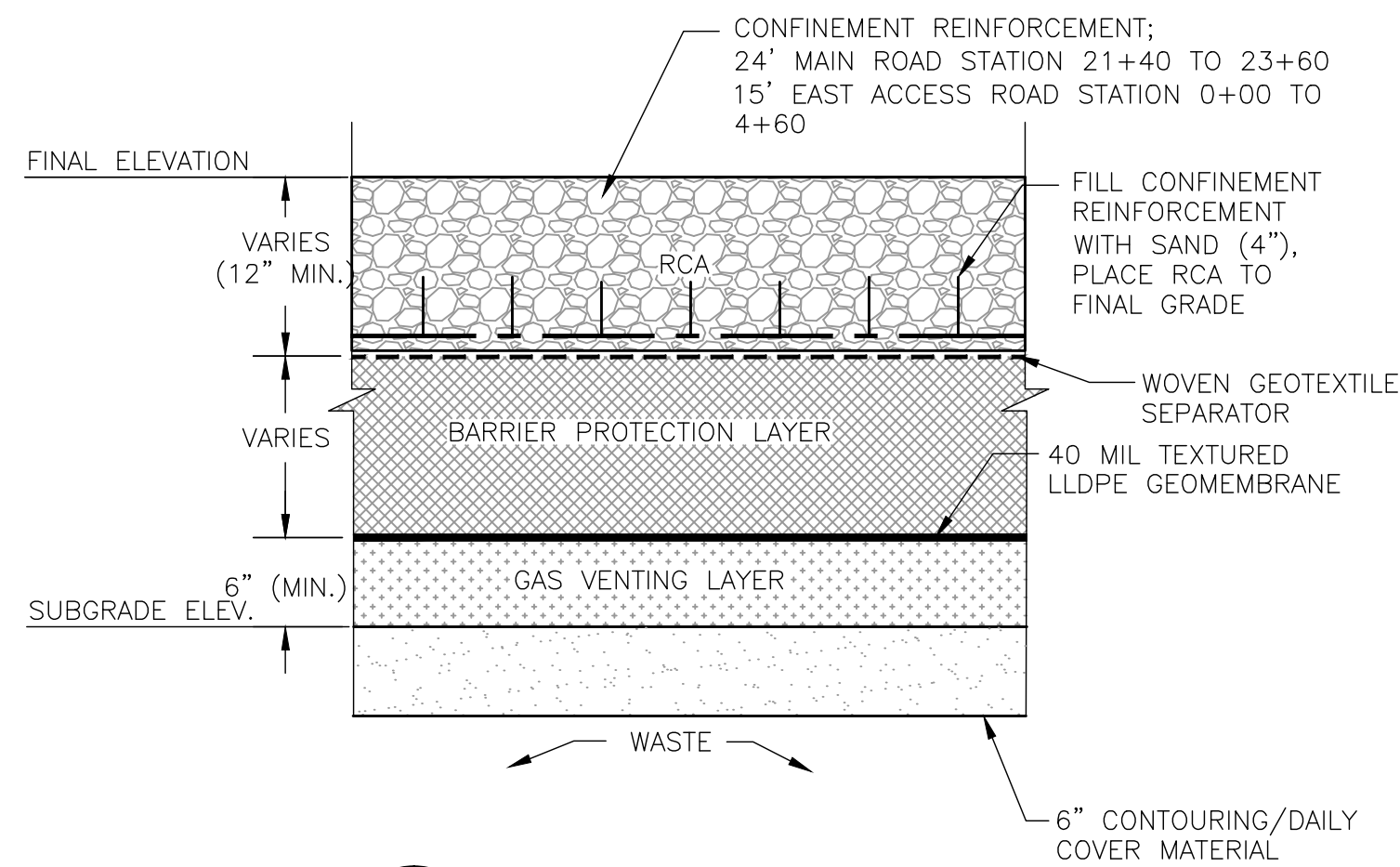


NOTE: APPLIES TO SHALLOW SLOPE AREAS OF THE LANDFILL AS INDICATED BY HATCHED AREAS ON DRAWING No. 5A

2
15
FINAL COVER SYSTEM B
1"=1'-0"



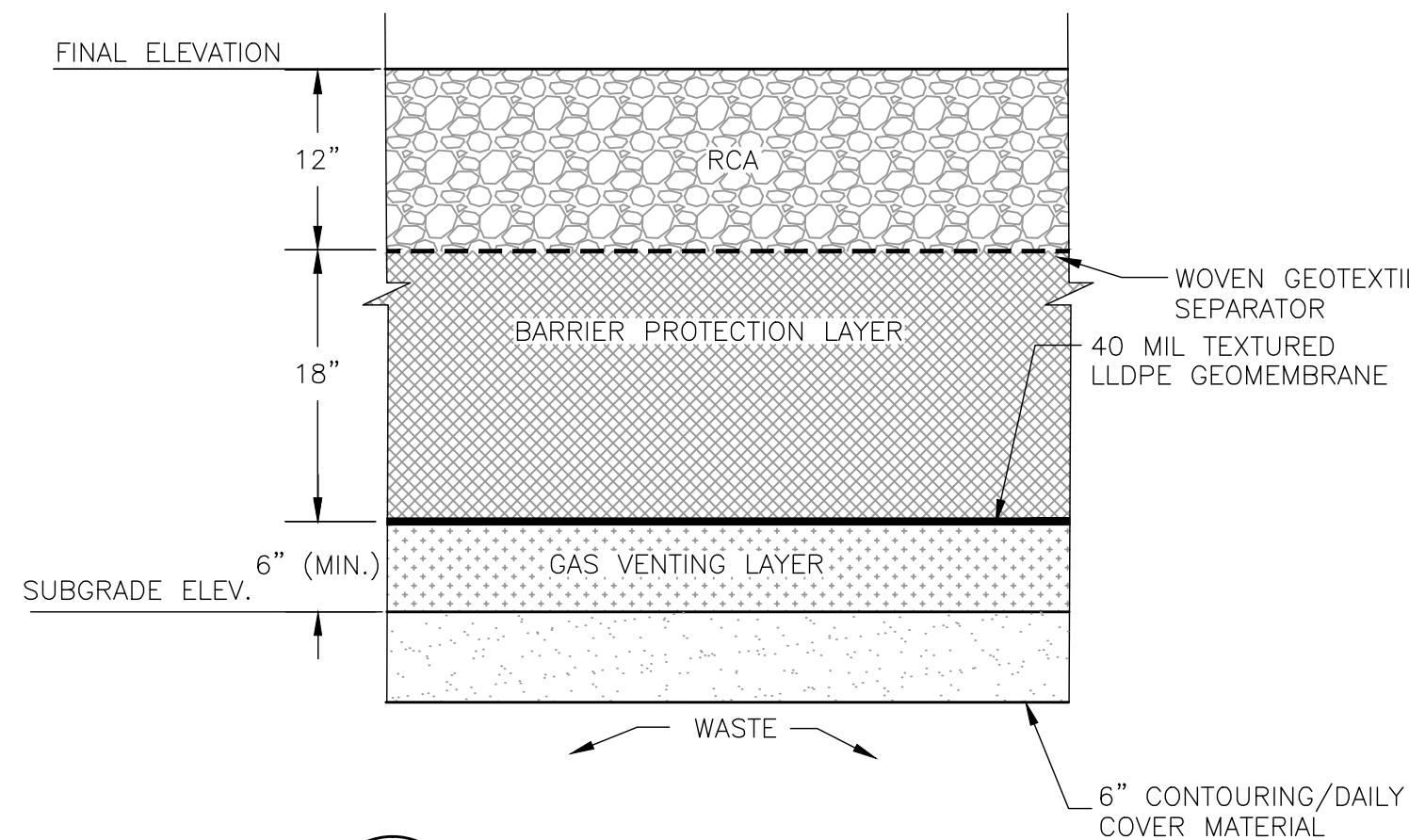
8
15
ASPHALT ROAD SECTION
1"=1'-0"



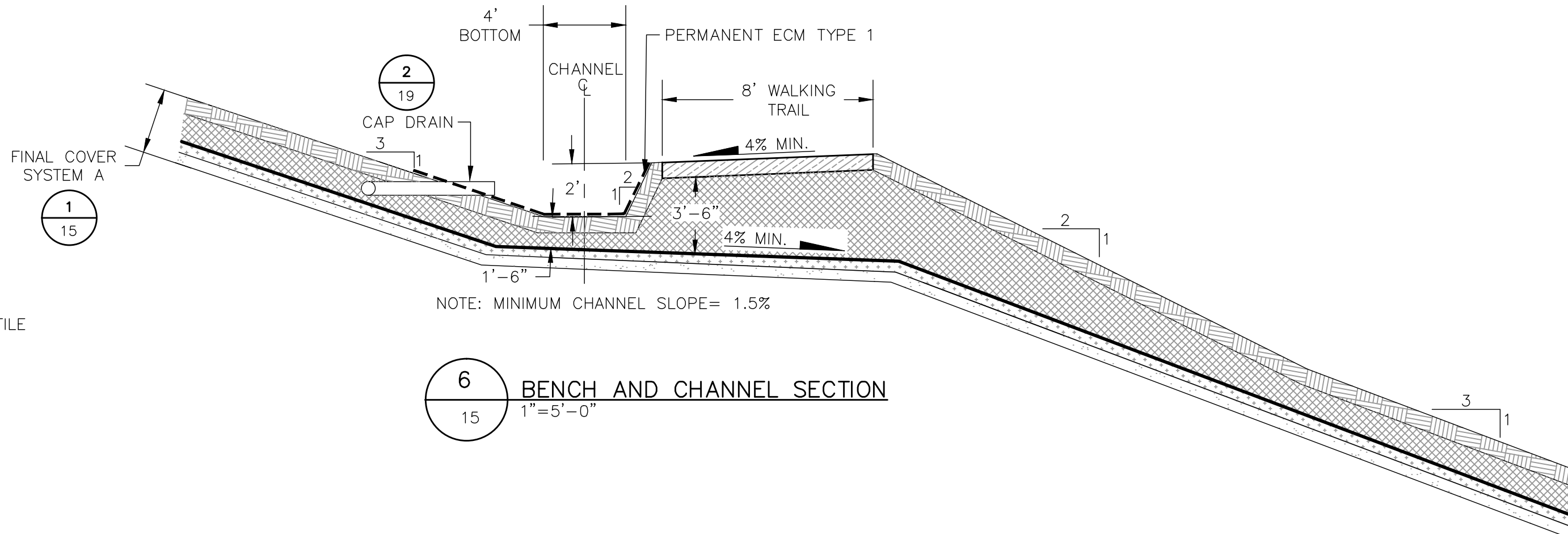
3
15
ROAD SECTION-FINAL COVER SYSTEM A
1"=1'-0"

NOTES:

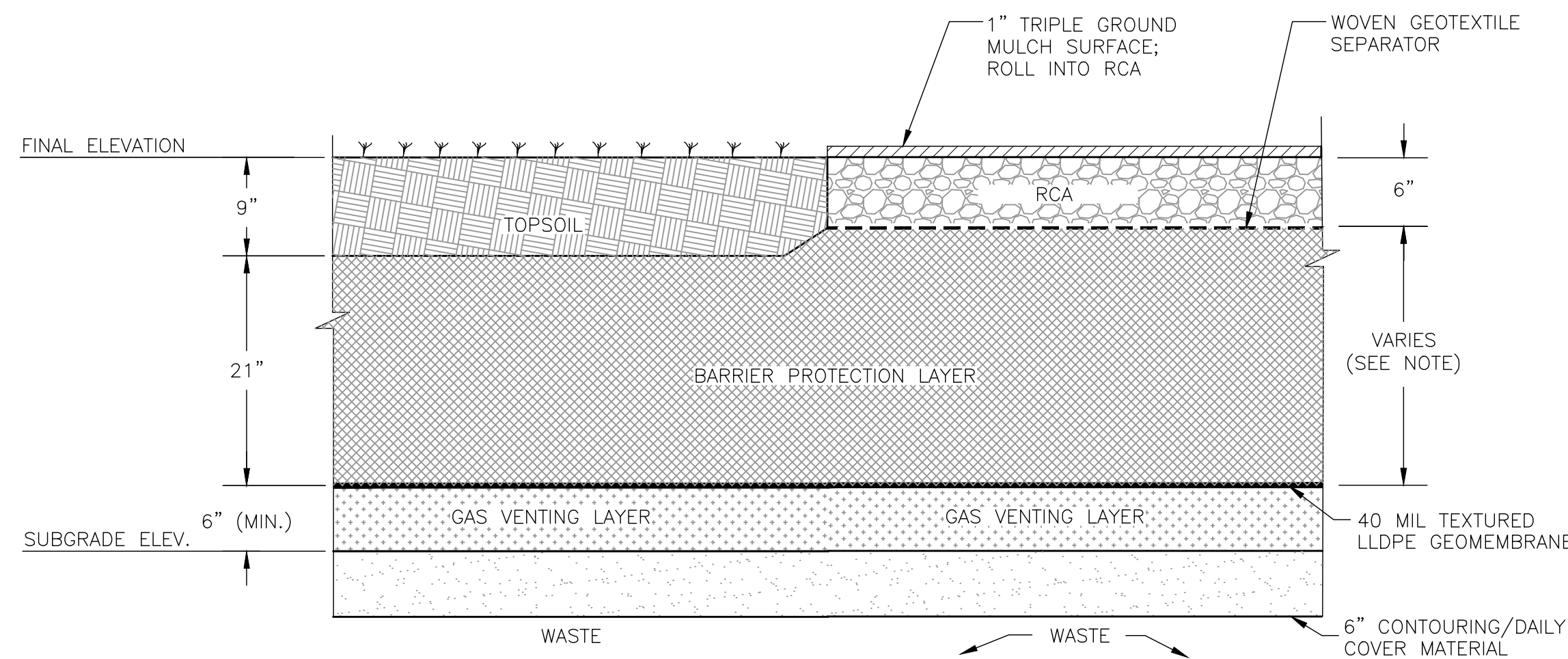
1. BARRIER PROTECTION LAYER IS RECLAIMED SAND SCREENED TO 1/4"
2. GAS VENTING LAYER IS RECLAIMED SAND SCREENED TO 1/4"
3. TOPSOIL IS RE-MIXED, RETESTED ONSITE MULCH PROVIDED BY THE OWNER-OR APPROVED OFF-SITE SUPPLIED SOURCE BY CONTRACTOR. ALL TOPSOIL WITHIN LIMIT OF FINAL CAP SHALL BE 9" THICK. ALL TOPSOIL OUTSIDE LIMIT OF FINAL CAP SHALL BE 6" THICK
4. CAP DRAIN OUTLET PIPES ARE NON-SLOTTED-POLYETHYLENE PIPES, CORRUGATED EXTERIOR AND SMOOTH INTERIOR.
5. PLACE SOILS WITHIN ONE FOOT OVER PIPE USING LOW-GROUND PRESSURE EQUIPMENT.
6. CONTOURING/DAILY COVER MATERIAL IS UNSCREENED RECLAIMED SAND.



4
15
ROAD SECTION-FINAL COVER SYSTEM B
1"=1'-0"

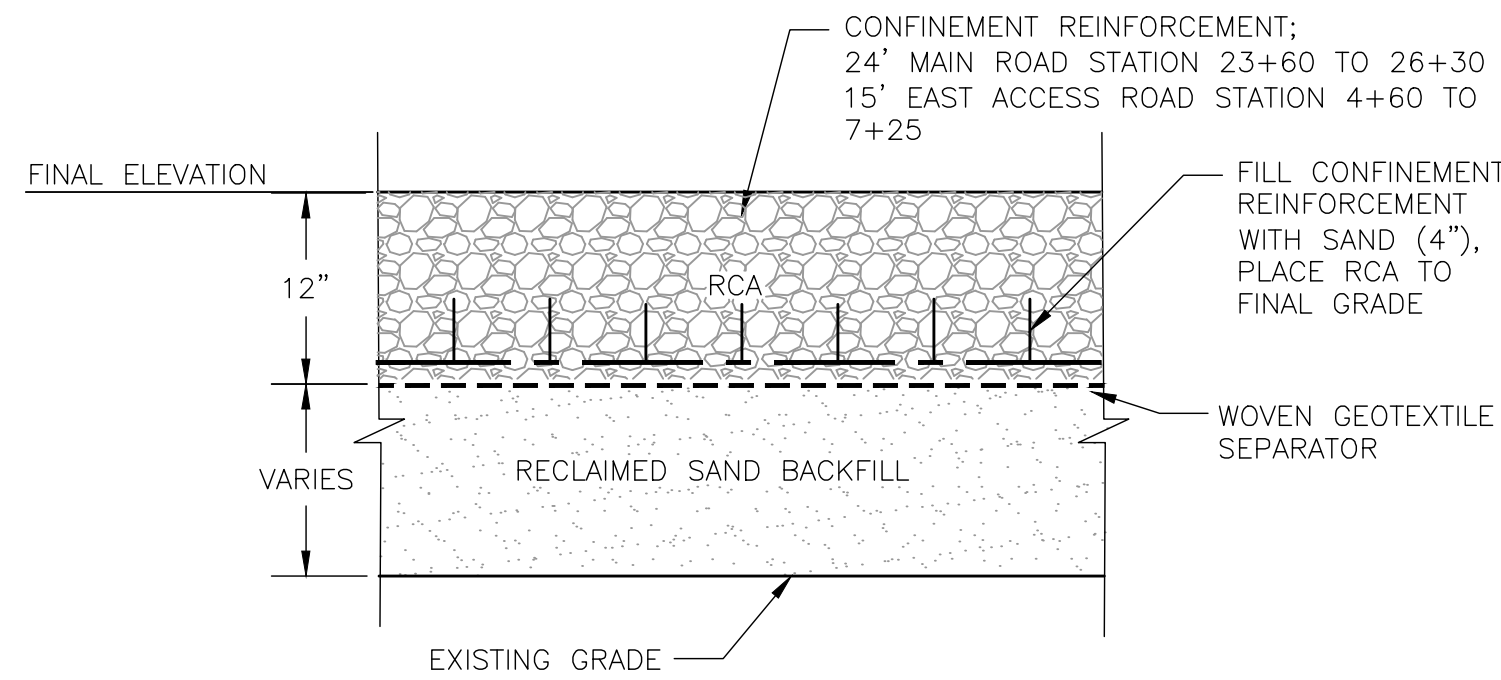


6
15
BENCH AND CHANNEL SECTION
1"=5'-0"



NOTE: BARRIER PROTECTION LAYER THICKNESS VARIES, EITHER 18" OR 24" BASED ON FINAL COVER SYSTEM A OR B.

7
15
WALKING TRAIL SECTION
1"=1'-0"



9
15
ROAD SECTION-OUTSIDE FINAL CAP LIMITS
1"=1'-0"

CLIENT

TOWN OF RIVERHEAD
200 HOWELL AVENUE
RIVERHEAD, NEW YORK 11901

SCS ENGINEERS, PC
STEARNS, CONRAD AND SCHMIDT
CONSULTING ENGINEERS, INC.

440 ROUTE 303, VALLEY COTTAGE, NEW YORK 10989
PH: (646) 363-5727 FAX: (646) 363-5731

PROJ. NO. 13206007.00
CHK. BY: LKW
APP. BY: GPM
DATE: 11/1/07

CADD FILE:
SHT 15-details

DATE: 11/1/07

SCALE:
AS SHOWN

DRAWING NO.

15 OF 24

NO.	REVISION	DATE
1	ISSUED FOR BIDDING	11/1/07
2		
3		
4		
5		

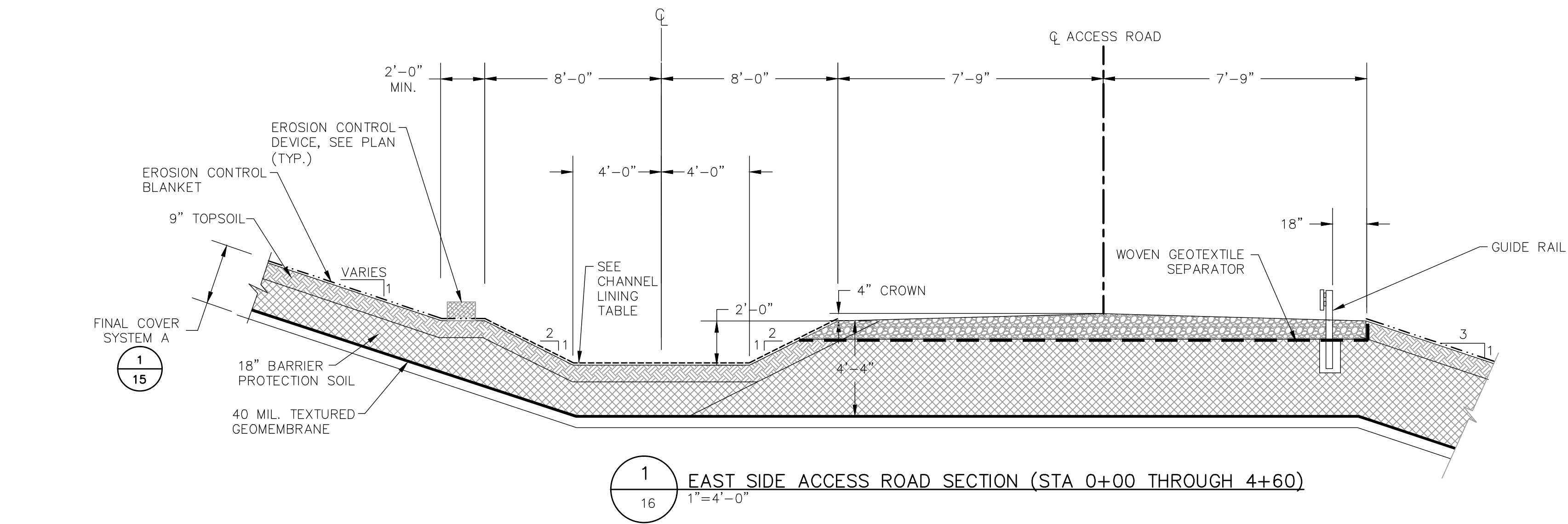
CAP SYSTEM DETAILS

SHEET TITLE

PROJECT TITLE

YOUNGS AVENUE LANDFILL
CLOSURE PLAN

FILE: G:\13206007\01\FINAL DRAWINGS IN CQA REPORT\SH1 16 - EAST ROAD DETAILS.DWG, DATE: 02/20/2013 09:43:08AM By:1613LKW XREFS:

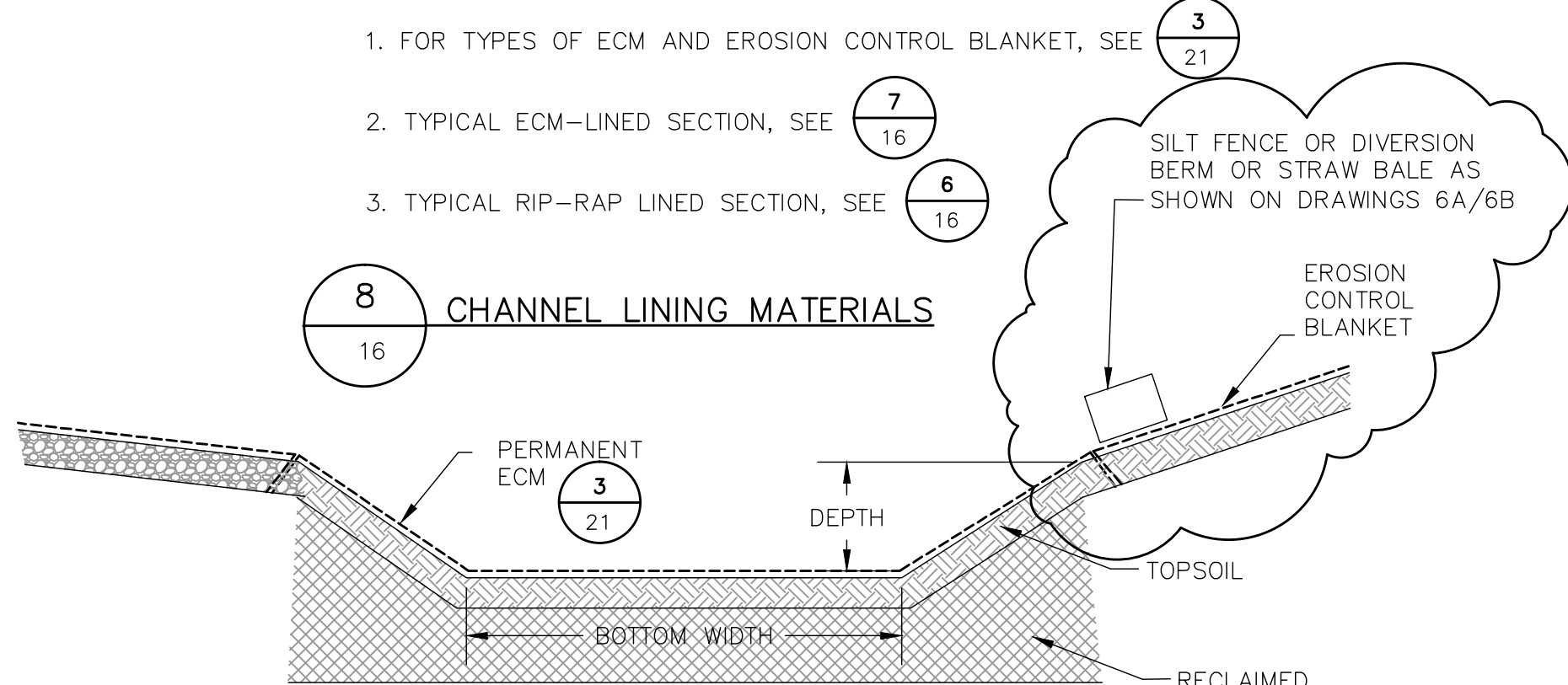


AREA	CHANNEL LINING	BOTTOM WIDTH (FT)	DEPTH (FT)	SIDE SLOPE	RIP-RAP SIZE d100 d50 d10	RIP-RAP THICKNESS
EAST CHANNEL UPPERSECTION STA. 0+00 - STA. 12+23	PERMANENT ECM TYPE 1	8	2	2 TO 1	— — —	—
EAST CHANNEL LOWERSECTION STA. 16+40 - STA. 18+00	RIP-RAP	8	2	2 TO 1	12" 8" 4"	18"
WEST CHANNEL STA. 0+00-10+54	EROSION CONTROL BLANKET	8	2	2 TO 1	— — —	—
WEST CHANNEL STA. 10+54-14+82	PERMANENT ECM TYPE 2	8	2	2 TO 1	— — —	—
YOUNGS AVENUE CHANNEL (FOR ECM SEE DETAIL 3 ON DRAWING 21)	EROSION CONTROL BLANKET	4	2	2 TO 1	— — —	—
DOWNCHUTE DISSIPATORS (DOWNCHUTES 3, 4, 5)	RIP-RAP	8	2	2 TO 1	9" 6" 3"	12"
SOUTH CHANNEL	EROSION CONTROL BLANKET	10	2	2 TO 1	— — —	—

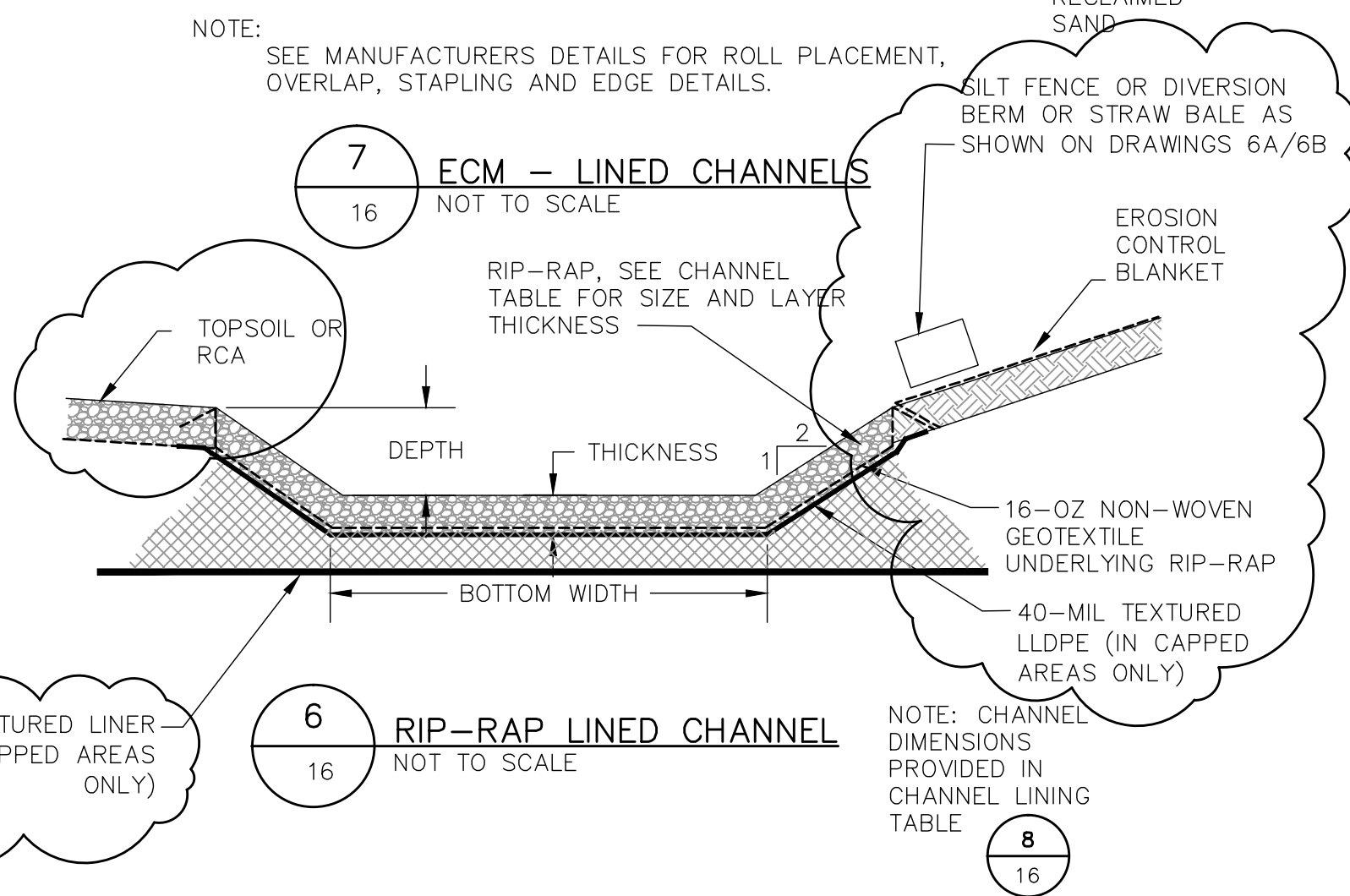
NOTES:

- FOR TYPES OF ECM AND EROSION CONTROL BLANKET, SEE 3/21
- TYPICAL ECM-LINED SECTION, SEE 7/16
- TYPICAL RIP-RAP LINED SECTION, SEE 6/16

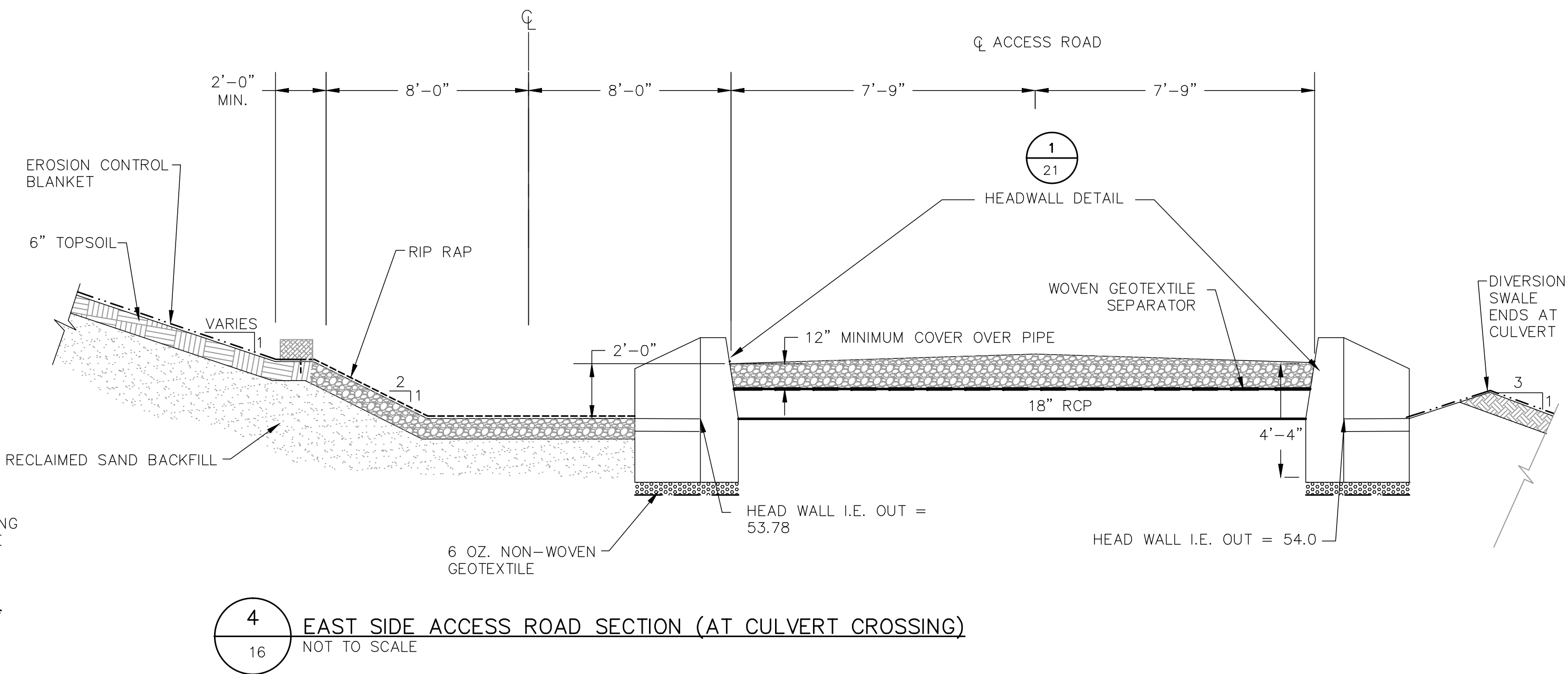
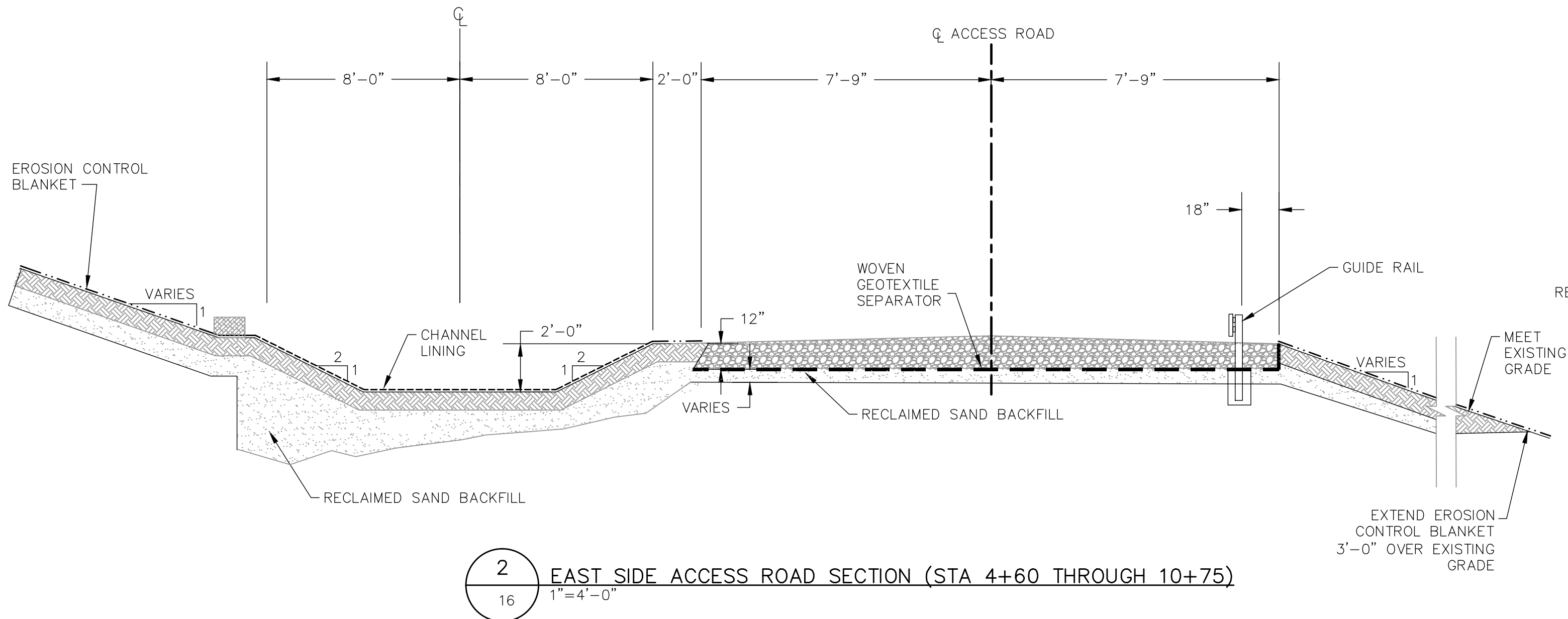
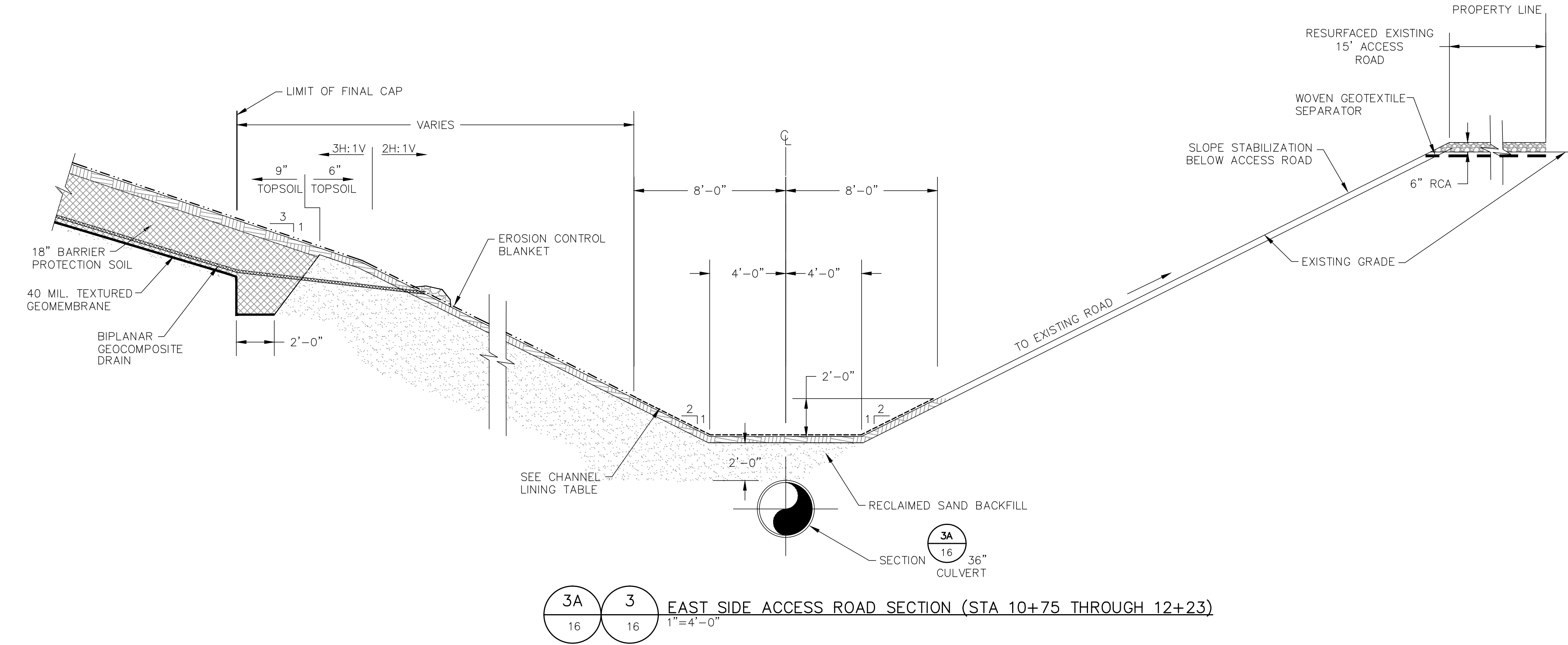
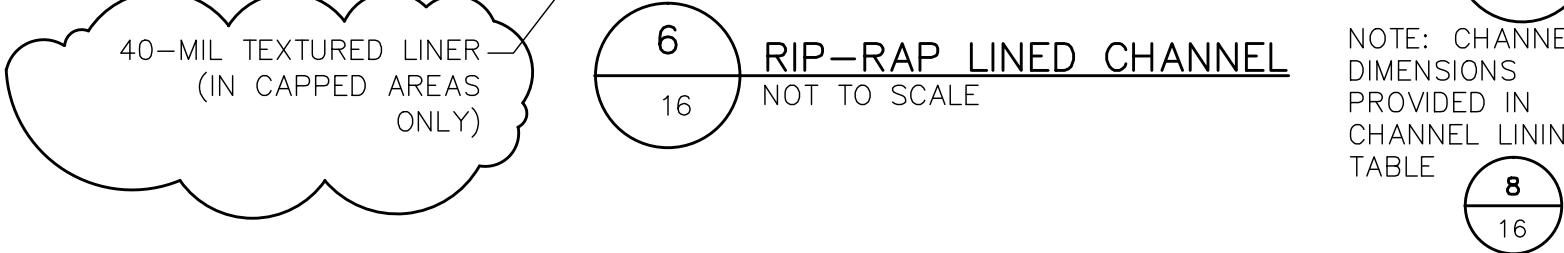
8 CHANNEL LINING MATERIALS



7 ECM - LINED CHANNELS

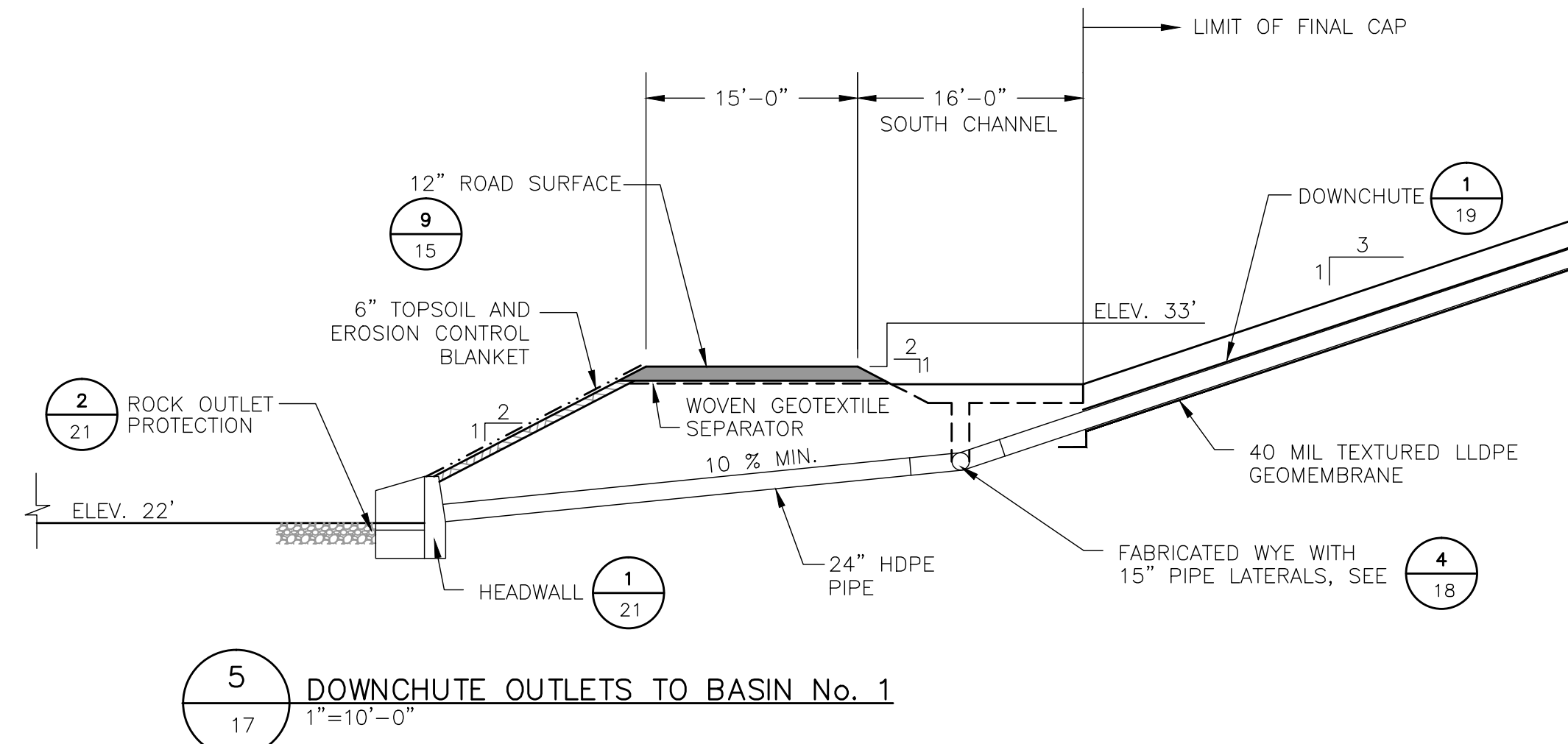
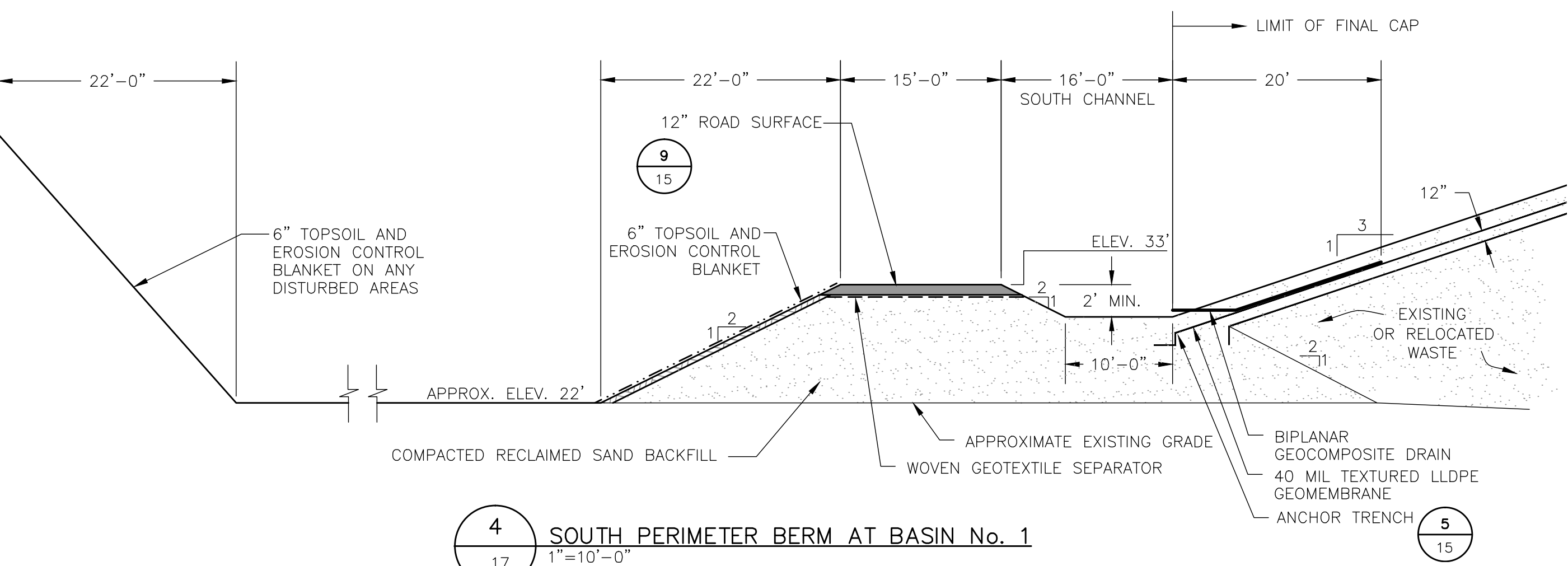
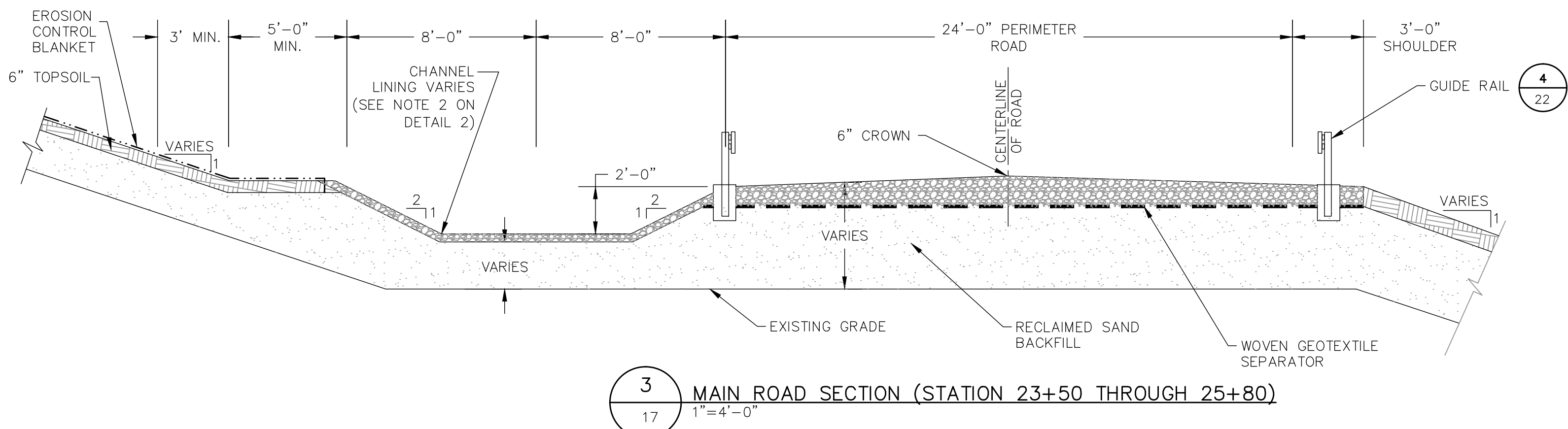
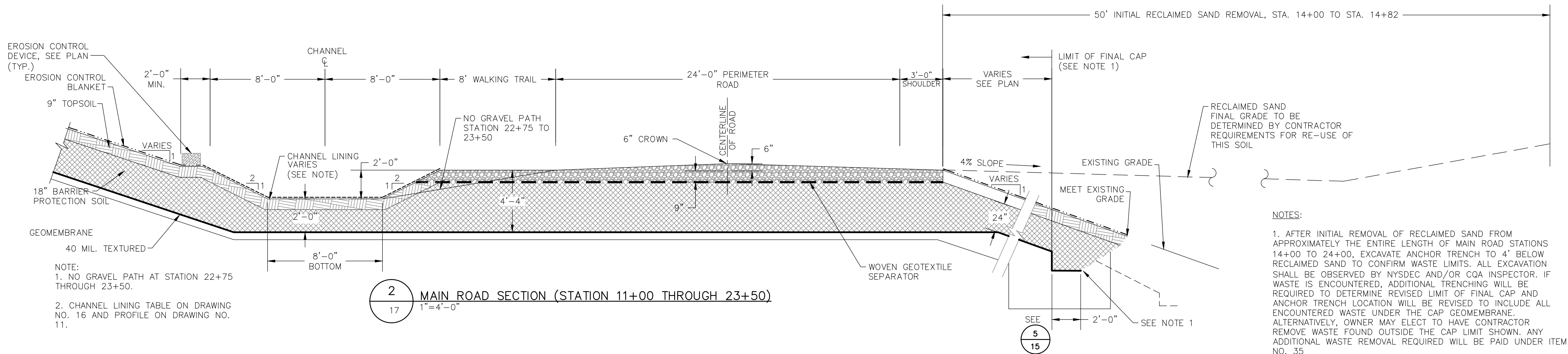
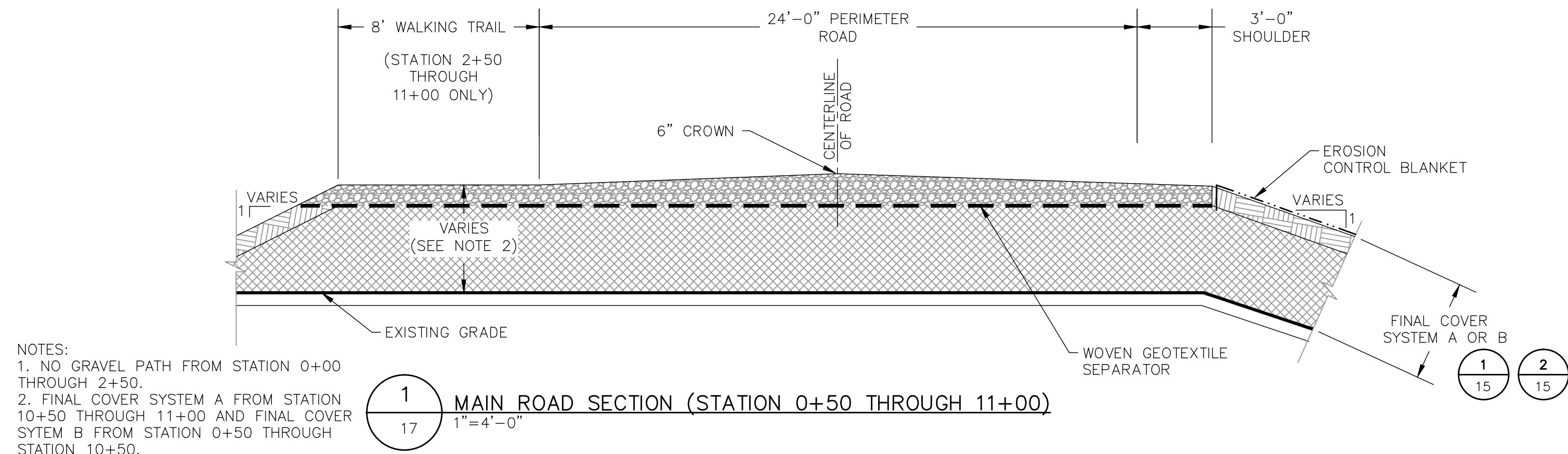


6 RIP-RAP LINED CHANNEL



DATE	11/1/07
	10/16/08
REVISION	details 6 and 7
NO.	
SHEET TITLE	EAST SIDE ROAD DETAILS
	PROJECT TITLE
CLIENT	TOWN OF RIVERHEAD
	200 HOWELL AVENUE RIVERHEAD, NEW YORK 11901
CADD FILE:	SH1 16-east rd
	DATE:
SCALE:	AS SHOWN
	DRAWING NO.
16 OF 24	

FILE: G:\13206007\01\FINAL DRAWINGS IN COA REPORT\SHIT 17 - WEST ROAD DETAILS.DWG, DATE: 02/20/2013 09:43:43AM BY: 6131.KW XREFS:



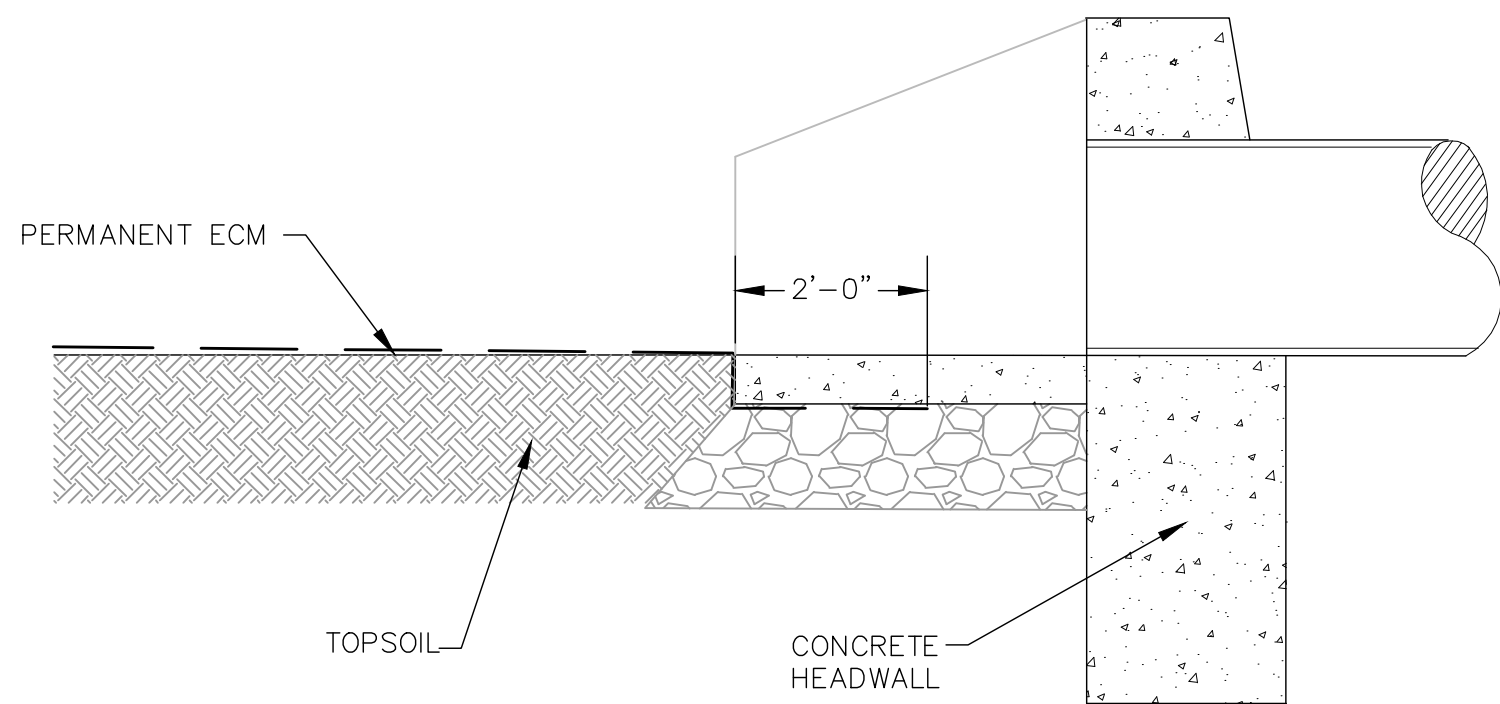
SCS ENGINEERS, PC				CLIENT		SHEET TITLE		NO.		REVISION		DATE	
STEARNS, CONRAD AND SCHMIDT CONSULTING ENGINEERS, INC. 140 ROUTE 58 WEST CHATELAIN, NEW YORK 10989 PH. (845) 353-5727 FAX. (845) 353-5731				TOWN OF RIVERHEAD		WEST AND SOUTH ROAD DETAILS		A		ISSUED FOR BIDDING		11/1/07	
PROD. NO. 1306007.00 DWG. BY: SAMP CHK. BY: GPM APP. BY: PFK LKW				200 HOWELL AVENUE RIVERHEAD, NEW YORK 11901		PROJECT TITLE		A					
CADD FILE: SHT 17-west rd						YOUNGS AVENUE LANDFILL CLOSURE PLAN		A					
DATE: 11/1/07								A					
SCALE: AS SHOWN								A					
DRAWING NO.								A					
17 OF 24								A					

FILE: G:\13206007\FINAL DRAWINGS IN COA-REPORT\SHT 21- ENDWALL.DWG. DATE: 02/20/2013 09:50:14AM BY:1613JWW XREFS:

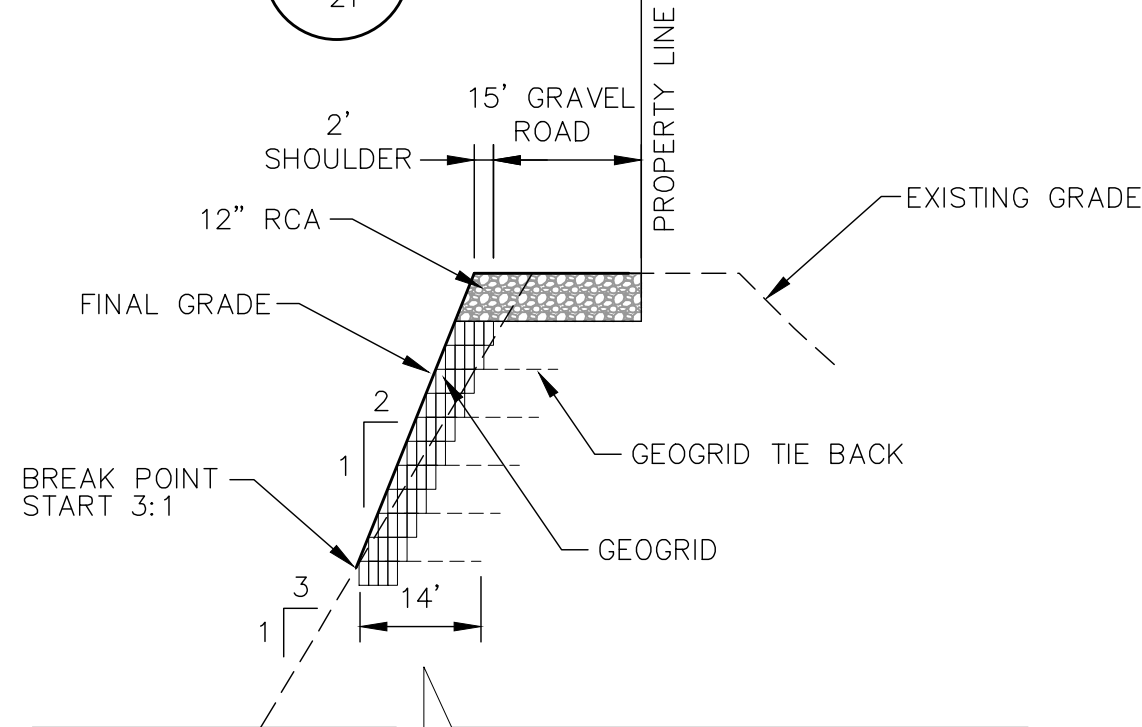
LOCATION	NAME	PRODUCT (OR EQUAL)
DIVERSION SWALES AND CHANNELS REQUIRING PERMANENT PROTECTION - LOWER VELOCITY	TYPE 1 - PERMANENT EROSION CONTROL MAT (ECM)	NORTH AMERICAN GREEN P300
CHANNELS REQUIRING PERMANENT PROTECTION - HIGHER VELOCITY	TYPE 2 - PERMANENT EROSION CONTROL MAT (ECM)	NORTH AMERICAN GREEN P550
LANDFILL SLOPES > 4%, BASIN SIDESLOPES, AND CHANNELS NEEDING PROTECTION ONLY DURING CONSTRUCTION	EROSION CONTROL BLANKET	NORTH AMERICAN GREEN SCI50
EXISTING ROAD BANK SUPPORT	SLOPE STABILIZATION	GEOWEB GW30V60804P

NOTE:
PRODUCT EQUIVALENCY BASED ON DEMONSTRATION THAT MATERIAL WILL BE STABLE AT DESIGN FLOWS.

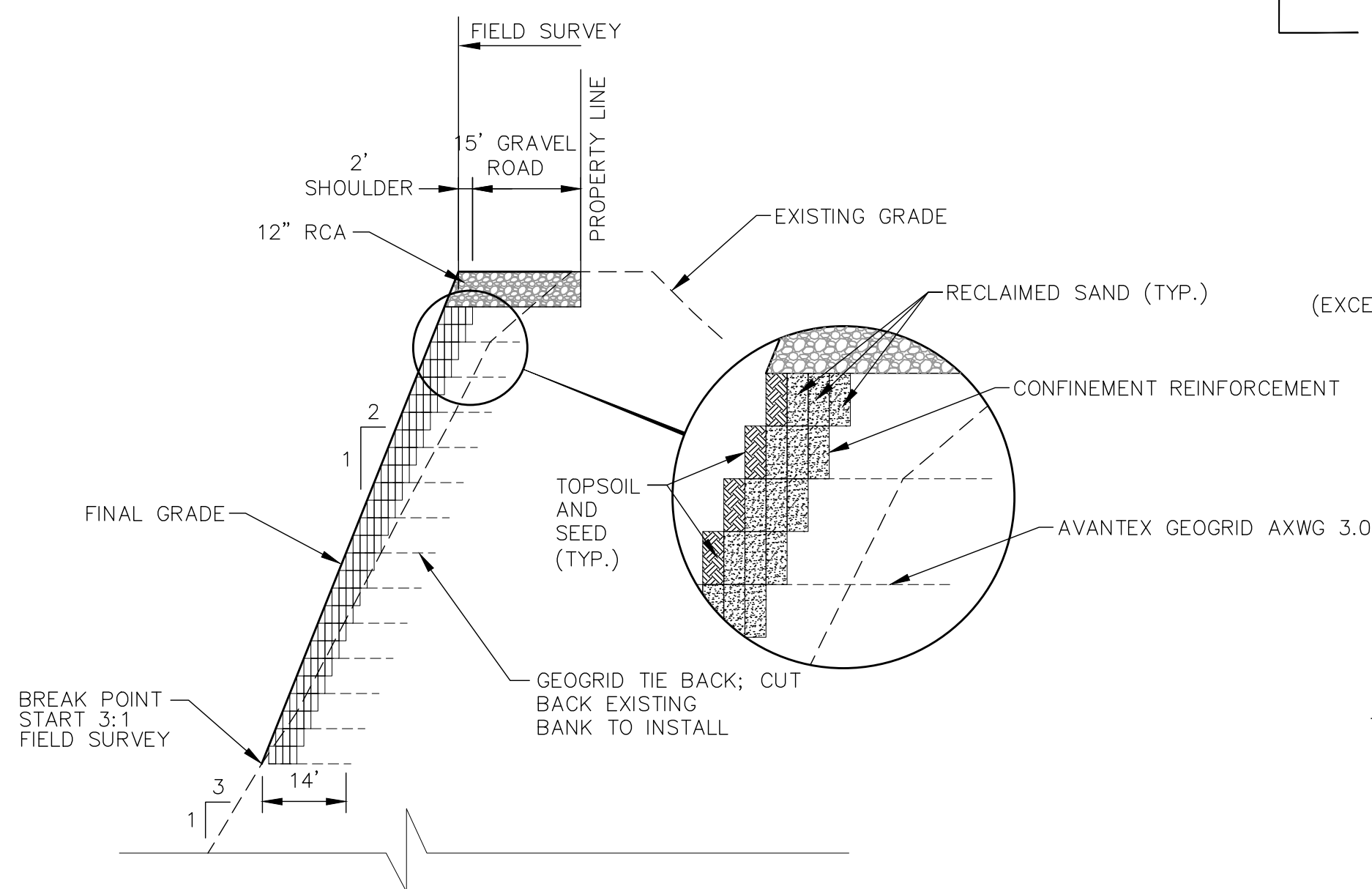
3
21
NTS
EROSION CONTROL TABLE



4
21
1"=50'
HEADWALL TRANSITION



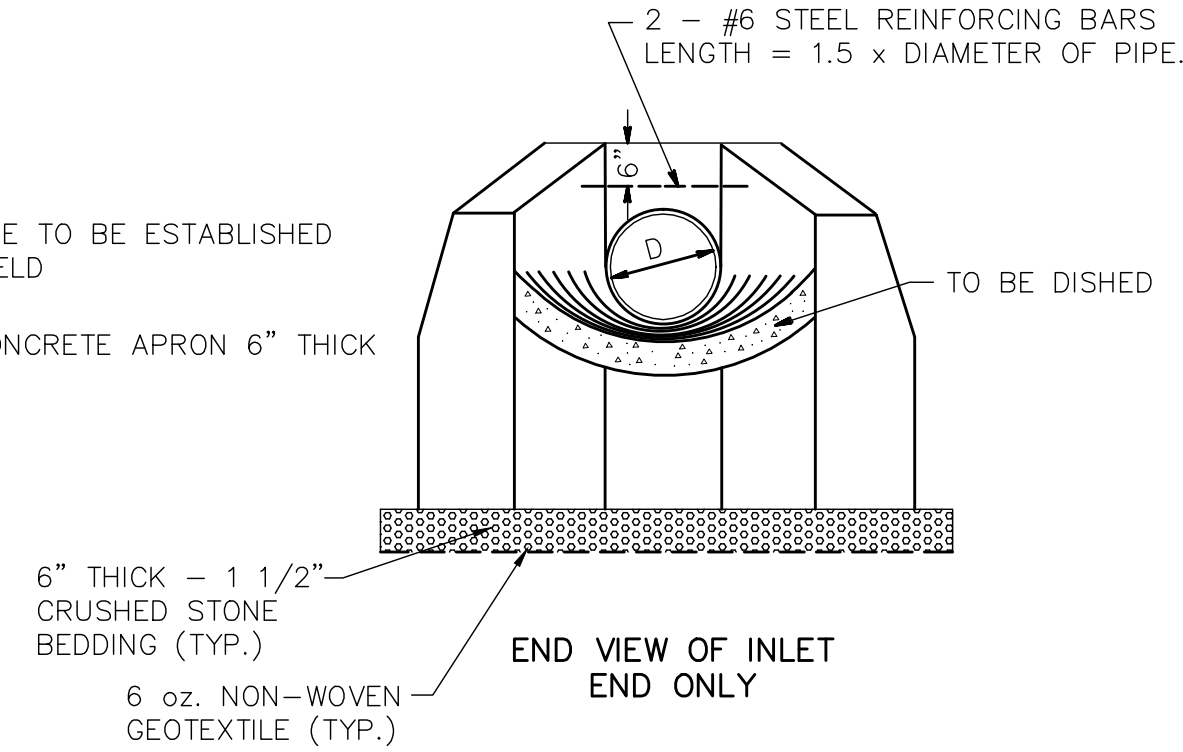
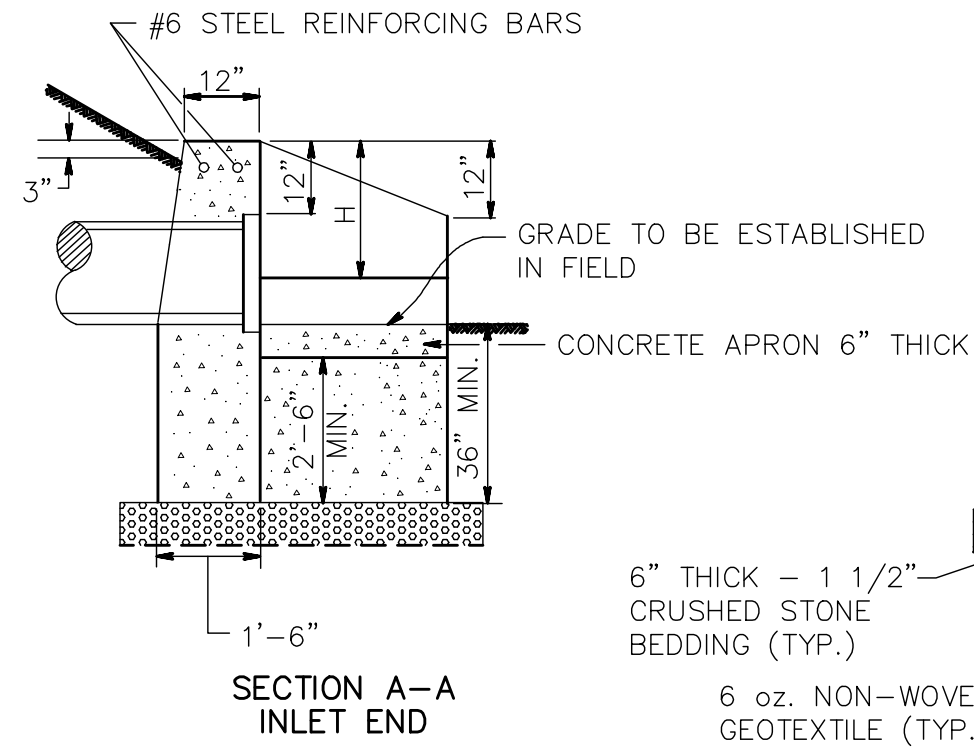
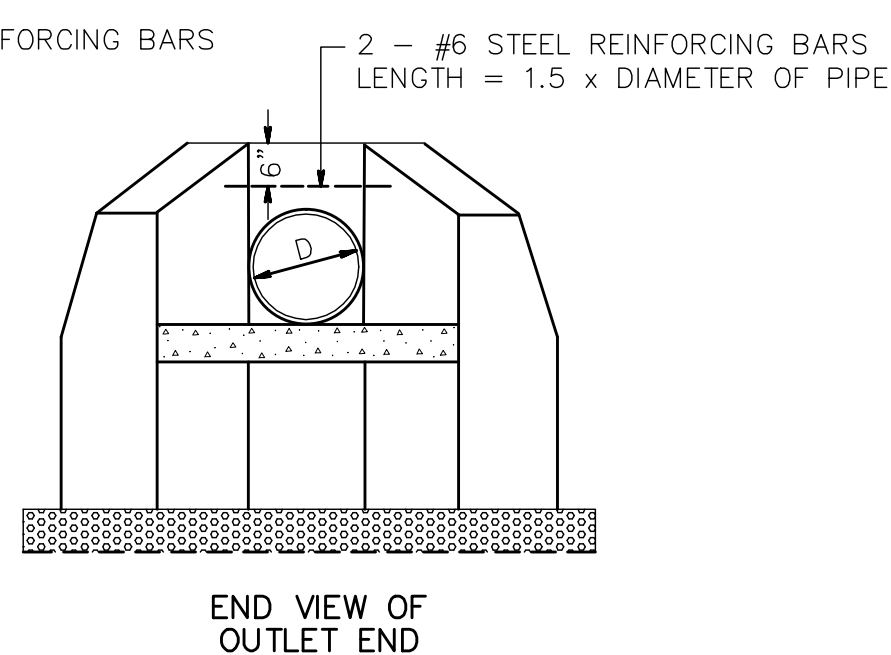
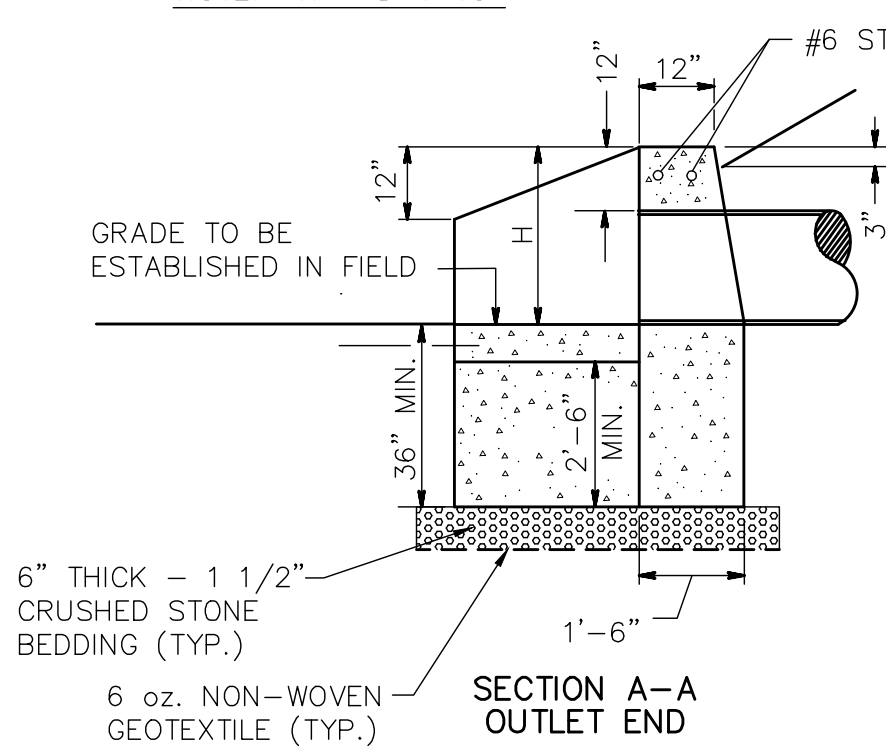
STA. 13+35 THROUGH 15+57 AND
STA. 16+82 THROUGH 17+30



- NOTES:
1. DETERMINE LENGTH AND HEIGHT OF ROAD BANK SUPPORT BY FIELD SURVEY
 2. CUT BACK EXISTING BANK SUFFICIENT TO INSTALL SUPPORT SYSTEM.

5
21
HORIZONTAL - 1"=20'
VERTICAL - 1"=4'
EXISTING ROAD BANK SUPPORT

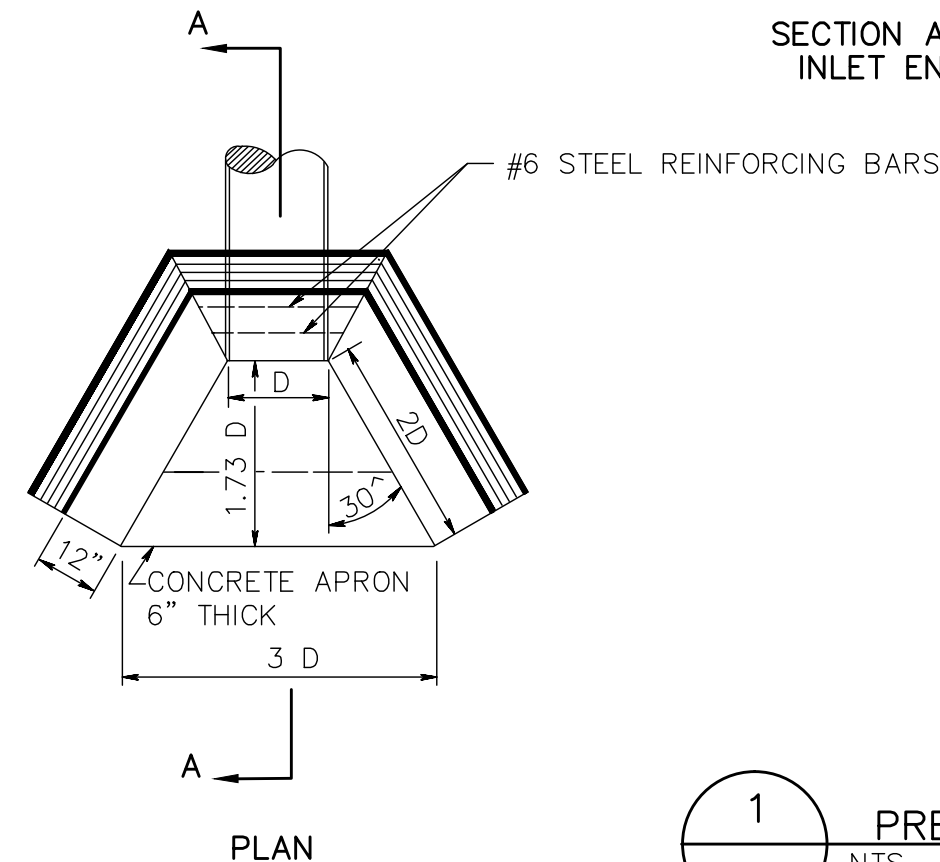
NOTE: $H = D + 18"$



- GENERAL NOTES:
1. ALL EDGES TO BE CHAMFERED 1 INCH.
 2. FOR SLOPE DRAIN HEADWALLS, DIMENSIONS AND APRON GRADES SHALL BE SET BY ENGINEER.
 3. THE TERMINUS FOR OUTLET AND INLET APRONS SHALL BE SET BY EXTENDING THE PIPE GRADE AHEAD AND BACK, RESPECTIVELY.
 4. CONCRETE SHALL BE 4000 PSI MINIMUM COMPRESSIVE STRENGTH.
 5. REINFORCING STEEL IN ACCORDANCE WITH ASTM A-615 (REINFORCING BARS).
 6. PIPE OPENINGS IN PRECAST DRAINAGE UNITS SHALL NOT EXCEED 4 INCHES AT ANY GIVEN POINT BETWEEN THE PIPE AND THE PRECAST UNIT.

VOLUME OF CONCRETE IN HEADWALLS
AND APRONS IN CUBIC YARDS

PIPE DIA.	CORR. STEEL PIPE	REIN. CONC. PIPE	APRONS
18"	2.4	2.5	0.6
21"	2.8	3.0	0.8
24"	3.3	3.4	0.9
27"	3.7	4.0	1.1
30"	4.2	4.5	1.2
36"	5.3	5.6	1.5

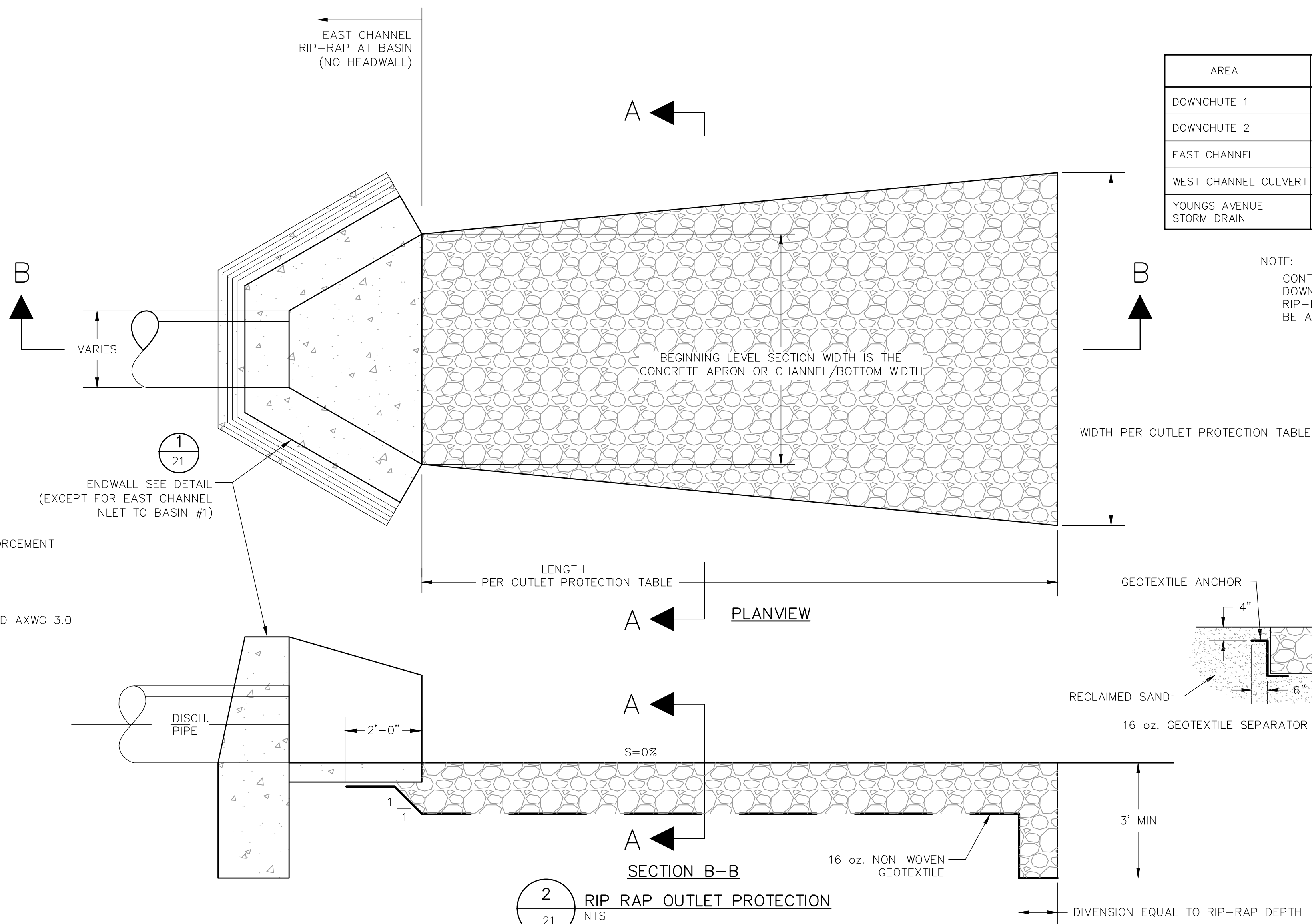


1
21
NTS
PRECAST CONCRETE HEADWALL DETAILS

OUTLET PROTECTION TABLE

AREA	LENGTH (FT)	WIDTH (FT)	d10	RIP-RAP SIZE	d50	d100	DEPTH (IN)
DOWNCHUTE 1	20	22	7"	15"	23"		34"
DOWNCHUTE 2	22	24	7"	15"	23"		34"
EAST CHANNEL	16	24	4"	8"	12"		18"
WEST CHANNEL CULVERT	18	20	5"	11"	17"		26"
YOUNGS AVENUE STORM DRAIN	18	20	4"	9"	13"		21"

NOTE:
CONTRACTOR MAY USE EAST CHANNEL RIP-RAP FOR DOWNCHUTES 1 AND 2 AND WEST CHANNEL CULVERT, IF THE RIP-RAP IS GROUTED TO EXISTING GRADE. GROUT TYPE SHALL BE APPROVED BY ENGINEER.



2
21
NTS
RIP RAP OUTLET PROTECTION

DATE	11/1/07
REVISION	ISSUED FOR BIDDING
NO.	

SHEET TITLE	MISCELLANEOUS DETAILS 1
PROJECT TITLE	YOUNGS AVENUE LANDFILL CLOSURE PLAN

CLIENT	TOWN OF RIVERHEAD 200 HOWELL AVENUE RIVERHEAD, NEW YORK 11901
--------	---

SCS ENGINEERS, PC	STEARN, CONRAD AND SCHMIDT CONSULTING ENGINEERS, INC. 140 ROUTE 303, VALLEY COTTAGE, NEW YORK 10889 PH. (845) 353-5727 FAX. (845) 353-5731
PROJ. NO.	13206007.00
DATE	11/1/07
BY	SWP
CHECKED BY	GPW
APPROVED BY	PFK

CADD FILE:	SHT21 - Endwall
DATE:	11/1/07
SCALE:	AS SHOWN
DRAWING NO.	

Technical drawing of an East Channel/36" RCP Outlet Transition Detail. The drawing shows two views of a channel transition. The top view shows a channel with a 4'-0" width, 0% slope, and a 10% slope. It includes a 36-inch RCP pipe and a 16'-0" rip-rap area. The bottom view shows a channel with an 8'-0" bottom width, 10% slope, and a 16'-0" rip-rap area. The drawing is labeled "EAST CHANNEL STA. 16+40" and "EAST CHANNEL STA. 18+12". It also includes a "SEE 1/5B" callout and a "2/21" detail number.

8'-0"

3" x 8" x 16'-0" PLANK

3/4" GALVANIZED CARRIAGE BOLTS, NUTS AND WASHERS

18" Ø CONCRETE SONOTUBE

36"

6"

FINISHED GRADE AT POST

GEOMEMBRANE

NOTES:

- ALL WOOD TO BE PRESSURE TREATED.
- THE BOTTOM OF THE WOOD GUIDE RAIL POST SHALL HAVE A MINIMUM OF 6" CLEARANCE ABOVE GEOMEMBRANE WHERE SHORTEN SONOTUBE AND PROVIDE MARINE PLYWOOD AT GUIDE RAIL POSTS WITHIN LIMIT OF FINAL CAP

2'-2"

1'-0"

8" x 8" SQUARE POST

1'-6"

PROPOSED ROAD

1'-6"

SEE NOTE 2

CONCRETE SONOTUBE FOR GUIDE RAIL POSTS OUTSIDE LIMIT OF FINAL CAP

18"x18" MARINE PLY 4-16P SPIKES TO POST AT LINER LOCATIONS

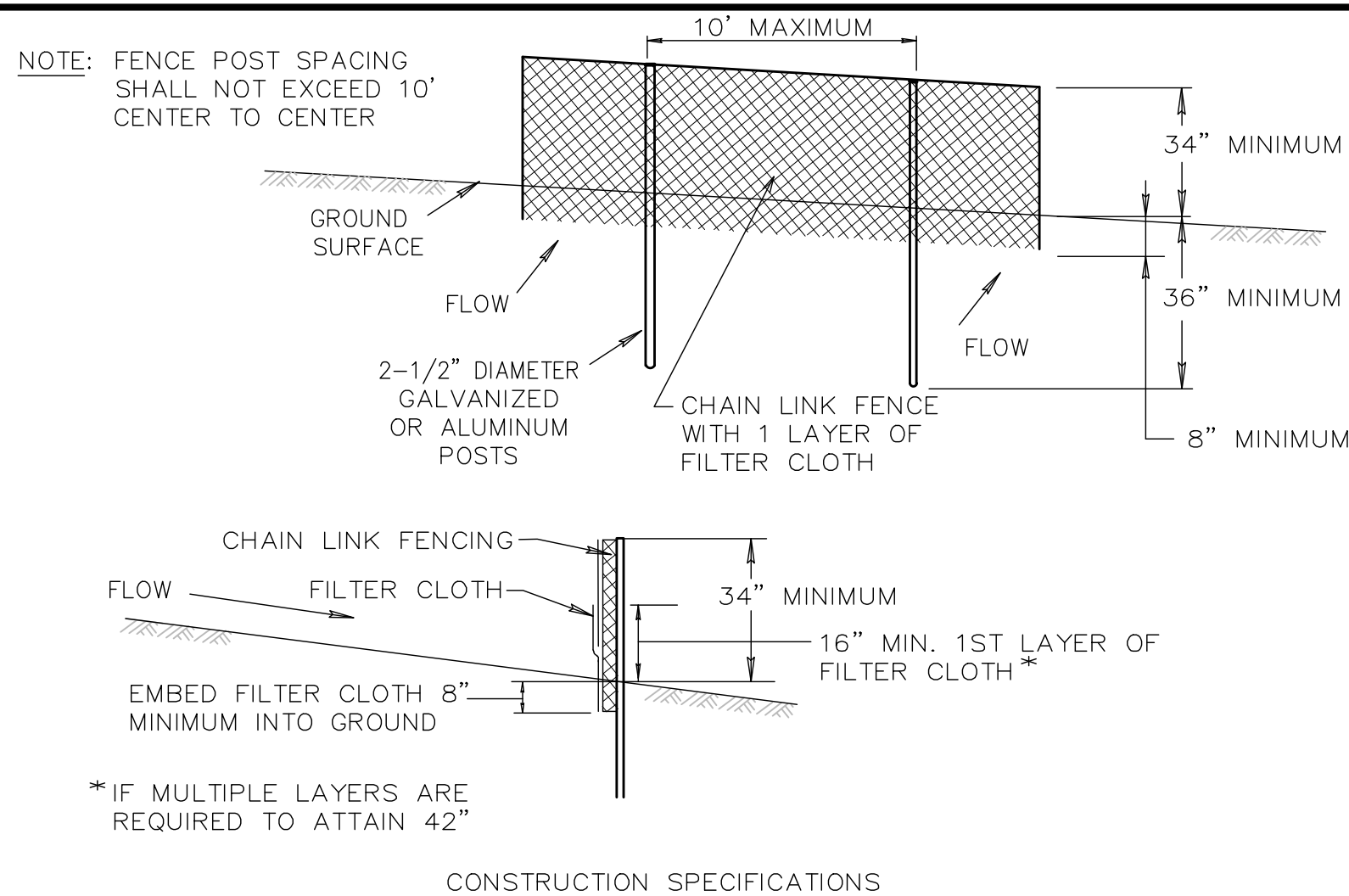
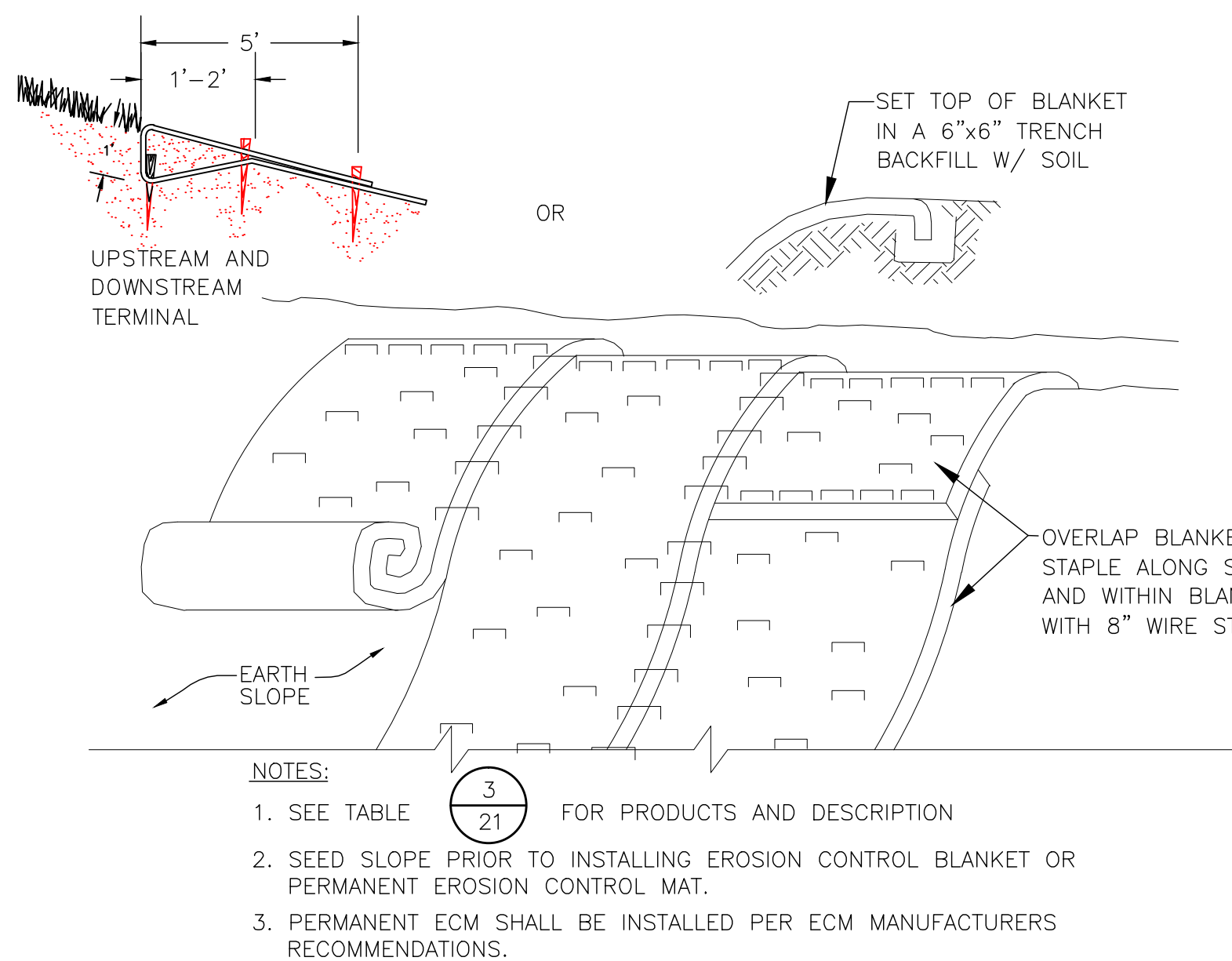
1. CONTRACTOR SHALL MAINTAIN STABILIZED CONSTRUCTION ENTRANCE IN A CONDITION THAT PREVENTS TRACKING OF SOILS AND SEDIMENT ONTO PUBLIC ROADWAYS.
2. STABILIZED CONSTRUCTION ENTRANCE SHALL BE INSTALLED PRIOR TO ANY DISTURBANCE OF EXISTING VEGETATION AND MAINTAINED DURING THE DURATION OF THE CONSTRUCTION ACTIVITIES.

Diagram illustrating the plan view of a proposed road section. The section is 22 feet wide, as indicated by the circle with '2' over '22'. The section is divided into three parts: a central 24-foot wide section (stippled pattern) and two 10-foot wide side sections (stippled pattern). The total width is 22 feet. The central section is 24 feet wide. The side sections are 10 feet wide. The total width is 22 feet. The diagram also shows existing ground on the left and an existing roadway on the right. A north arrow points upwards.

[illegible]

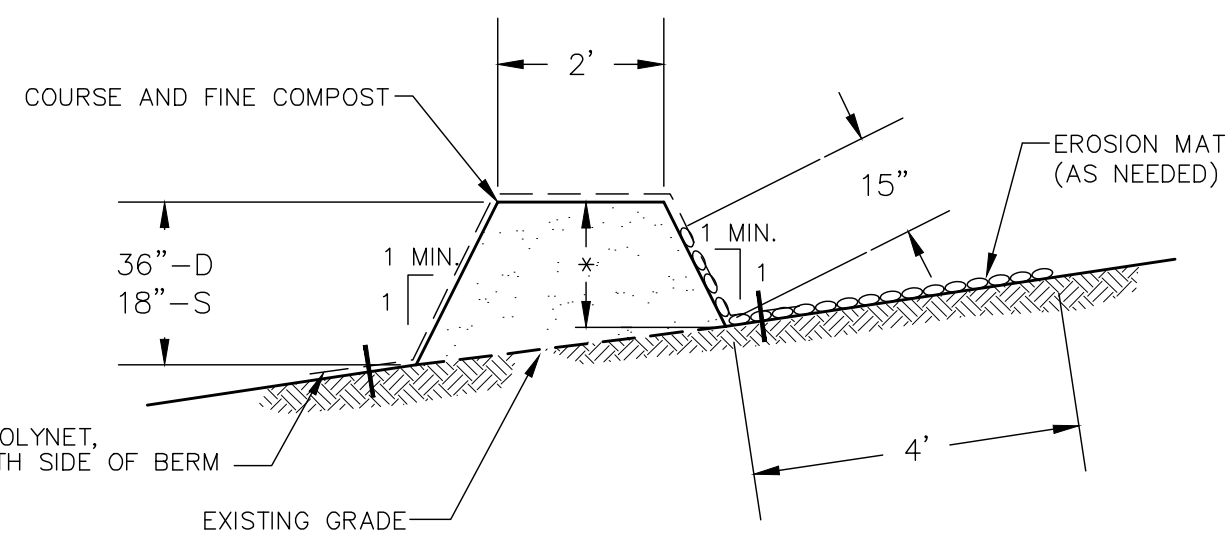
SEDIMENT AND EROSION CONTROL NOTES

1. ALL SOIL EROSION AND SEDIMENT CONTROL PRACTICES TO BE INSTALLED PRIOR TO ANY MAJOR SOIL DISTURBANCE, OR IN THEIR PROPER SEQUENCE, AND MAINTAINED UNTIL PERMANENT PROTECTION IS ESTABLISHED.
2. UNLESS OTHERWISE SPECIFIED OR ACCEPTED ALL WORK SHALL BE DONE IN ACCORDANCE WITH THE "GUIDELINES FOR URBAN EROSION AND SEDIMENT CONTROL IN NEW YORK" LATEST REVISION.
3. IMMEDIATELY FOLLOWING INITIAL DISTURBANCE OR ROUGH GRADING, ALL CRITICAL AREAS SUBJECT TO EROSION (i.e. STEEP SLOPES AND ROADWAY EMBANKMENTS) SHALL BE GRADED SMOOTH AND SHALL RECEIVE EROSION CONTROL BLANKET IN ACCORDANCE WITH THE PROJECT SPECIFICATIONS OR AS DIRECTED BY THE PROJECT ENGINEER.
4. PROVIDE 24-HOUR OBSERVATION AND MAINTENANCE OF STORM WATER CONTROLS UNTIL SOILS ARE STABILIZED.
5. PERMANENT VEGETATION SHALL BE SEEDING ON ALL EXPOSED AREAS WITHIN SEVEN DAYS AFTER FINAL GRADING. INSTALL EROSION CONTROL MATTING AND SEED.
6. SEEDING (PERMANENT SEEDING SHALL BE PERFORMED BETWEEN MARCH 1 TO MAY 1, AND FROM AUGUST 15 TO OCTOBER 15). SEED SHALL BE IN ACCORDANCE WITH SPECIFICATION SECTION 02936.
7. MULCHING, EROSION CONTROL BLANKETS SHALL BE IN ACCORDANCE WITH SPECIFICATION SECTIONS 01502 AND 02500.
8. TOPSOIL SHALL BE IN ACCORDANCE WITH SPECIFICATION SECTION 02235.
9. AT THE TIME WHEN THE SITE PREPARATION FOR PERMANENT VEGETATIVE STABILIZATION IS GOING TO BE ACCOMPLISHED, ANY SOIL THAT WILL NOT PROVIDE A SUITABLE ENVIRONMENT TO SUPPORT ADEQUATE VEGETATIVE GROUND COVER, SHALL BE REMOVED OR TREATED IN SUCH A WAY THAT WILL PERMANENTLY ADJUST THE SOIL CONDITIONS AND RENDER IT SUITABLE FOR VEGETATIVE GROUND COVER.
10. PROVIDE EROSION CONTROL BLANKET TO RESTORE DISTURBED AREAS ON SLOPES IN ACCORDANCE WITH SPECIFICATION SECTION 02500. INSTALL IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS. PROVIDE PERMANENT EROSION CONTROL MAT AS NOTED ON THE PLANS.
11. COORDINATE WORK IN EXISTING CHANNELS SUCH THAT THE SITE IS PROTECTED DURING RAIN STORM EVENTS. THE CONTRACTOR SHALL BE RESPONSIBLE FOR DAMAGE TO DOWNSTREAM STRUCTURES AS A RESULT OF EROSION DUE TO CONTRACTOR'S WORK. ROAD, CHANNEL, AND DOWNCHUTE CROSSINGS SHALL BE COMPLETED IN ONE DAY'S WORK.
12. LIMIT WORK SUCH THAT, TRENCHING IS BACKFILLED AND PROTECTED AT THE COMPLETION OF EACH DAY'S WORK.
13. TO THE EXTENT POSSIBLE, CONTRACTOR SHALL MINIMIZE LAND DISTURBANCE. CONTRACTOR SHALL IMPLEMENT ADDITIONAL EROSION AND SEDIMENT CONTROLS AS NEEDED, AND AS REQUIRED BY THE EROSION CONTROL INSPECTOR. LAND DISTURBANCE SHALL BE PERMITTED IF NECESSARY TO PROVIDE ACCESS TO CONSTRUCT THE FEATURES SHOWN.
14. EROSION AND SEDIMENT CONTROLS MUST BE CONSTRUCTED, STABILIZED, AND FUNCTIONAL BEFORE SITE STABILIZATION WITHIN THE TRIBUTARY AREAS OF THOSE CONTROLS.
15. AFTER FINAL SITE STABILIZATION HAS BEEN ACHIEVED, TEMPORARY EROSION AND SEDIMENT CONTROLS SHALL BE REMOVED. AREAS DISTURBED DURING REMOVAL OF THE CONTROLS SHALL BE STABILIZED IMMEDIATELY.
16. UNTIL THE SITE IS STABILIZED, ALL EROSION AND SEDIMENT CONTROLS SHALL BE MAINTAINED PROPERLY. ALL EROSION AND SEDIMENT CONTROLS SHALL BE INSPECTED ON A WEEKLY BASIS AND AFTER EACH STORM EVENT. ALL PREVENTATIVE AND REMEDIAL MAINTENANCE WORK, INCLUDING CLEAN OUT, REPAIR, REPLACEMENT, REGRADING, RESEEDING, REMULCHING AND RENETTING SHALL BE PERFORMED IMMEDIATELY.
17. CONTRACTOR SHALL CLEAN STORMWATER STRUCTURES (i.e. CHANNELS, CHUTES, CULVERT PIPES AND CATCH BASINS), TO REMOVE THE SEDIMENT THAT MAY HAVE ACCUMULATED DURING THE PERFORMANCE OF WORK IN THE CONTRACT AS WELL AS SEDIMENT REMOVAL TO DEPTHS SHOWN ON THE DRAWINGS. PLACE ALL SEDIMENT AT AN ONSITE LOCATION AS DIRECTED BY OWNER OR CQA REPRESENTATIVE.

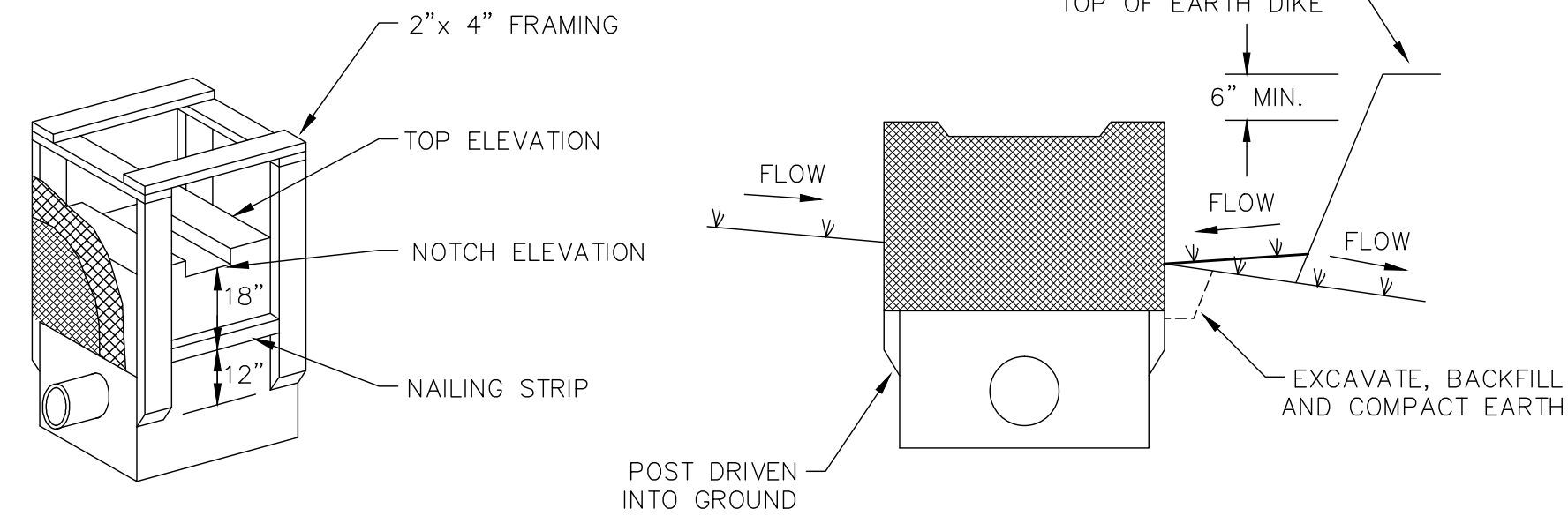
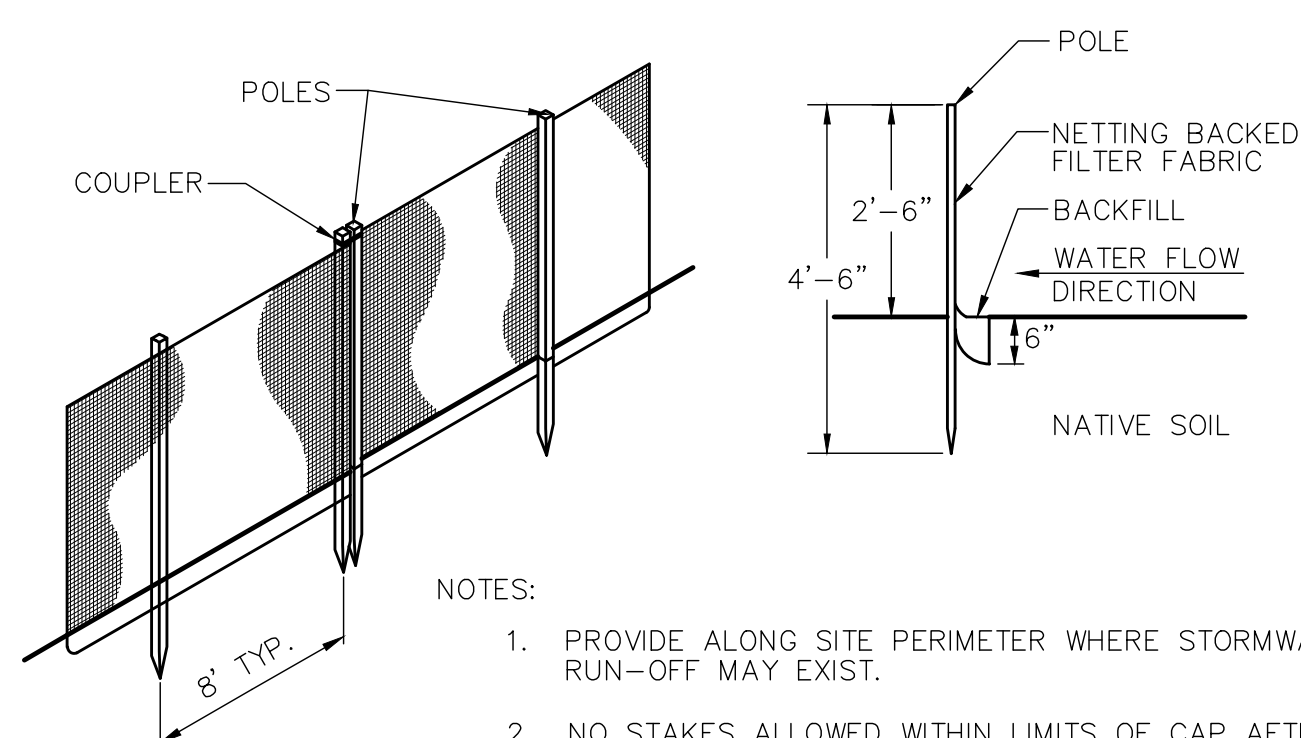


1. FENCING SHALL BE 42" IN HEIGHT AND CONSTRUCTED IN ACCORDANCE WITH THE STANDARD DETAILS FOR CHAIN LINK FENCING. THE SPECIFICATION FOR A 6' FENCE SHALL BE USED, SUBSTITUTING 42" FABRIC AND 6' LENGTH POSTS.
2. CHAIN LINK FENCE SHALL BE FASTENED SECURELY TO THE FENCE POSTS WITH WIRE TIES. THE LOWER TENSION WIRE, BRACE AND TRUSS RODS, DRIVE ANCHORS AND POST CAPS ARE NOT REQUIRED EXCEPT ON THE ENDS OF THE FENCE.
3. FILTER CLOTH SHALL BE FASTENED SECURELY TO THE CHAIN LINK FENCE WITH TIES SPACED EVERY 24" AT THE TOP AND MID SECTION.
4. FILTER CLOTH SHALL BE EMBEDDED A MINIMUM OF 8" INTO THE GROUND.
5. WHEN TWO SECTIONS OF FILTER CLOTH ADJOIN EACH OTHER, THEY SHALL BE OVERLAPPED BY 6" AND FOLDED.
6. MAINTENANCE SHALL BE PERFORMED AS NEEDED AND SILT BUILDUPS REMOVED WHEN "BULGES" DEVELOP IN THE SILT FENCE, OR WHEN SILT REACHES 50% OF FENCE HEIGHT
7. FILTER CLOTH SHALL BE FASTENED SECURELY TO EACH FENCE POST WITH WIRE TIES OR STAPLES AT TOP AND MID SECTION AND SHALL MEET THE FOLLOWING REQUIREMENTS FOR GEOTEXTILE CLASS F:

TENSILE STRENGTH	50 LBS/IN (MIN.)	TEST: MSMT 509
TENSILE MODULUS	20 LBS/IN (MIN.)	TEST: MSMT 509
FLOW RATE	0.3 GAL/FT ² /MINUTE (MAX.)	TEST: MSMT 322
FILTERING EFFICIENCY	75% (MIN.)	TEST: MSMT 322

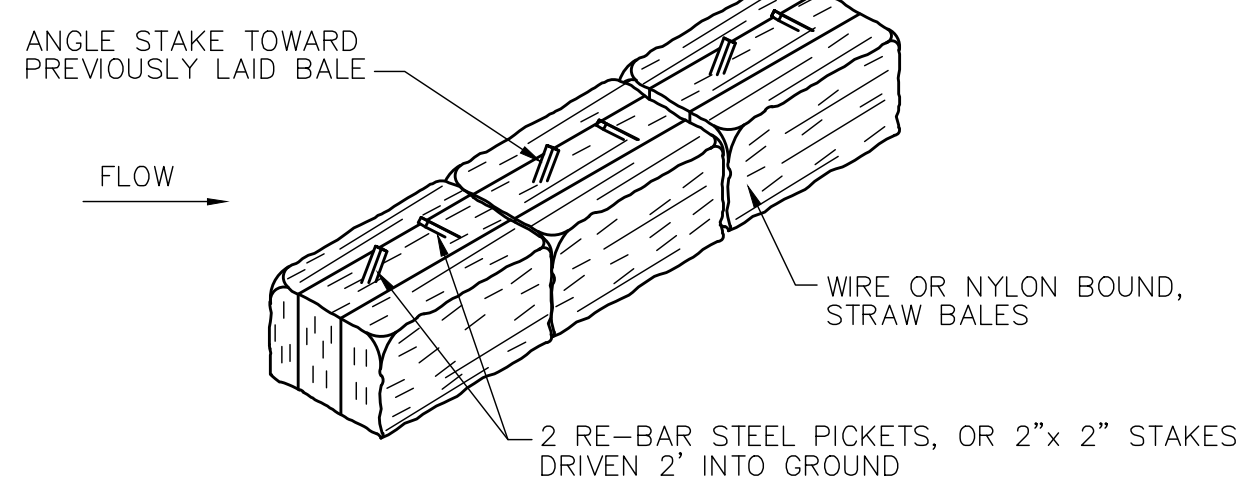
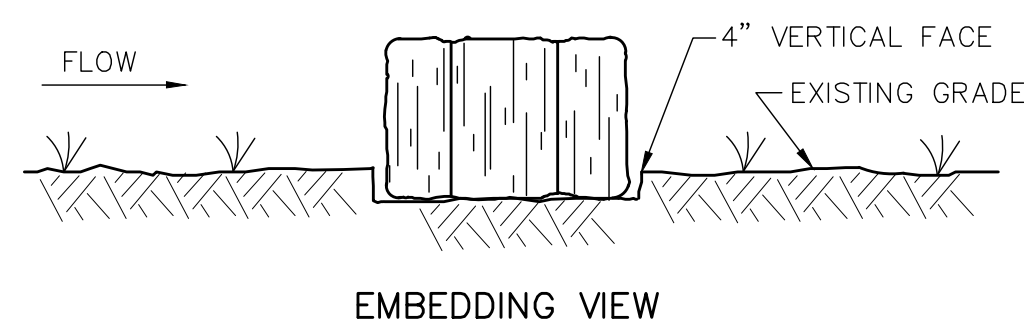
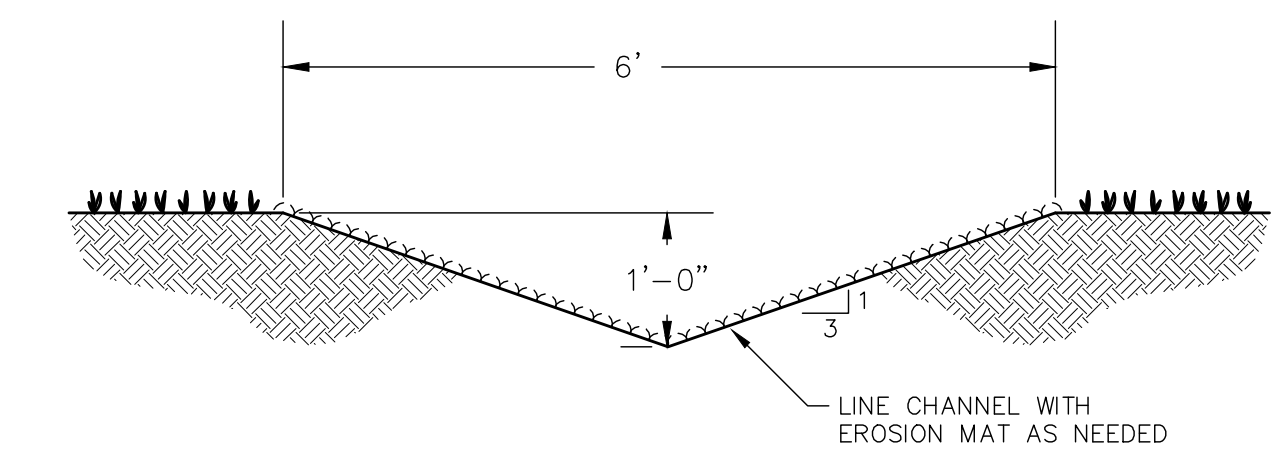


- NOTES:
1. STORMWATER DIVERSION BERM TO CONTAIN SILTATION.
 2. REMOVE LOWER SLOPE BERM AFTER STABILIZATION.
 3. COMPOST FILTER BERMS TO BE COMBINATION OF COARSE AND FINE COMPOST COVERED WITH 1" POLYNET STAKED TO GROUND AS APPROVED BY CQA CONSULTANT.

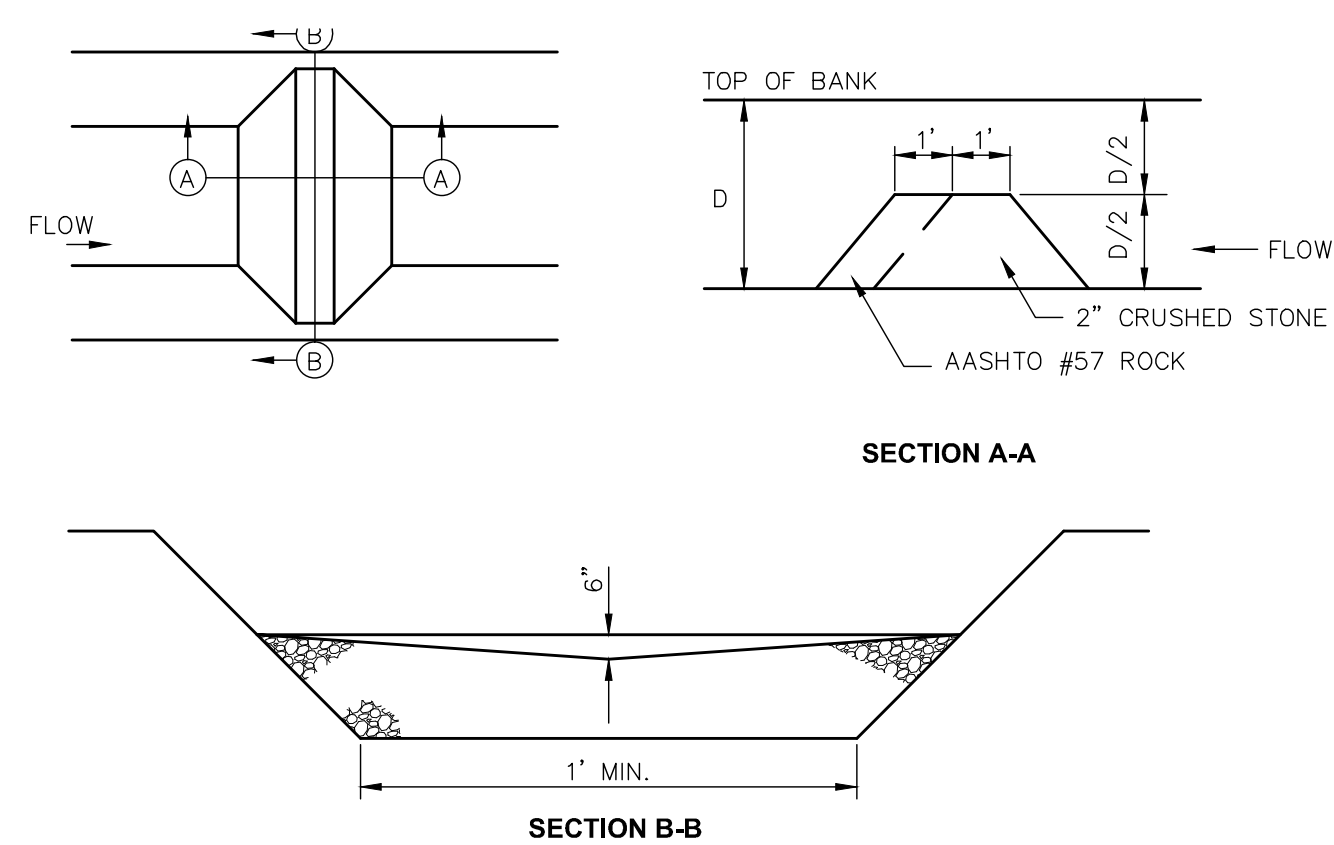
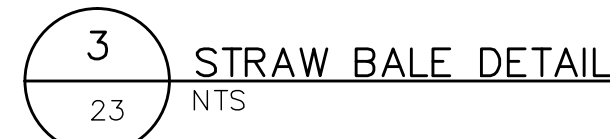


CONSTRUCTION SPECIFICATIONS:

1. EXCAVATE COMPLETELY AROUND THE INLET TO A DEPTH OF 18" BELOW THE NOTCH ELEVATION.
2. DRIVE THE 2" X 4" CONSTRUCTION GRADE LUMBER POSTS 1' INTO THE GROUND AT EACH CORNER OF THE INLET. PLACE NAIL STRIPS BETWEEN THE POSTS ON THE ENDS OF THE INLET. ASSEMBLE THE TOP PORTION OF THE 2" X 4" FRAME USING THE OVERLAP JOINT SHOWN ON DETAIL. THE TOP OF THE FRAME (WEIR) MUST BE 6" BELOW ADJACENT ROADWAYS WHERE FLOODING AND SAFETY ISSUES MAY ARISE.
3. STRETCH THE 1/2" X 1/2" WIRE MESH TIGHTLY AROUND THE FRAME AND FASTEN SECURELY. THE ENDS MUST MEET AND OVERLAP AT THE POST.
4. STRETCH THE GEOTEXTILE/FILTER FABRIC TIGHTLY OVER THE WIRE MESH WITH THE GEOTEXTILE EXTENDING FROM THE TOP OF THE FRAME TO 18" BELOW THE INLET NOTCH ELEVATION. FASTEN THE GEOTEXTILE FIRMLY TO THE FRAME. THE ENDS OF THE GEOTEXTILE MUST MEET AT A POST, BE OVERLAPPED AND FOLDED, THEN FASTENED DOWN.
5. BACKFILL AROUND THE INLET IN COMPACTED 6" LAYERS UNTIL THE LAYER OF EARTH IS LEVEL WITH THE NOTCH ELEVATION ON THE ENDS AND TOP ELEVATION ON THE SIDES.
6. IF THE INLET IS NOT IN A SUMP, CONSTRUCT A COMPACTED EARTH DIKE ACROSS THE DITCH LINE DIRECTLY BELOW IT. THE TOP OF THE EARTH DIKE SHOULD BE AT LEAST 6" HIGHER THAN THE TOP OF THE FRAME.
7. THE STRUCTURE MUST BE INSPECTED PERIODICALLY AND AFTER EACH RAIN AND THE GEOTEXTILE REPLACED WHEN IT BECOMES CLOGGED.



- NOTE:
1. NO STAKES ALLOWED WITHIN LIMITS OF CAP AFTER INSTALLATION OF GEOSYNTHETICS.



ROCK FILTERS SHOULD NOT BE USED IN CHANNELS OF LESS THAN 1 FOOT TOTAL DEPTH.

THE FILTER SHOULD BE EQUAL IN HEIGHT TO $\frac{1}{2}$ THE TOTAL DEPTH OF THE CHANNEL WITH A 6" DEPRESSION IN THE CENTER.

A ONE FOOT THICK LAYER OF AASHTO #57 STONE SHOULD BE PLACED ON THE UPSTREAM SIDE OF THE FILTER. NOTE: FILTER FABRIC AND STRAW BALES SHOULD NOT BE USED IN ROCK FILTERS.

ROCK FILTERS SHOULD BE INSPECTED WEEKLY AND AFTER EACH RUNOFF EVENT.

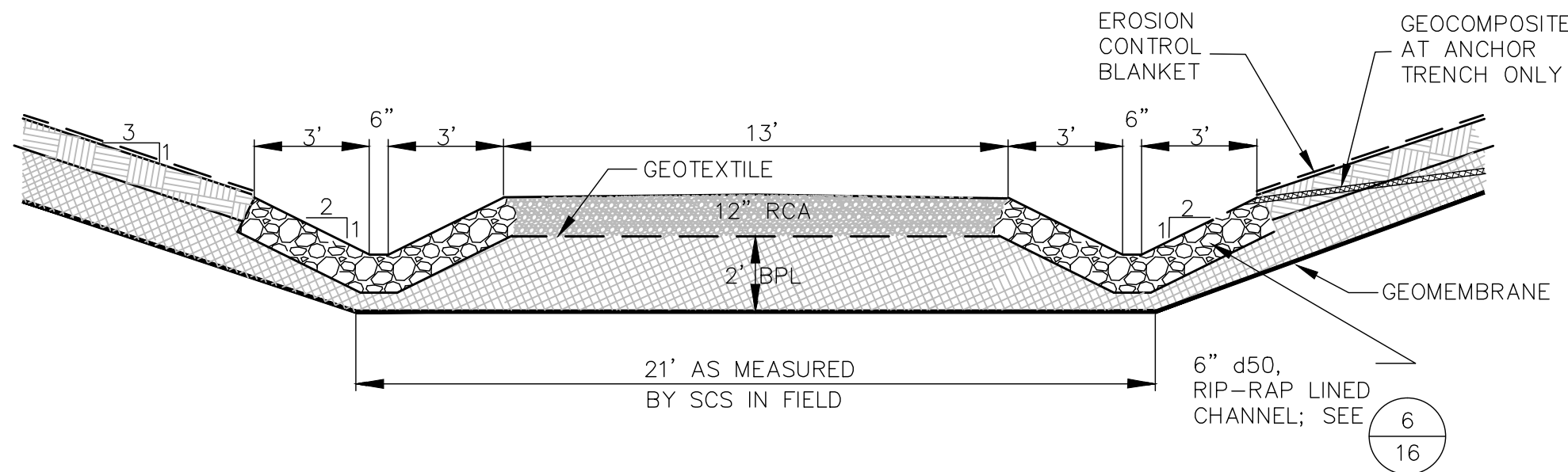
CLOGGED FILTER STONE (AASHTO # 57) SHOULD BE REPLACED.

SEDIMENT MUST BE REMOVED WHEN ACCUMULATIONS REACH 1/2 THE HEIGHT OF THE FILTERS.

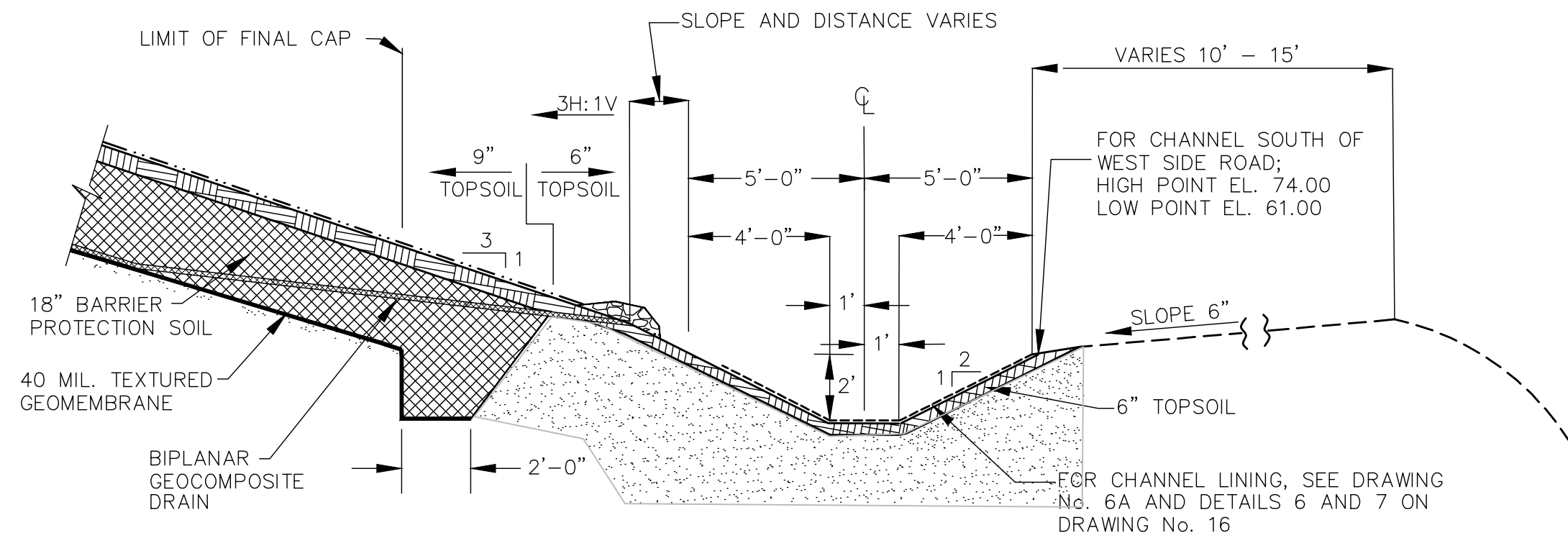
IMMEDIATELY UPON STABILIZATION OF EACH CHANNEL, REMOVE ACCUMULATED SEDIMENT, REMOVE ROCK FILTER, AND STABILIZE DISTURBED AREAS.

SCS ENGINEERS, PC STEARNS, CONRAD AND SCHMIDT CONSULTING ENGINEERS, INC. 140 ROUTE 303, VALLEY COTTAGE, NEW YORK 10889 PH. (845) 353-5727 FAX. (845) 353-5731	CLIENT TOWN OF RIVERHEAD 200 HOWELL AVENUE RIVERHEAD, NEW YORK 11901		SHEET TITLE EROSION CONTROL DETAILS PROJECT TITLE YOUNGS AVENUE LANDFILL CLOSURE PLAN	NO. ☒ REVISION ISSUED FOR BIDDING 11/1/07	DATE 11/1/07
	CADD FILE: SHT 23--E&S	DATE: 11/1/07			
SCALE: AS SHOWN					
DRAWING NO.					
23 of 24					

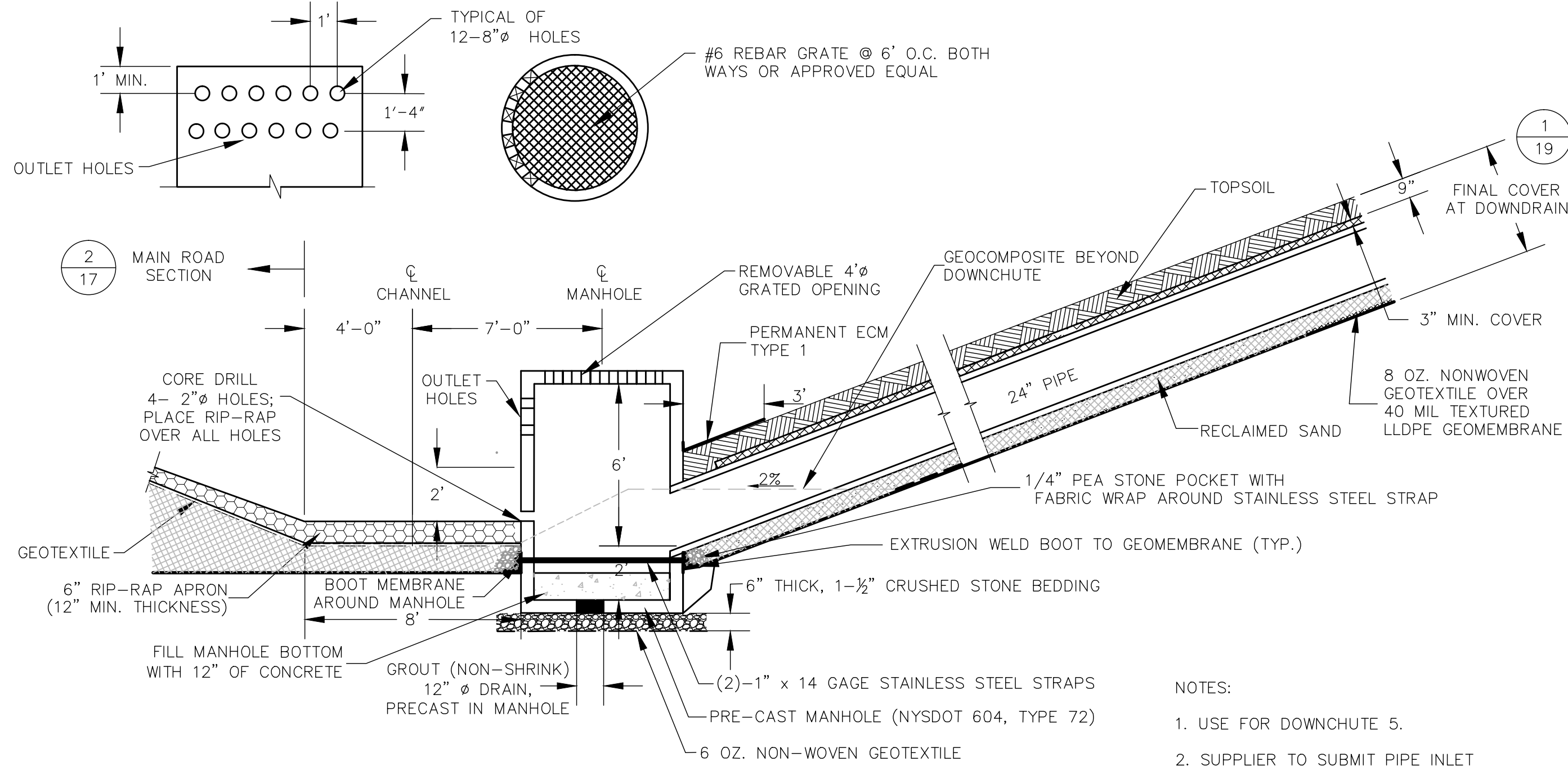
FILE: G:\13206007\01\FINAL DRAWINGS IN COA REPORT\3HT25-MISCDETAILS.DWG. DATE: 02/20/2013 09:52:28AM



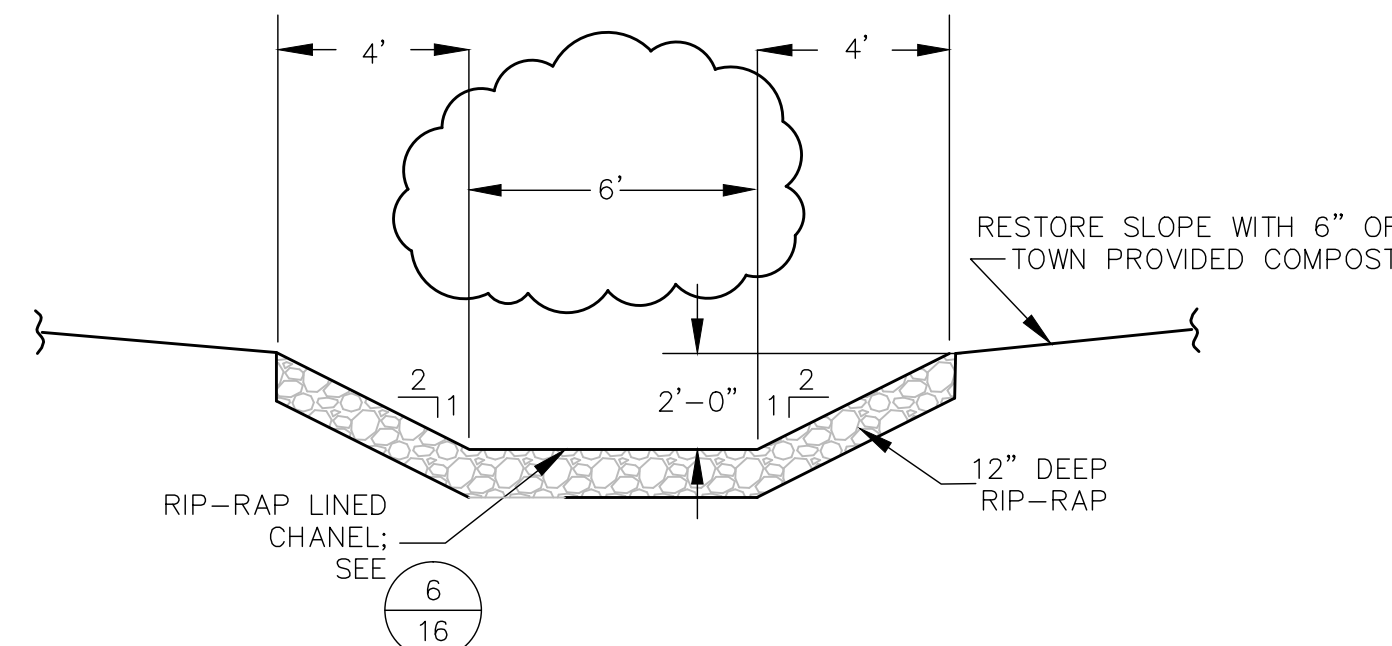
1 WEST SIDE ACCESS ROAD SECTION
1" = 4'-0"



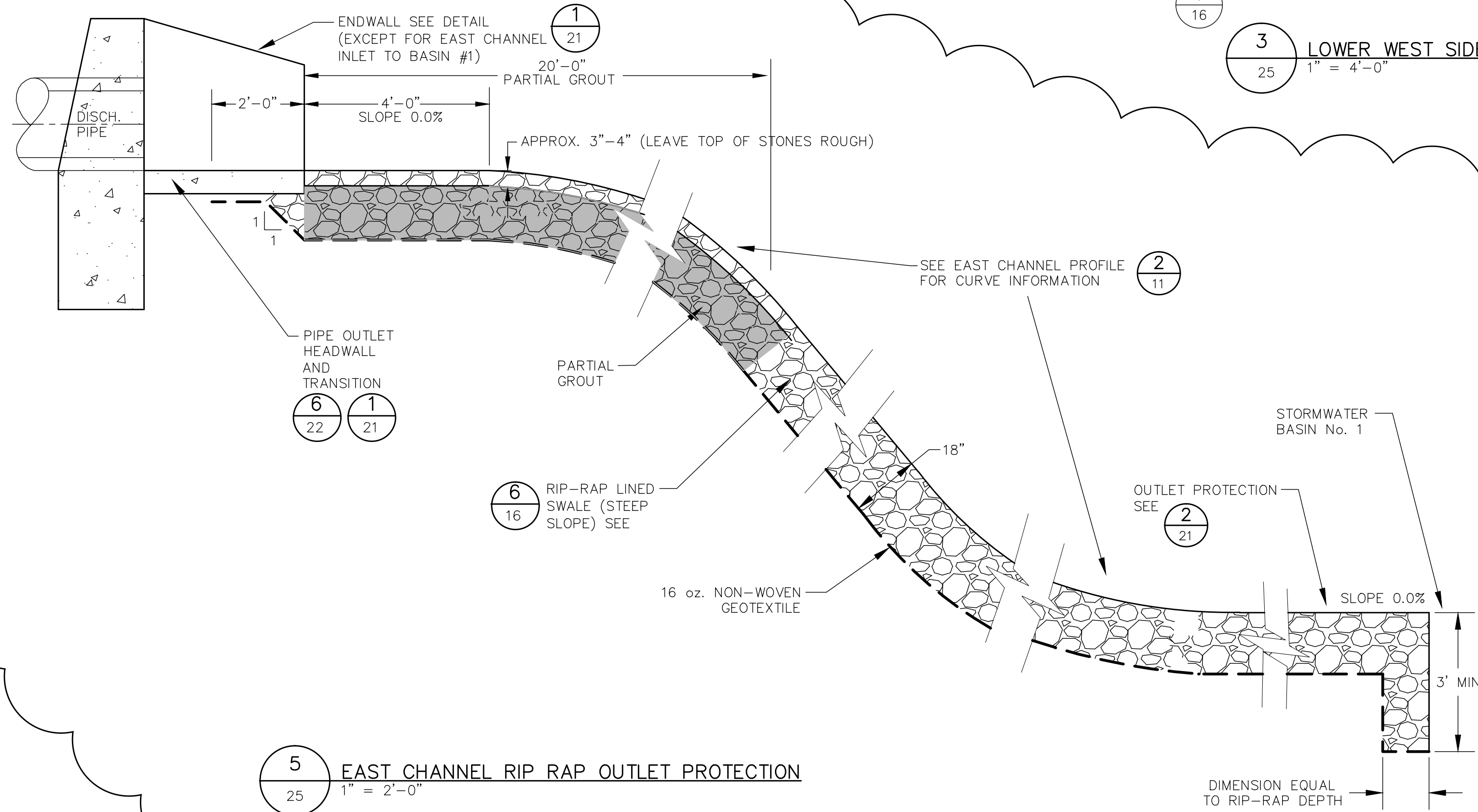
2 LOWER WEST DRAINAGE CHANNEL SECTION
1" = 4'-0"



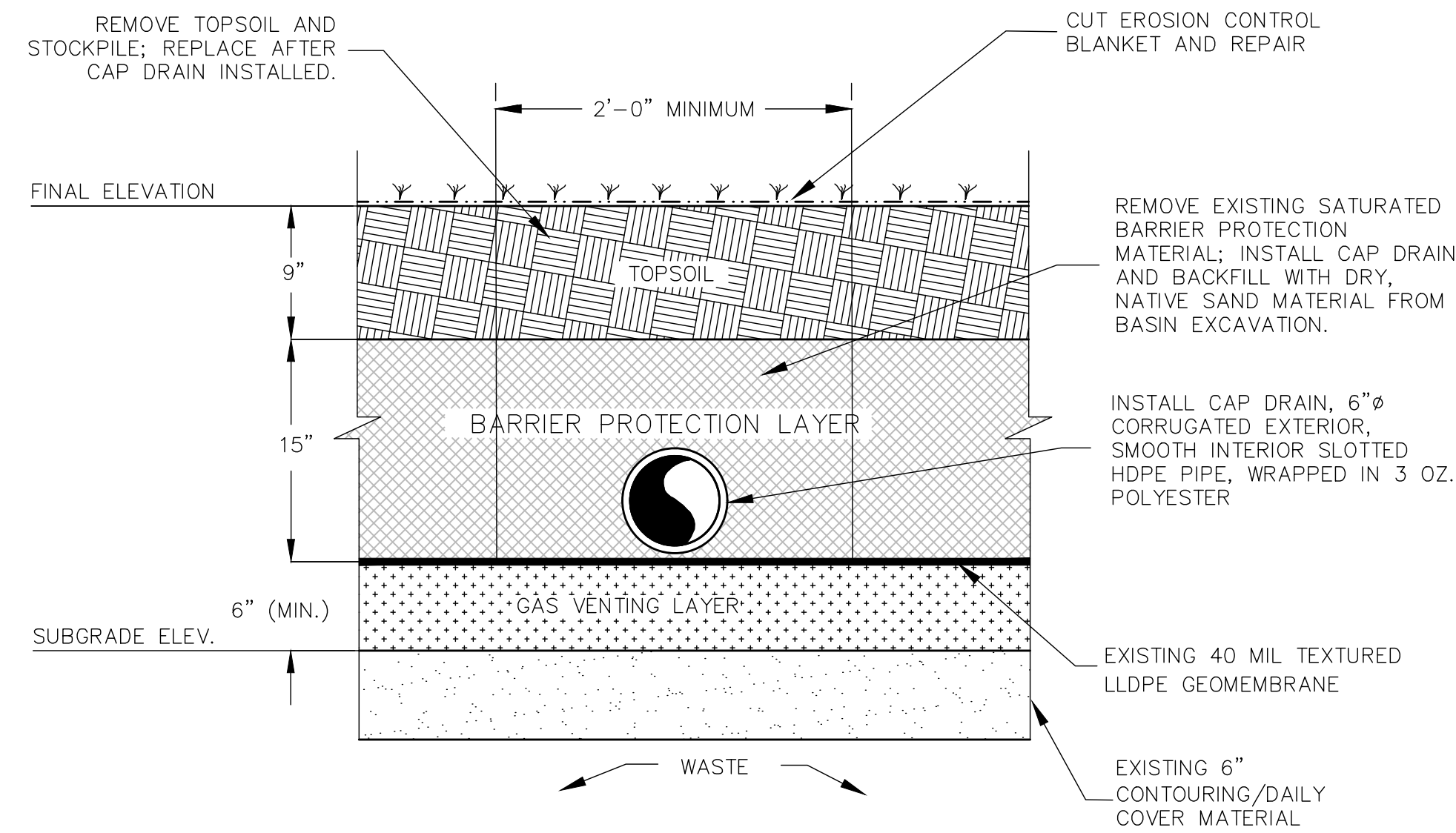
4 DOWNCHUTE No. 5 OUTLET
1" = 4'-0"



3 LOWER WEST SIDE DOWNCHUTE
1" = 4'-0"



5 EAST CHANNEL RIP RAP OUTLET PROTECTION
1" = 2'-0"



6 CAP DRAIN INSTALLATION
NTS

- NOTES:
- MINIMUM OF CAP DRAINS ON STEEP SLOPES IS 5%.
 - SOLID PORTIONS OF CAP DRAINS MAY BE INSTALLED TO A DEPTH OF 1 FOOT BELOW GRADE AND MAY TIE INTO SOLID PIPE OF EXISTING CAP DRAINS.

- NOTES:
- USE FOR DOWNCHUTE 5.
 - SUPPLIER TO SUBMIT PIPE INLET SEAL DETAILS, SECTION AND TOP DETAILS

MISCELLANEOUS DETAILS
PROJECT TITLE
YOUNGS AVENUE LANDFILL
CLOSURE PLAN

CLIENT
TOWN OF RIVERHEAD
200 HOWELL AVENUE
RIVERHEAD, NEW YORK 11901

SCS ENGINEERS, PC
STEARNS, CONRAD AND SCHMIDT
CONSULTING ENGINEERS, INC.
140 ROUTE 303 VALLEY COTTAGE, NEW YORK 10989
PH. (845) 353-5727 FAX. (845) 353-5731

CADD FILE:
SHT 25
DATE:
10-16-2008
SCALE:
AS SHOWN
DRAWING NO.

25 of 24

FPM Group, Ltd.
FPM Engineering Group, P.C.
formerly Fanning, Phillips and Molnar

January 31, 2013

CORPORATE HEADQUARTERS
909 Marconi Avenue
Ronkonkoma, NY 11779
631/737-6200
Fax 631/737-2410

Mr. Ken Testa, P.E.
Town Engineer
Town of Riverhead
1295 Pulaski St
Riverhead, NY 11901

Re: **Sampling Plan for Groundwater, Surface Water
and Landfill Gas Post-Closure Monitoring
Youngs Avenue Landfill, Riverhead, New York**

Dear Mr. Testa:

Enclosed herewith for NYSDEC review and approval is a proposed Sampling Plan for Quarterly Groundwater, Surface Water and Landfill Gas Post-Closure Monitoring (Sampling Plan) at the above-referenced site. The Sampling Plan is based on the April 2010 Post-Closure Monitoring and Maintenance Operations Manual (Manual) for the landfill prepared by SCS Engineers, PC (SCS), 6 NYCRR Part 360 Regulations, and our previous experience with landfill monitoring. This Sampling Plan will provide a consistent approach for future monitoring efforts.

Sampling Plan

Quarterly monitoring will be performed at 10 groundwater monitoring wells [five well clusters (each well cluster containing one shallow and one deep well) with two well clusters situated on landfill property and three well clusters located offsite], one surface water body (lower west pond if it is not filled in by the Town and contains at least six inches of water), and six landfill gas probes. The locations of the on-site groundwater monitoring wells, lower west pond, and landfill gas probes are provided in the attached Figure A. Off-site groundwater monitoring locations are shown on the attached Figure B.

Groundwater and Surface Water Monitoring

Monitoring will consist of a sampling cycle which will include one sampling round for baseline parameters and four sampling rounds for routine parameters each quarter. Each sampling round will be performed over two consecutive days. A 10-year schedule for the monitoring cycle is attached.

At each sampling location, field personnel will note any conditions present at the sampling location that could potentially impact upon the quality of the sample. Such observations may include nearby disturbances around the sampling point, integrity of the well, and ambient weather conditions.

After noting any well condition concerns, a decontaminated Solinst Portable Electronic Water Level Meter Model 101 or equivalent will be used to measure the static water level in each well. The distance down from the top of the well casing will be measured to the nearest 0.01 foot and recorded on a well sampling form. The water level measurement will be converted to a water elevation utilizing the existing well survey information. After recording the water level on a well sampling form, the well will be purged of three standing well volumes or until fully evacuated,

whichever comes first. The well will be purged using a decontaminated stainless steel submersible pump compatible with each well depth and diameter and disposable polyethylene discharge tubing. A Grundfos stainless steel submersible pump (Model No. 10SQE05B for 4-inch wells and Redi-Flo 2 for 2-inch wells or equivalents) and attached dedicated polyethylene tubing will be used to purge the well. In accordance with 6 NYCRR 360-2.11(d)(3)(vi)(c), each well will be fully purged of standing water by placing the pump in the upper portion of the water column (i.e., top 10 feet) and adjusted downward accordingly if significant drawdown is experienced in the well during purging. The pump will be decontaminated with a solution of Liquinox and water and rinsed with potable water between wells. The approximate flow rate and lift capacity of the 10SQE05B are 10-15 gpm and 80-240 ft, respectively. The approximate flow rate and lift capacity of the Redi-Flo 2 are 4-7 gpm and 25-120 ft, respectively. Literature on model specifications and lift capacity of the pumps are included in Appendix A.

During purging, field measurements will be obtained as required under 6 NYCRR Part 360-2.11(d)(6). Measurements of turbidity, specific conductivity, redox potential (Eh), temperature, and pH will be obtained with calibrated field instruments (Horiba U-52 or equivalent) and recorded on well sampling forms. In addition, the appearance of the water (e.g., color, odor, sheen etc.) will also be included as part of the field measurements and noted on the well sampling form. The calibration of the field screening instruments will be performed in accordance with the manufacturer's specifications and for rented instruments, the supplied instruments will be delivered pre-calibrated by the equipment supply company. Each well will be purged until each of the monitored parameters indicates that a stable condition has been obtained. The criteria for a stable condition are that the values between successive purge volumes will be within 5% of one another and below 50 NTU for the turbidity reading. If the field parameters have not stabilized after three purge volumes, additional purge volumes up to a maximum of five well volumes will be performed until parameters stabilize prior to sampling. Calibration procedures for the field screening instrument is included in Appendix A.

Sampling will be performed using a dedicated polyethylene tubing for each well and samples will be collected on the same day the well is purged. The sampling order will be volatile organics, leachate parameters and inorganics. Note: based upon previous sampling results, only unfiltered metals will be performed. However, if elevated turbidity conditions are observed requiring filtered samples, two sample volumes will be collected and sent to the laboratory so both unfiltered and filtered analyses can be performed. Based upon the results of previous sampling rounds, the purge water and decontamination water will continue to be disposed to the ground surface in the vicinity of the sample locations. However, if conditions change and conditions indicative of contamination are observed, the purged water will be drummed for proper disposal.

One surface water sample shall be obtained from the lower west pond if the pond is not filled in by the Town and if there is at least six inches of water present at the time of sampling. The surface water will be sampled six inches below the water surface and the sample will be collected with a disposable bailer and managed and analyzed in a manner similar to the groundwater samples. Note: In accordance with NYSDEC Subpart 360-2 Regulations, a field measurement of dissolved oxygen will be obtained and recorded on the well sampling form for the surface water sample.

Quality Assurance/Quality Control (QA/QC) samples shall be collected will include a matrix spike/matrix spike duplicate (MS/MSD) for each round of monitoring, one duplicate sample for each round of monitoring, one equipment blank for each day of monitoring, and one trip blank sample for each day where groundwater samples are collected for analysis of volatile organic compounds (VOCs). QA/QC samples shall be prepared, labeled and managed in a similar manner as the primary groundwater samples as described below.

All water samples shall be placed into laboratory-supplied sample bottles with appropriate preservatives. Each bottle will be labeled using the required unique sample identifiers and the labeled bottles will be placed in a cooler with ice to depress the sample temperature. A chain of custody form shall be completed to document the sequence of sample possession. At the close of each sampling day, the filled coolers shall be sealed and transmitted with the chain of custody forms to the selected analytical laboratory via an overnight courier. The sampling contractor will maintain a copy of the completed chain of custody, and a copy shall also be included with each groundwater monitoring report.

Sample analysis will be performed by a New York State Department of Health ELAP-certified analytical laboratory. The laboratory will analyze all water samples for 6 NYCRR Part 360 water quality analysis parameters including organics, leachate indicators, and/or inorganics and as specified on the chain of custody documents. The analysis will be performed under a normal one to two-week turnaround time. The sampling contractor will be provided with the complete laboratory report from which summary tables will be prepared, data validation will be performed, and sampling results will be included in a monitoring report.

Landfill Gas Monitoring

Landfill gas monitoring will be performed by connecting a portable combustible gas meter (e.g., Landtec GA-90 Gas Analyzer, model GA1/1 or equivalent) to the quick connect fitting at the top of the PVC pipe. The instrument will be utilized to monitor static pressure and landfill gas composition including methane (CH₄), carbon dioxide (CO₂), oxygen (O₂), and balance gas (nitrogen, or N₂) which will be recorded on a sampling form. In addition to percent gas, the instrument may also be utilized to evaluate landfill gas concentrations as percentages of the lower explosive limit (LEL).

If you have any questions, please do not hesitate to call at (631) 737-6200.

Very truly yours,



Kevin F. Loyst, PE, PMP
Department Manager
Environmental Engineering

KFL/kfl
Attachments

S:\Riverhead\GW Sampling\2013\YoungsAveLandfillPostClosureSamplingPlan(Rev).doc



REV: 2/12/2013
REV: 9/18/2012
DATE: 6/20/2011

Well locations are approximate.

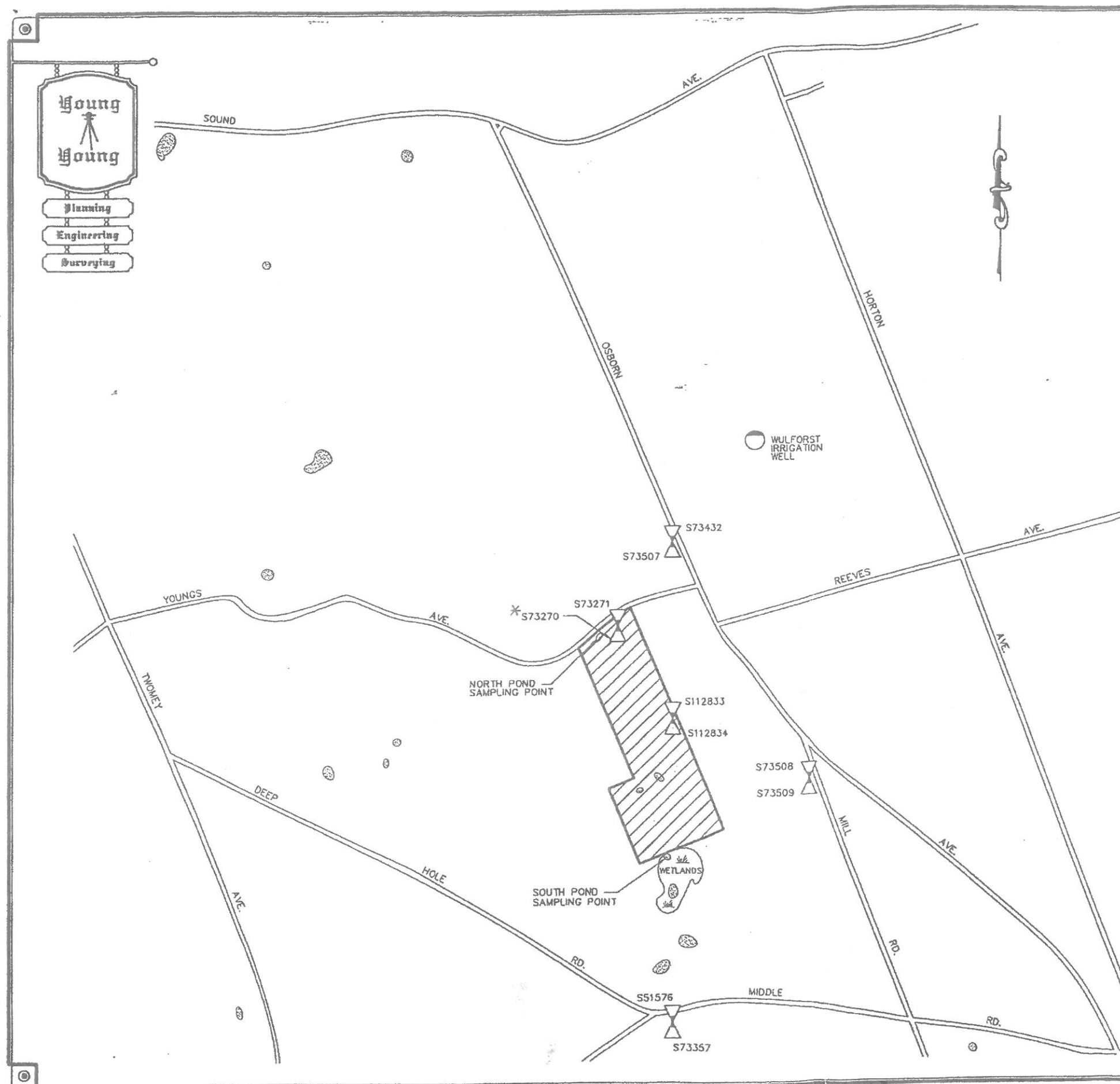
Property Lines Courtesy:
Suffolk County Real Property Tax Service
COPYRIGHT (c) 2010 COUNTY OF SUFFOLK, N.Y.

map of
YOUNGS AVE LANDFILL
ONSITE MONITORING WELLS

FIGURE A

No vehicle access to asphalt walkways.

TOWN OF RIVERHEAD
200 Howell Ave.
Riverhead, New York 11901



Young & Young, Land Surveyors
 400 Ostrander Avenue, Riverhead, New York 11901
 516-727-2303

Alden W. Young, P.E & L.S. (1908-1994)
 Howard W. Young, Land Surveyor
 Thomas C. Wolpert, Professional Engineer
 Kenneth F. Abruzzo, Land Surveyor
 John Schnurr, Land Surveyor

MONITORING WELL	DATES LAST SAMPLED
S51576(S)	JUNE 1994, OCT. 1998
S73357(D)	JUNE 1994, OCT. 1998
S73271(S)	JUNE 1994, OCT. 1998
S73270(D)	JUNE 1994, *
S73507(S)	JUNE 1994, OCT. 1998
S73432(D)	JUNE 1994, OCT. 1998
S73509(S)	JUNE 1994, OCT. 1998
S73508(D)	JUNE 1994, NOV. 1998
NORTH POND	JUNE 1994
SOUTH POND	JUNE 1994, OCT. 1998
WULFORST IRRIGATION WELL	JUNE 1994, OCT. 1998
S112833(S) **	OCT. 1998
S112834(D) **	OCT. 1998

* PROBLEM WELL, OCT. 1998
 ** WELL INSTALLED, SEPT. 1998

**PLAN OF GROUNDWATER SAMPLING POINTS
 PREPARED FOR YOUNGS AVENUE
 LANDFILL CAPPING & CLOSURE PROJECT
 TOWN OF RIVERHEAD**

At: BAITING HOLLOW Town of: RIVERHEAD
 Suffolk County, New York

Suff. Co. Tax Map:	600	80	2	6.1
	600	80	2	9.1
	District	Section	Block	Lot

DATE : DEC. 2, 1998
 SCALE : 1"=1200'
 JOB NO. : 98-0286
 SHEET NO. : 1 OF 1
 (980286LOC.DWG)

Note: *Well S73270(D) was re-installed at the extreme northeast corner of the property in February 2010 (See Figure A for location).

FIGURE B

THE LOCATION OF WELLS (W), SEPTIC TANKS (ST) & CESSPOOLS (CP) SHOWN HEREON ARE FROM FIELD OBSERVATIONS AND OR DATA OBTAINED FROM OTHERS.

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Youngs Avenue Landfill
Town of Riverhead, NY
10-Year Post-Closure GW/LFG Sampling Schedule

[illegible]

Project: YoungsAve_10-yearSamp

Date: Thu 1/31/13

Task

Summary

External Milestone

Inactive Summary

Manual Summary Rollup

Finish-only

Routine Sampling

Baseline Sampling

Split

Project Summary

Inactive Task

Manual Task

Manual Summary

Deadline

Milestone

External Tasks

Inactive Milestone

Duration-only

Start-only

Progress

APPENDIX A
PUMP SPECIFICATIONS AND
EQUIPMENT CALIBRATION INFORMATION

SQ, SQE, SQE-NE, CU 321



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- It is our mission - the basis of our existence - to successfully develop, produce and sell high-quality pumps and pumping systems world-wide, contributing to a better quality of life and a healthy environment



Bjerringbro, Denmark



Fresno, California



Olathe, Kansas



Monterrey, Mexico



Allentown, Pennsylvania



Oakville, Ontario

- One of the 3 largest pump companies in the world
- The second largest manufacturer of submersible motors in the world
- World headquarters in Denmark
- North American headquarters in Kansas City - Manufacturing in Fresno, California
- 80 companies in 45 countries
- More than 16 million motors and pumps produced annually worldwide
- North American companies operating in USA, Canada and Mexico
- Continuous reinvestment in growth and development enables the company to **BE** responsible, **THINK** ahead, and **INNOVATE**

Introduction

3-inch SQ, SQE submersible well pumps for 3-inch and larger wells

SQ, SQE pumps are suitable for both continuous and intermittent operation for a variety of applications:

- Domestic water supply
- light commercial
- irrigation
- tank applications.

Features and benefits

SQ, SQE pumps offer these features:

- Dry-run protection
- high efficiency pump and motor
- protection against up-thrust
- soft-start
- over-voltage and under-voltage protection
- over-temperature protection
- high starting torque.

Additionally, SQE pumps offer these advantages:

- Constant pressure control
- variable speed
- electronic control and communication.

SQ, SQE innovative motor technology

SQ, SQE pumps feature an innovative motor design incorporating permanent-magnet technology. By combining permanent-magnet motors and a Grundfos micro-frequency converter, we are able to deliver unmatched performance and the ability to control and communicate with the pump in ways never before possible. A few of the features that result from this combined technology are Constant Pressure Control, Soft-Start, and Integrated Dry-Run Protection, but these are just a few of the features these pumps offer.

SQ pump models operate at a constant speed much like today's conventional pumps. The difference is that SQ delivers the benefits of an electronically controlled permanent-magnet motor that cannot be achieved with a conventional induction motor.

SQ pumps are available for single-phase power; a simple 2-wire design makes installation easy.

SQE pumps are equipped with a Grundfos "Smart Motor." Like the SQ models, SQ pumps have a high efficiency permanent-magnet motor — but we add the ability to communicate.

The "Smart Motor" communicates via the CU301 status box through the power leads.

It is not necessary to run any additional wires down the well. Communication with the pump provides Constant Pressure Control and the highly useful ability to change the pump performance while the pump is installed in the well. Like the SQ motor, this is also a 2-wire motor designed for single-phase operation.

Dry-running protection

The pumps are protected against dry running. A value of $P_{\text{cut-out}}$ ensures cut-out of the pump in case of lack of water in the borehole thus preventing a burnout of the motor.

$P_{\text{cut-out}}$ is factory-set both for the SQ and SQE, SQE-NE pumps.

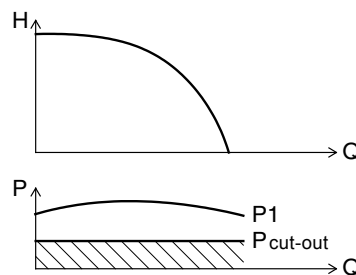


Fig. 1 $P_{\text{cut-out}}$ curve

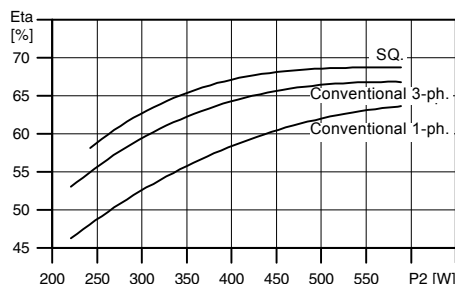
High pump efficiency

The hydraulic pump components are polyamide reinforced with 30 % glass fiber. The hydraulic design provides for high pump efficiency resulting in low energy consumption and therefore low energy costs.

TM01 2751 2298

High motor efficiency

The motors are based on a permanent magnet rotor (PM motor) featuring high efficiency within a wide load range.



TM01 2698 2298

Fig. 2 Efficiency curves of Grundfos SQ motor versus conventional motors

Wear resistance

The pump design features "floating" impellers (not fastened to the shaft). Each impeller has its own tungsten carbide/ceramic bearing. The construction and materials ensure high wear resistance to sand for long product life.



TM01 3141 3498

Fig. 3 Example of Grundfos floating impeller

Protection against upthrust

Starting up a pump with a very low counter pressure involves the risk of the entire impeller stack being lifted, also called upthrust. Upthrust may cause breakdown of both pump and motor.

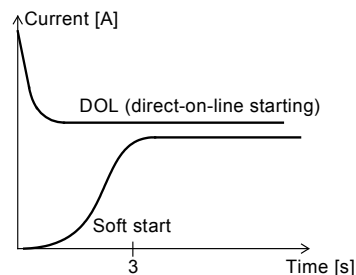
SQ, SQE, SQE-NE motors are fitted with a top bearing protecting both pump and motor against upthrust, thus preventing breakdown during the critical start-up phase.

Excellent starting capabilities

The integrated electronic unit of the motor features soft starting. Soft start reduces the starting current and thus gives the pump a smooth and steady acceleration.

The soft starter minimizes the risk of wear on the pump and prevents overloading of the mains during start-up.

The excellent starting capabilities are a result of the high locked-rotor torque of the permanent magnet motor together with the few pump stages. The high starting reliability also applies in case of low voltage supply.



TM01 3479 4198

Fig. 4 Soft-start feature

Overvoltage and undervoltage protection

Overvoltage and undervoltage may occur in case of unstable voltage supply.

The integrated protection of all motors prevents damage to the motor in case the voltage moves outside the permissible voltage range.

The pump will cut out if the voltage falls below 150 V or rises above 315 V. The motor is automatically cut in again when the voltage again falls within the permissible voltage range. Therefore no extra protection relay is needed.

Overload protection

Exposure of the pump to heavy load causes the current consumption to rise. The motor will automatically compensate for this by reducing the speed to 3000 rpm. Further overload will lead to stop.

If the rotor is being prevented from rotating, this will automatically be detected and the power supply will be cut out. Consequently, no extra motor protection is needed.

Overtemperature protection

A permanent magnet motor gives off very little heat to its surroundings. In combination with an efficient internal circulation system leading the heat away from the rotor, stator and bearings, this ensures optimum operating conditions for the motor.

As an extra protection, the electronic unit has a built-in temperature sensor. When the temperature rises too high, the motor is cut out; when the temperature has dropped, the motor is automatically cut in again.

Reliability

The motors are built for high reliability and feature:

- Tungsten carbide / ceramic bearings
- thrust bearings protecting against downthrust
- product life time equal to conventional AC motors.

Variable speed

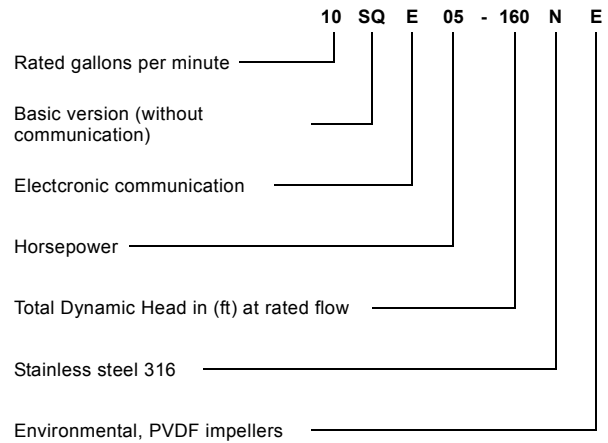
The SQE motor enables continuously variable speed control from 3,000 to 10,700 rpm. The pump can be set to operate in any duty point in the range between the 3,000 and 10,700 rpm performance curves of the pump. Consequently, the pump performance can be adapted to any specific requirement.

The variable speed control facility requires the use of the CU 300 or CU 301 control unit.

For the calculation of pump speed, the program "SQE Speed Calculation" is available on CD-ROM as an accessory.

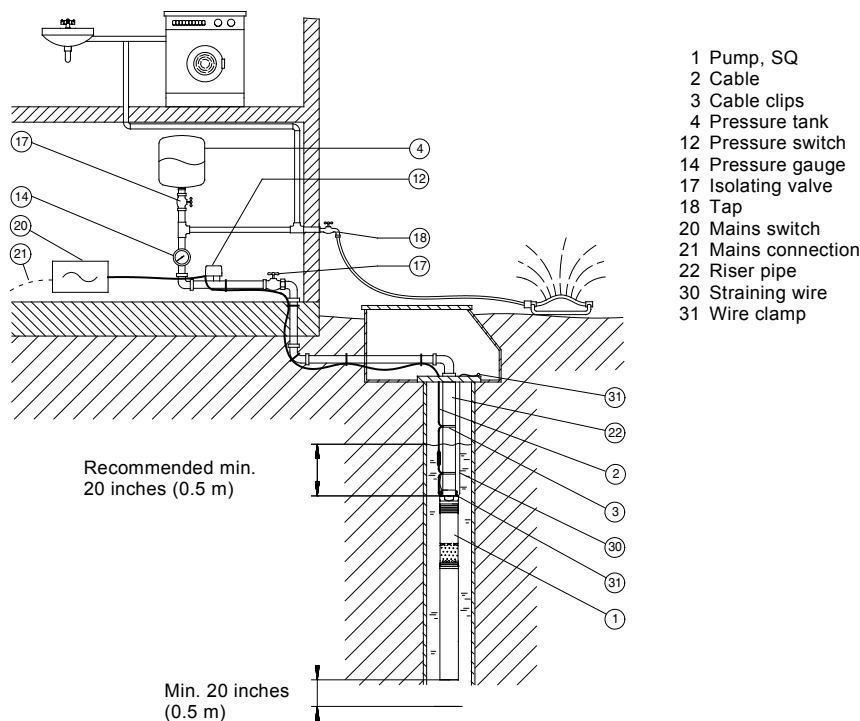
Identification

Type key example SQ, SQE, SQE-NE



SQ with pressure switch and pressure tank

SQ is ideally suited for domestic water supply in single-family dwellings or summer homes which are not connected to municipal waterworks. SQ is easy to install and operate.



TM01 2447 1798

Fig. 5 Application example: SQ with pressure switch and pressure tank

SQ with pressure switch and pressure tank

Pos.	Part	Type	No. of units	Product number	Unit price	Total price
1	Pump	SQ				
2	Cable					
3	Cable clips					
4	Pressure tank					
12	Pressure switch					
14	Pressure gauge					
20	Mains switch					
30	Straining wire					
31	Wire clamp					

Constant-pressure control with CU 301 - residential water supply

Features and benefits

The system maintains a constant pressure within the maximum pump performance in spite of a varying water consumption.

The pressure is registered by the pressure sensor and transmitted to the CU 301. The CU 301 adjusts the pump performance accordingly.

Function

When a tap is opened the pressure in the tank will start to drop. At a flow lower than approximately 1 gpm (0.18 m³/h), the pressure will drop slowly.

When the pressure in the tank is 7 psi (0.5 bar) below setpoint, the pump will start. The pump will run until the pressure is 7 psi (0.5 bar) above setpoint. This way of operation is called on/off operation.

At a flow higher than approximately 1 gpm (0.18 m³/h), the pressure will drop quickly and the pump will start immediately and maintain a constant pressure.

During operation, the CU 301 will regulate the pump speed to maintain a constant pressure. If there is no consumption, the pump will boost the pressure to 7 psi (0.5 bar) above setpoint and stop after a few seconds.

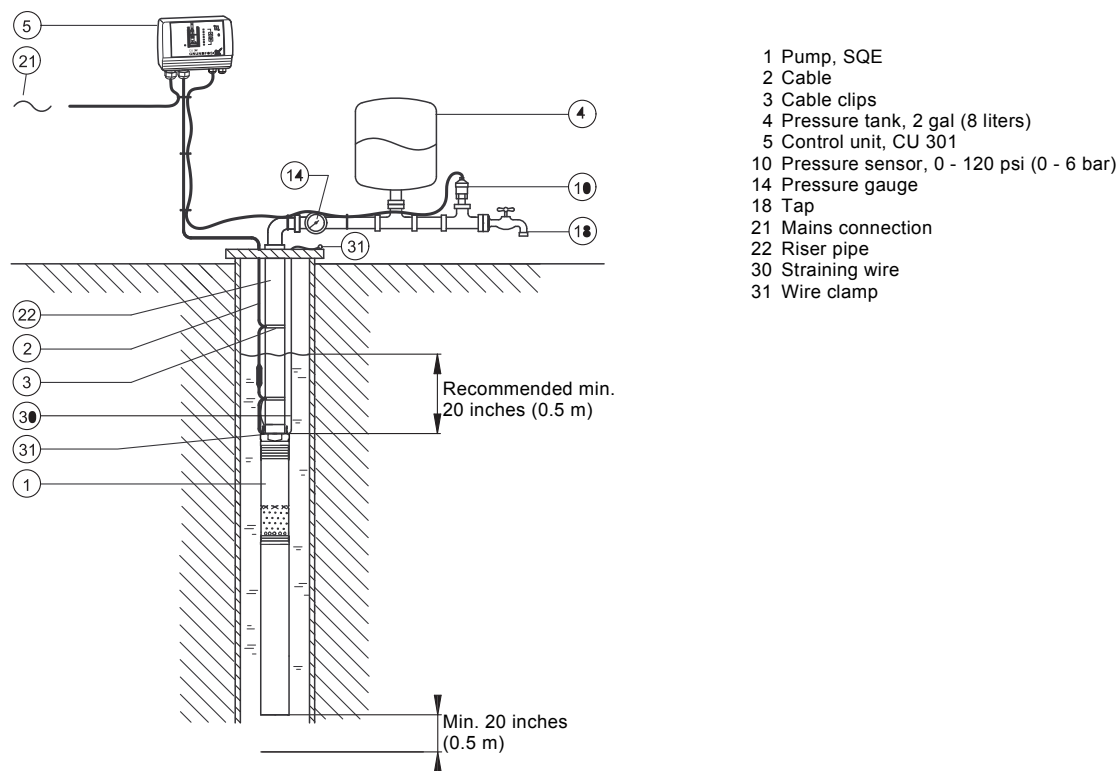


Fig. 6 Application example: Constant-pressure control with CU 301 - residential water supply

Constant-pressure control with CU 301 - residential water supply

Pos.	Part	Type	No. of units	Product number	Unit price	Total price
1	Pump	SQE				
2	Cable					
3	Cable clips					
4	Pressure tank	2 gal (8 liters)				
5	Control unit	CU 301				
10	Pressure sensor	0 - 120 psi (0 - 6 bar)				
14	Pressure gauge					
30	Straining wire					
31	Wire clamp					

TM03 3429 0406

Constant-pressure control with CU 301 - irrigation

Features and benefits

The system maintains a constant pressure within the maximum pump performance in spite of a varying water consumption.

The pressure is registered by means of the pressure sensor and transmitted to the CU 301. The CU 301 adjusts the pump performance accordingly.

Function

When the sprinkler system is started, the pressure in the tank will start to drop.

At a flow lower than approximately 1 gpm (0.18 m³/h),

the pressure will drop slowly. When the pressure in the tank is 7 psi (0.5 bar) below setpoint, the pump will start. The pump will run until the pressure is 7 psi (0.5 bar) above setpoint. This way of operation is called on/off operation.

At a flow higher than approximately 1 gpm (0.18 m³/h), the pressure will drop quickly and the pump will start immediately and maintain a constant pressure.

During operation, the CU 301 will regulate the pump speed to maintain a constant pressure. If there is no consumption, the pump will boost the pressure to 7 psi (0.5 bar) above setpoint and stop after a few seconds.

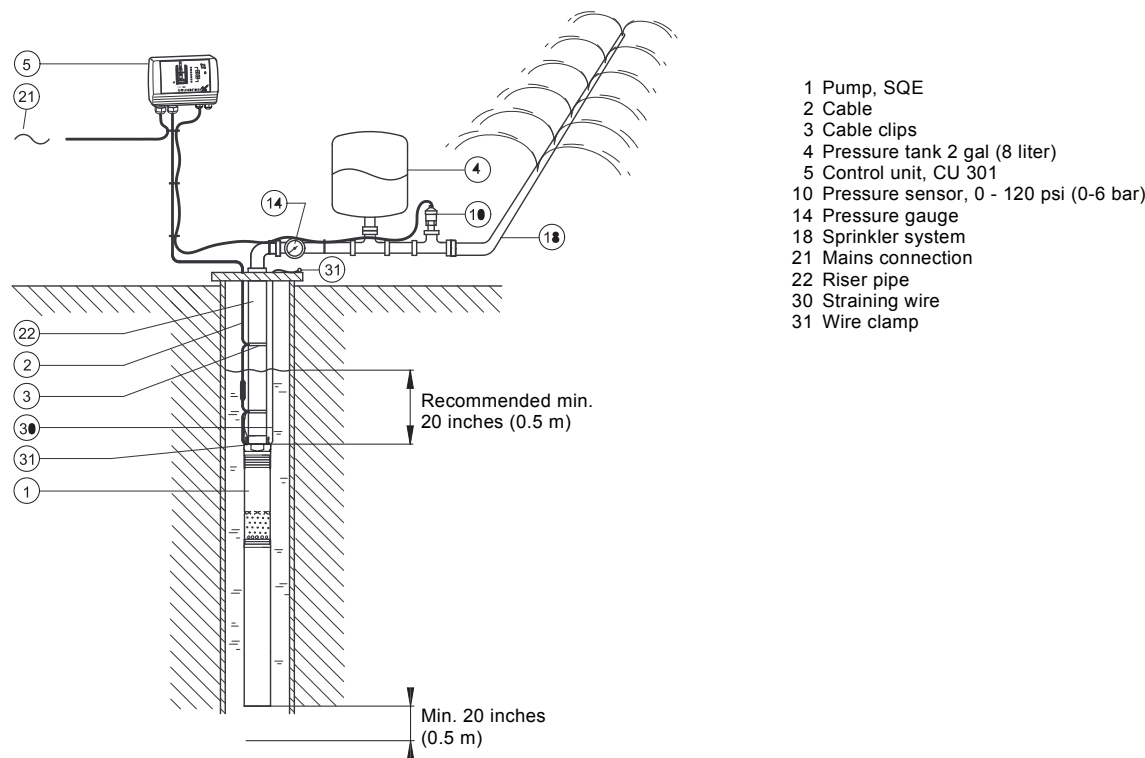


Fig. 7 Application example: Constant-pressure control with CU 301 - irrigation

Constant-pressure control with CU 301 - irrigation

Pos.	Part	Type	No. of units	Product number	Unit price	Total price
1	Pump	SQE				
2	Cable					
3	Cable clips					
4	Pressure tank	2 gal (8 liter)				
5	Control unit	CU 301				
10	Pressure sensor	0 - 120 psi (0 - 6 bar)				
14	Pressure gauge					
30	Straining wire					
31	Wire clamp					

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Maintaining a constant water table

Functioning and benefits

A constant water table can be maintained by adjusting pump performance. It may be important to maintain a constant water table, e.g. in connection with keeping out the groundwater on a building site or water remediation projects.

The example shows how to maintain a constant water table by adjusting pump performance.

Sensors

Level	Description	Reaction
Level sensor (pos. 11)		
Warning (max.)	Too high water level. Possible cause: Insufficient pump capacity.	Alarm relay operates.
Desired level	The water level which should be maintained.	
Warning (min.)	Too low water level. Possible cause: Too high pump capacity.	Alarm relay operates.

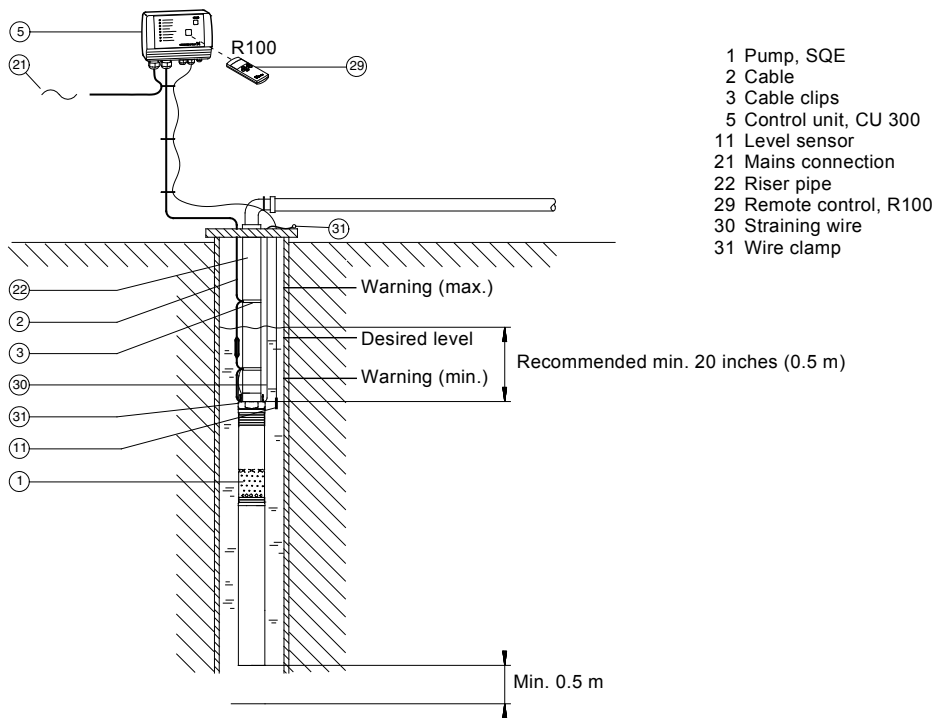


Fig. 8 Application example: Maintaining a constant water table

Maintaining a constant water table

Pos.	Part	Type	No. of units	Product number	Unit price	Total price
1	Pump	SQE				
2	Cable					
3	Cable clips					
5	Control unit	CU 300				
11	Level sensor					
29	Remote control	R100				
30	Straining wire					
31	Wire clamp					

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Emptying or filling a tank

The SQE pump with CU 300 is ideal for emptying or filling a tank.

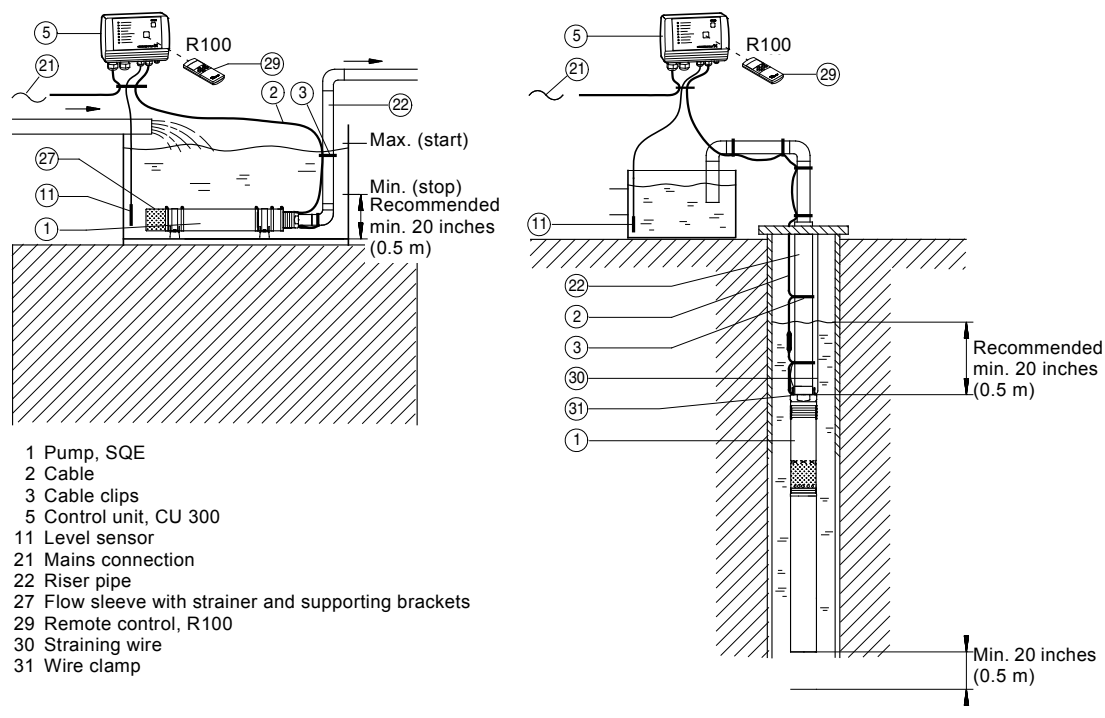


Fig. 9 Application example: Emptying or filling a tank

Emptying or filling a tank

Pos.	Part	Type	No. of units	Product number	Unit price	Total price
1	Pump	SQE				
2	Cable					
3	Cable clips					
5	Control unit	CU 300				
11	Level sensor					
22	Riser pipe					
27	Flow sleeve with strainer and supporting brackets					
29	Remote control	R100				
30	Straining wire					
31	Wire clamp					

Pumping from one tank to another

Functioning and benefits

The SQE pump is ideal for pumping water from one tank to another.

Sensors

Level	Description	Light indication on CU 300
Level sensor (pos. 11, tank at top)		
Max. (stop)	When the water has reached this level, the pump stops.	Green indicator light in on/off button is flashing.
Min. (start)	When the water has dropped to this level, the pump starts.	Green indicator light in on/off button is permanently on.
Level sensor (pos. 11, tank at bottom)		
Max. (start)	When the water has reached this level, the pump starts.	Green indicator light in on/off button is on.
Min. (stop)	When the water has dropped to this level, the pump stops.	Green indicator light in on/off button is flashing.

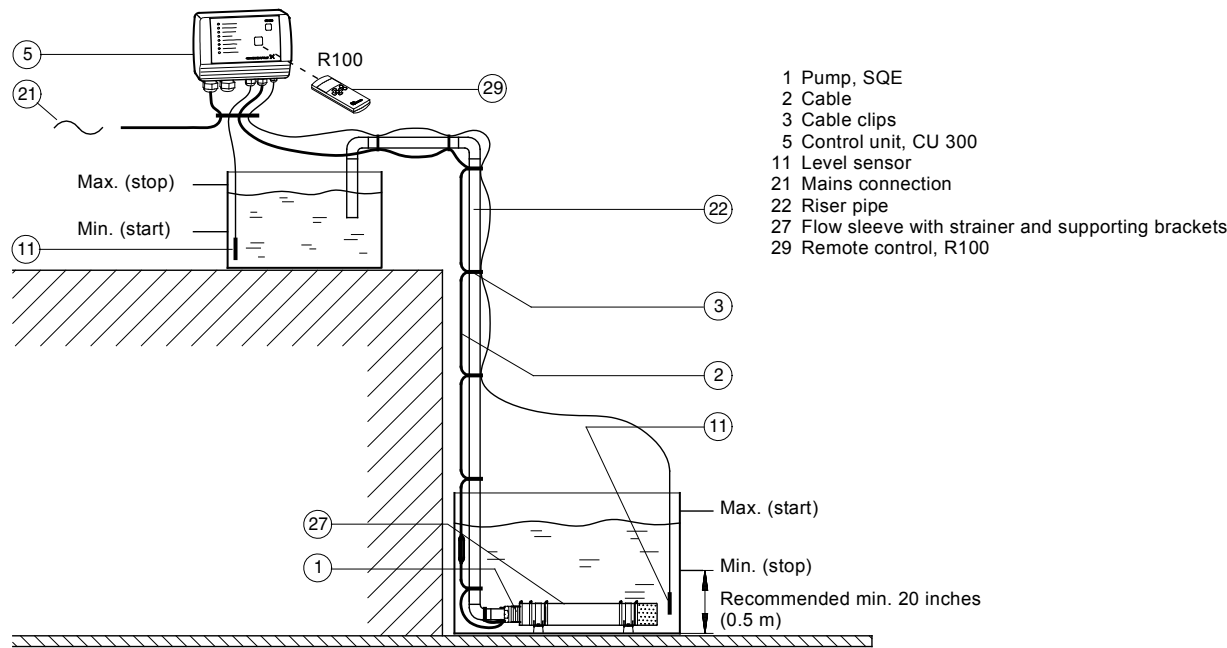


Fig. 10 Application example: Pumping from one tank to another

Pumping from one tank to another

Pos.	Part	Type	No. of units	Product number	Unit price	Total price
1	Pump	SQE				
2	Cable					
3	Cable clips					
5	Control unit	CU 300				
11	Level sensor					
27	Flow sleeve with strainer and supporting brackets					
29	Remote control	R100				

TM01 2454 4801

Setting of operating parameters

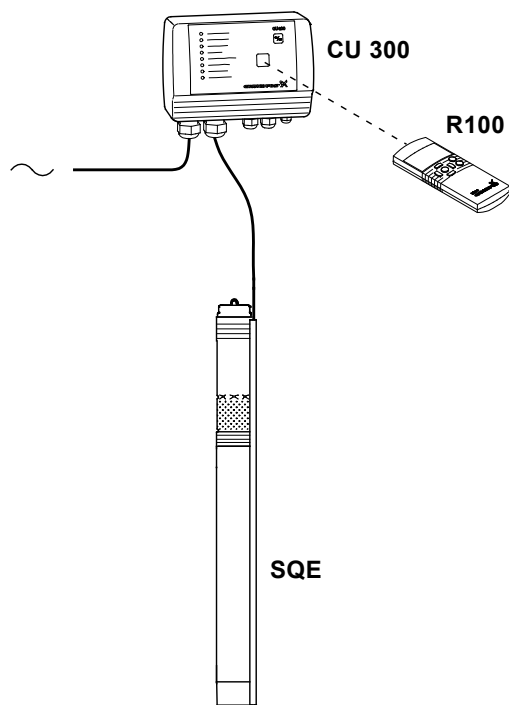
Using the R100 and the CU 300 enables change of the motor speed and thereby setting of the pump to a specific performance.

The software program "SQE Speed Calculation" has been developed for the calculation of the speed in order to obtain the required flow rate and head.

Dry-running protection

The value $P_{\text{cut-out}}$, ensuring dry-running protection, is factory-set for the SQE pump.

If the speed of the SQE pump is reduced by more than 1000 rpm, the $P_{\text{cut-out}}$ value must be readjusted by means of the CU 300 and R100.



Note: The SQE pump must not be started until the pump has been completely submerged below the water table. However, the change of the motor speed can be made even if the pump is not submerged.

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Fig. 11 Application example: Workshop setting of operating parameters

Setting of operating parameters

Part	Type	No. of units	Product number	Unit price	Total price
Pump	SQE				
Remote control	R100				
Control unit	CU 300				
SQE Speed Calculation program					

SQE with manual speed control

Functioning and benefits

Manual speed control of the SQE pumps is possible by means of R100 and an SPP 1 potentiometer.

This application is especially suitable for sampling from groundwater monitoring wells. The monitoring well is purged at high speed and the sample is taken at a low speed (quiet flow). For contaminated groundwater the SQE-NE type range is recommended.

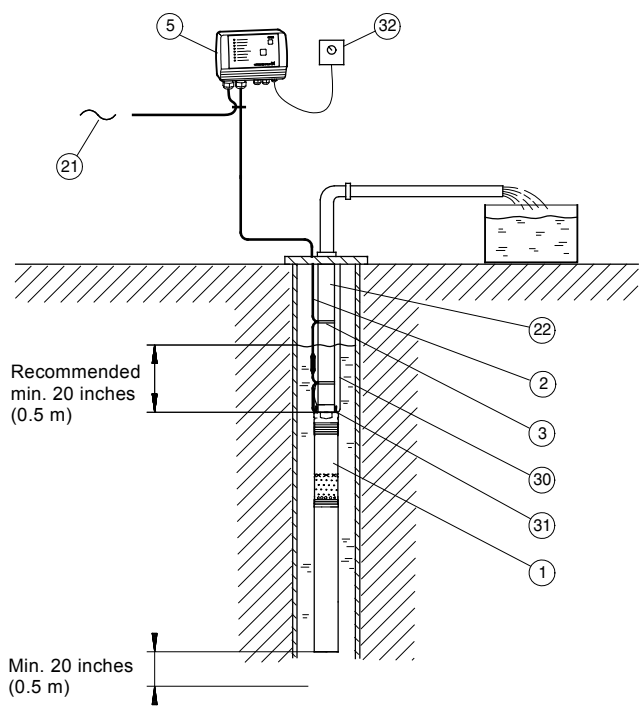
In case frequent sampling is required, dedicated installation of the pump is recommended, thus eliminating wear caused by frequent assembly and dismantling the installation.

Furthermore, dedicated installations saves the costs of assembling and dismantling the installation.

Important: Through dedicated installation the transfer of contamination from one monitoring well to another is avoided.

Dry-running protection

The value $P_{cut\ out}$, ensuring dry-running protection, is factory-set for the SQE pump. If the speed of the pump is reduced more than 1,000 rpm, the value of $P_{cut\ out}$ must be readjusted by means of CU 300 and R100.



- 1 SQE pump
- 2 Cable
- 3 Cable clips
- 5 Control unit, CU 300
- 21 Mains connection
- 22 Riser pipe
- 30 Stainless-steel straining wire
- 31 Stainless-steel wire clamps, 2 per lifting eye
- 32 Potentiometer, SPP 1

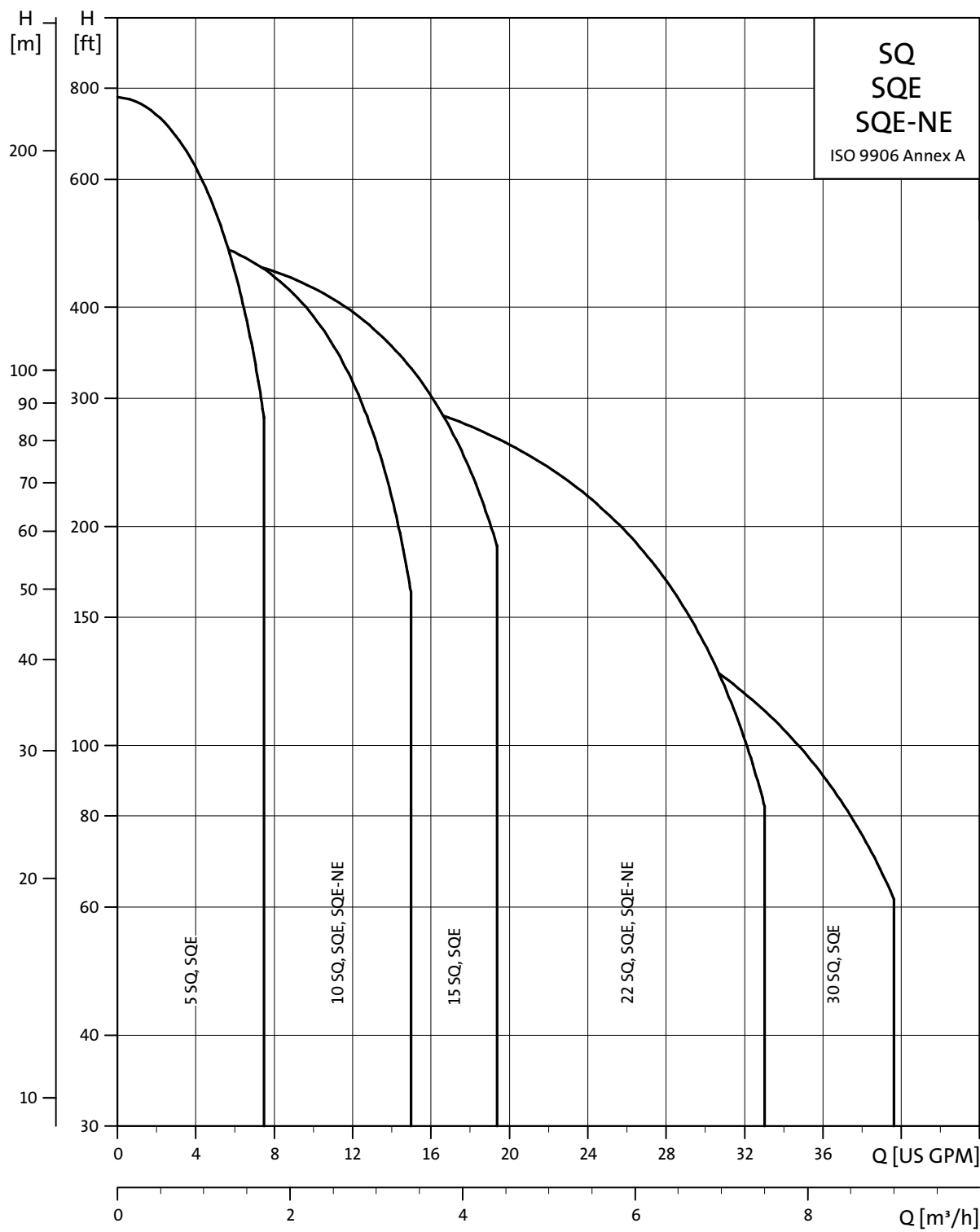
Fig. 12 Application example: Sampling/manual speed control of SQE

Sampling/manual speed control of SQE

Pos.	Part	Type	No. of units	Product number	Unit price	Total price
1	Pump	SQE				
2	Cable					
3	Cable clips					
5	Control unit	CU 300				
22	Riser pipe					
30	Stainless-steel straining wire					
31	Wire clamps	2 per lifting eye				
32	Potentiometer	SPP 1				

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Performance range



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Installation

The SQ and SQE, SQE-NE may be installed vertically, horizontally or in any position in between.

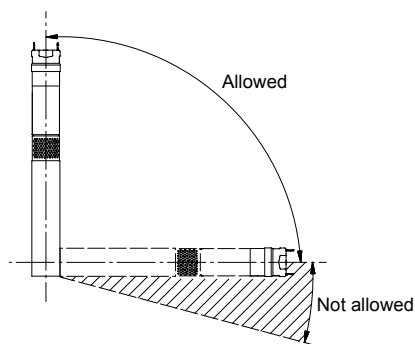
Note: The pump must not fall below the horizontal level in relation to the motor.

The following features ensure simple installation of the pump:

- Built-in check valve with spring
- low weight ensuring user-friendly handling
- installation in 3" or larger boreholes
- only on/off switch is needed, which means that no extra motor starter / starter box is necessary.

For horizontal installation a flow sleeve is recommended in order to:

- ensure sufficient flow velocity past the motor and thus provide sufficient cooling
- prevent motor and electronic unit from being buried in sand or mud.



TM01 1375 1498

Fig. 13 SQE installation

System sizing guide

Step 1

Calculate minimum head requirements at no flow conditions:

$$H_{\max} \text{ (required)} = \text{dynamic head} + \text{system pressure (in feet)} + \text{above grade elevation} + \text{friction loss}$$

Step 2

Select pump from chart as follows:

- Choose model family based on the desired flow rate (i.e. 15SQE for a flow rate of 15 gpm)
- Select the first model with a value in Column 2 greater than the $H_{\max}$ calculated in Step 1
(For example: the choice for a 22 gpm model with an $H_{\max}$ of 140 ft would be the 22SQE-160).
- Double check your selection in the performance curves; see *Curve charts* on p. 19.

System sizing matrix		
Pump type Model B	Column 1	Column 2
	Shutoff head (0 gpm) @ 3000 rpm min. speed	Head @ rated gpm @ 10700 rpm max. speed
	TDH [feet]	TDH [feet]
5SQE-90	11	86
5SQE-140	17	131
5SQE-180	22	177
5SQE-230	28	222
5SQE-270	34	270
5SQE-320	39	315
5SQE-360	45	360
5SQE-410	51	405
5SQE-450	56	450
10SQE-110	12	105
10SQE-160	17	164
10SQE-200	23	215
10SQE-240	29	267
10SQE-290	34	328
10SQE-330	40	390
15SQE-70	10	75
15SQE-110	14	123
15SQE-150	19	164
15SQE-180	24	205
15SQE-220	29	246
15SQE-250	33	287
15SQE-290	38	328
22SQE-40	5	36
22SQE-80	9	77
22SQE-120	14	117
22SQE-160	18	159
22SQE-190	23	200
22SQE-220	27	240
30SQE-40	5	33
30SQE-90	11	82
30SQE-130	16	126

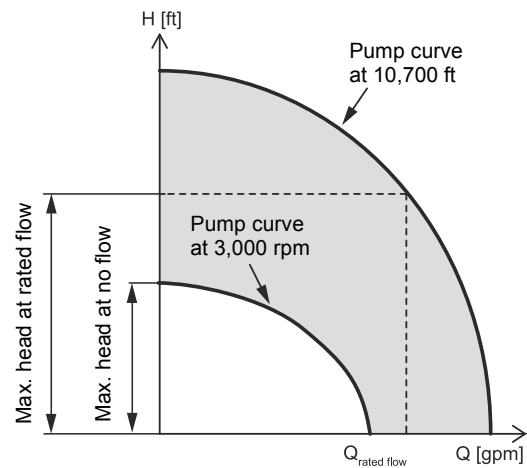


Fig. 14 Recommended sizing

Note: All calculated head requirements must lie between the selected pump models minimum and maximum speed curves.

TM01 8547 0400

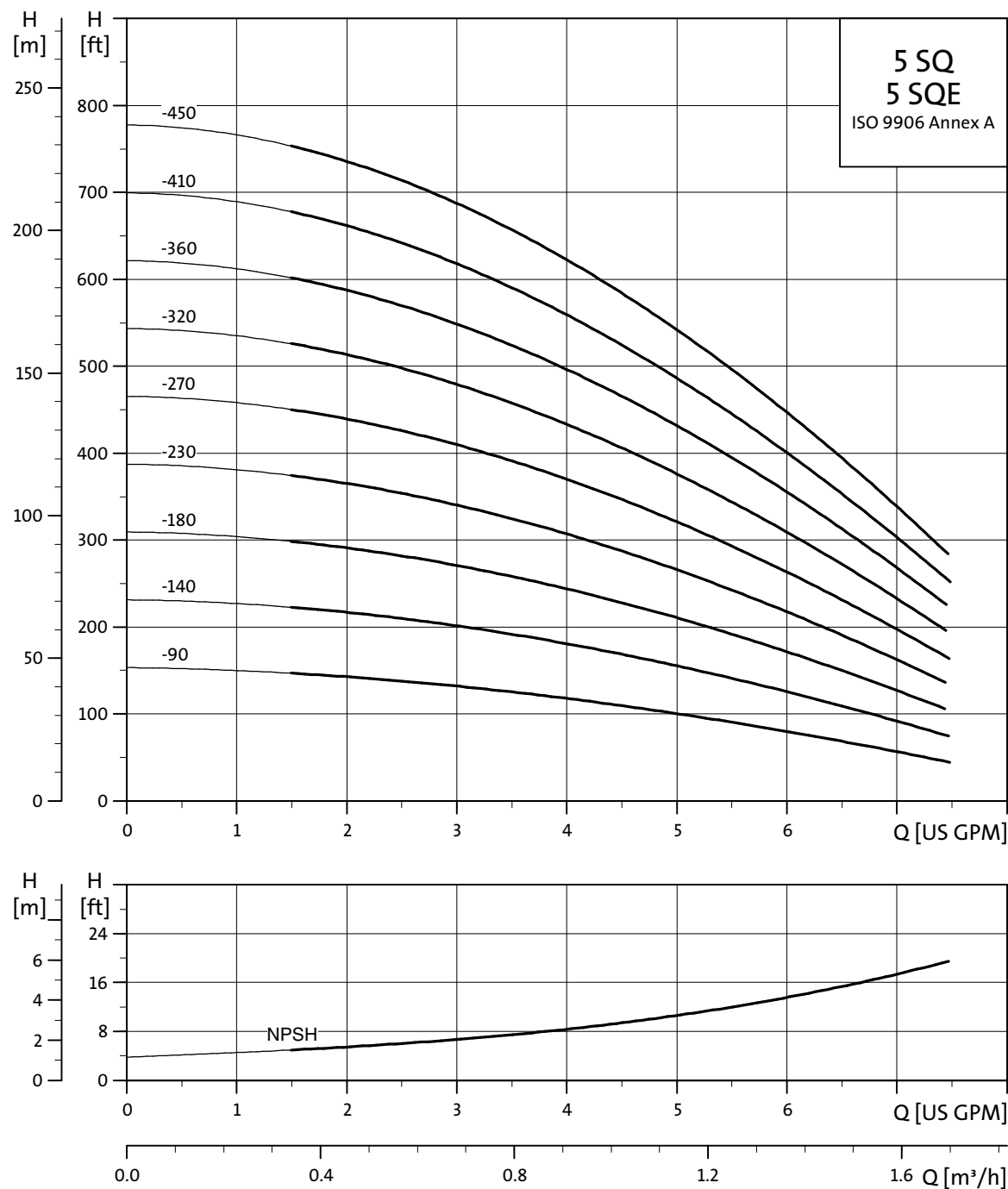
SQ, SQE, SQE-NE cable sizing chart

Motor rating			Copper wire size (AWG)						
Volts	Hp	Amps	14	12	10	8	6	4	2
115	0.5	12	140	220	360	550	880	1390	2260
230	0.5	5.2	640	1000	1660	2250	4060	—	—
230	0.75	8.4	400	620	1030	1580	2510	3970	—
230	1	11.2	300	460	770	1190	1890	2980	4850
230	1.5	12	280	430	720	1110	1760	2780	4530

Cable length in feet.

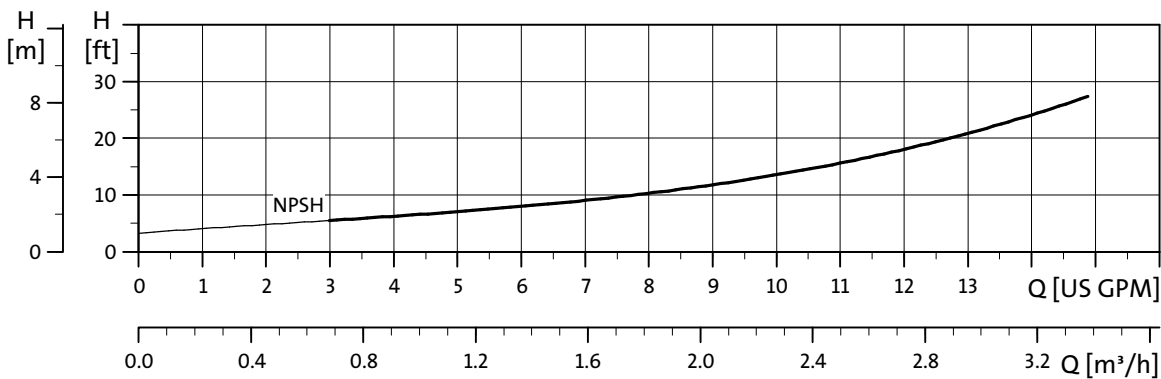
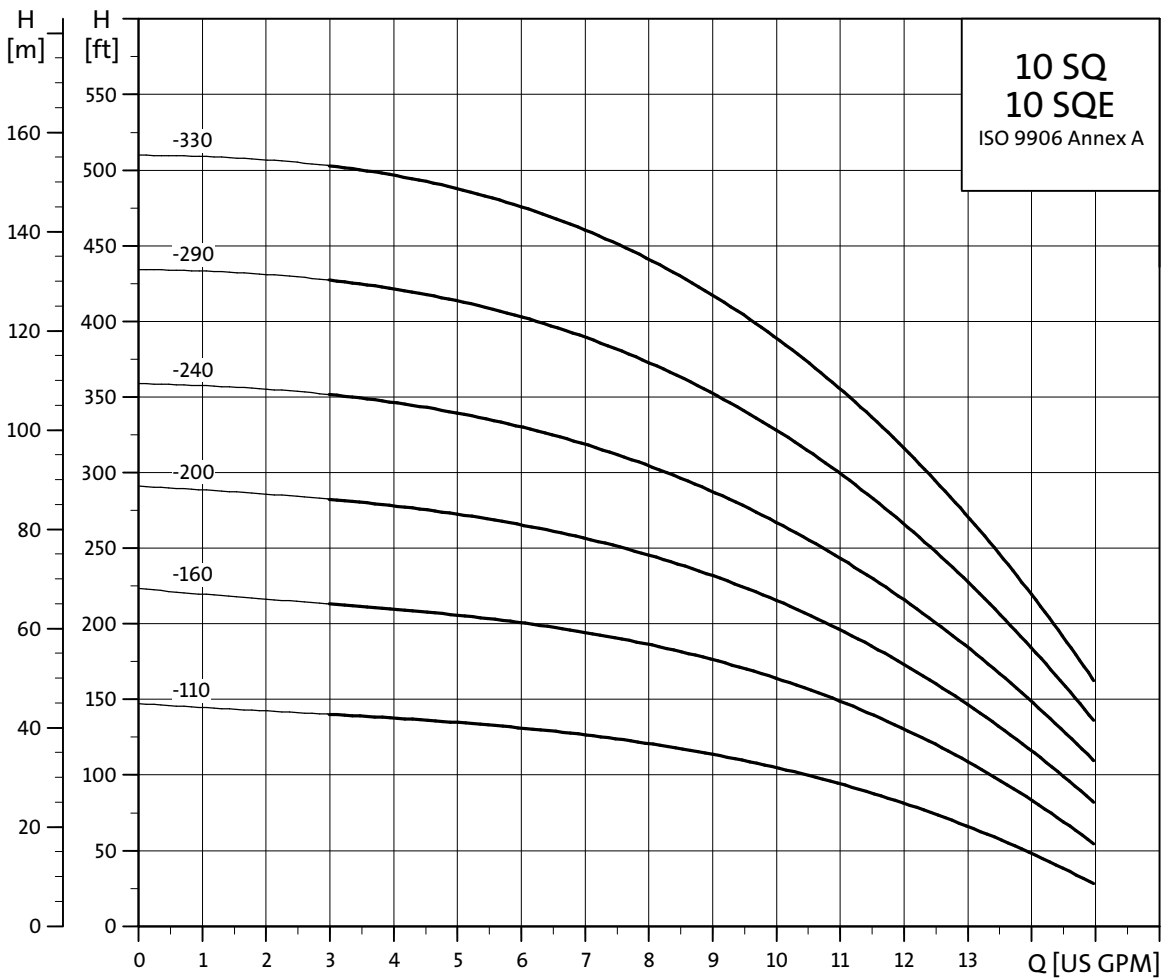
Note: shaded values do not apply when using a CU 301 as its max. recommended cable length is 650 ft.

5 SQ, SQE



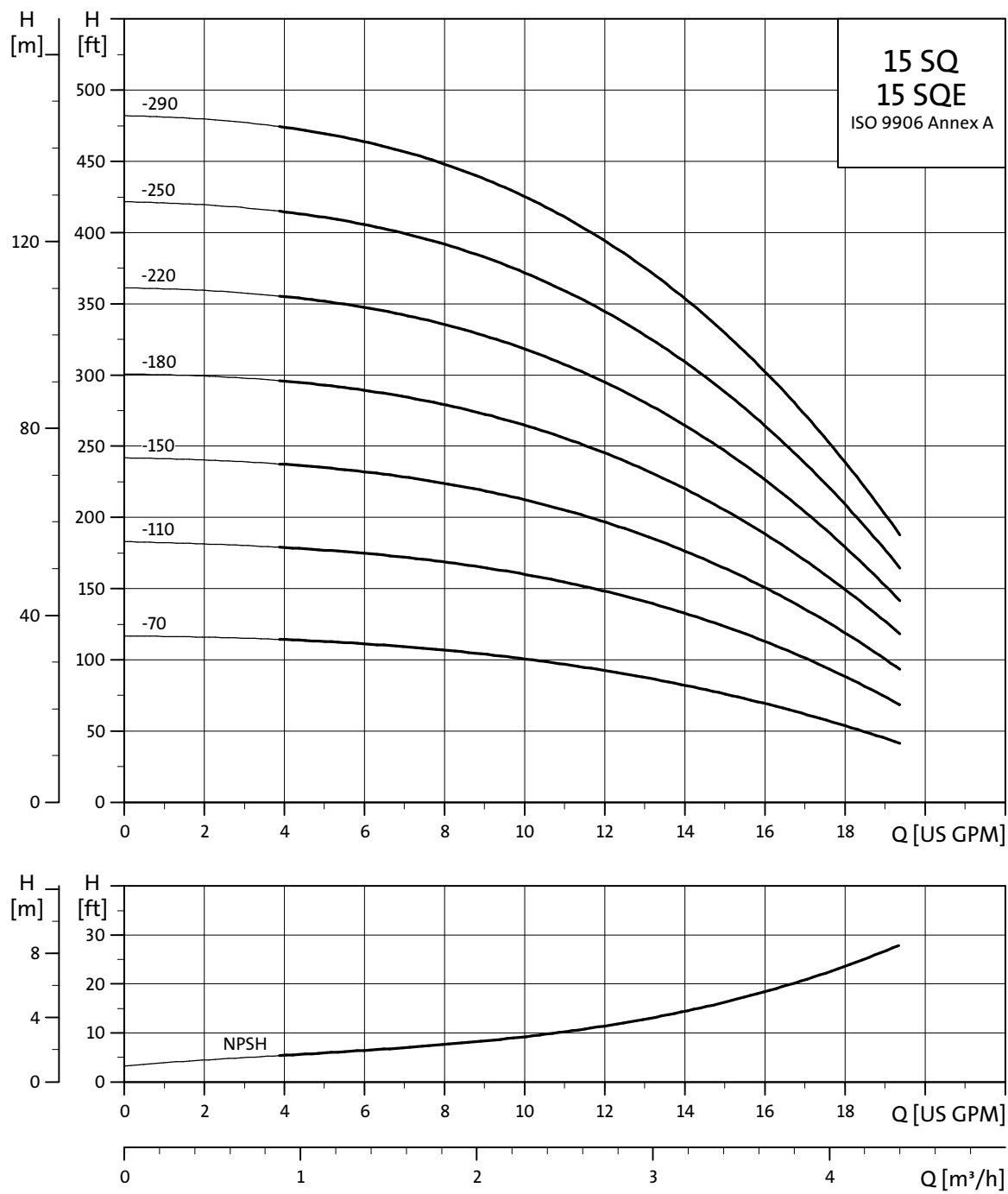
TM04 7463 2010

10 SQ, SQE



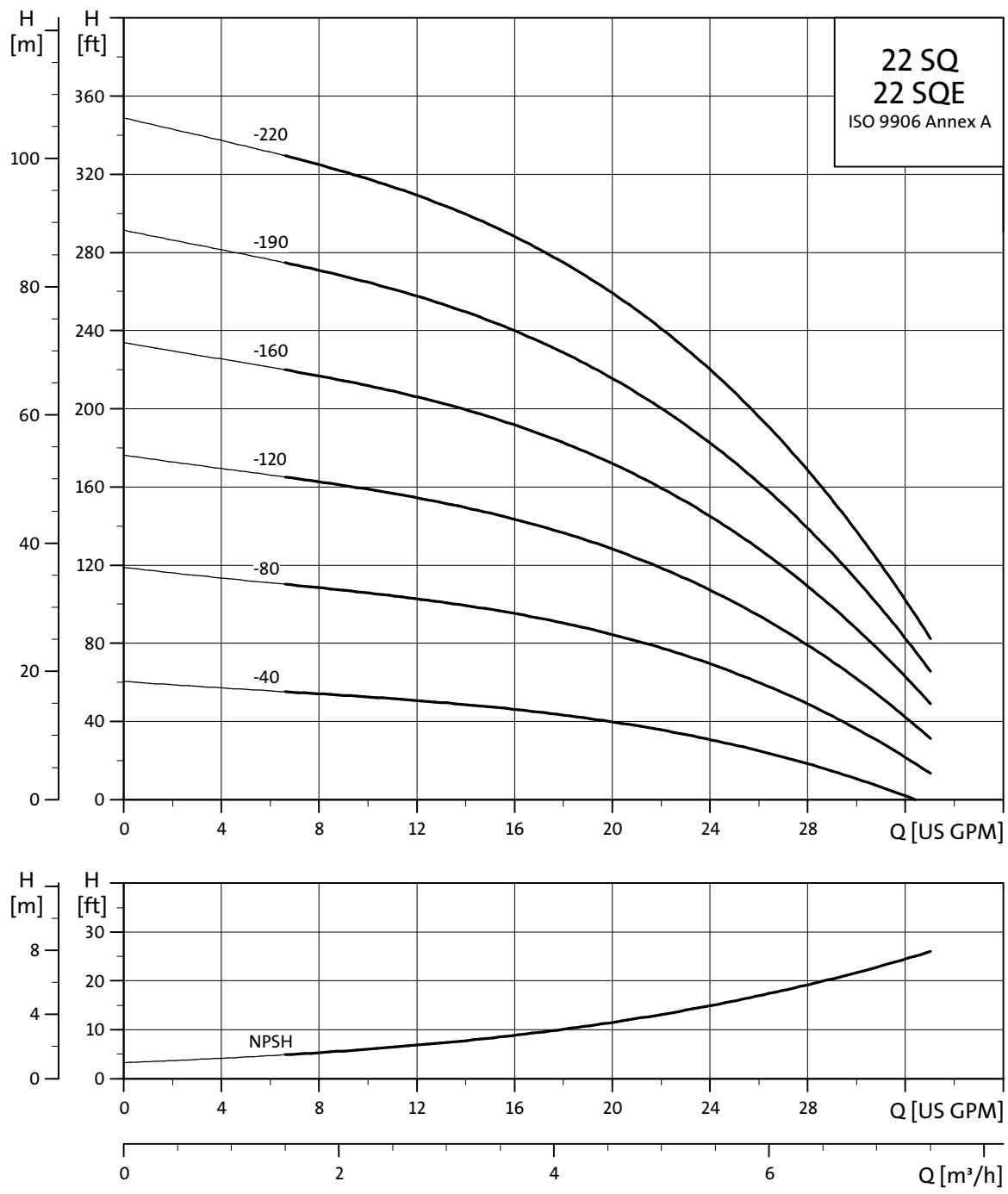
TM04 7464 2010

15 SQ, SQE



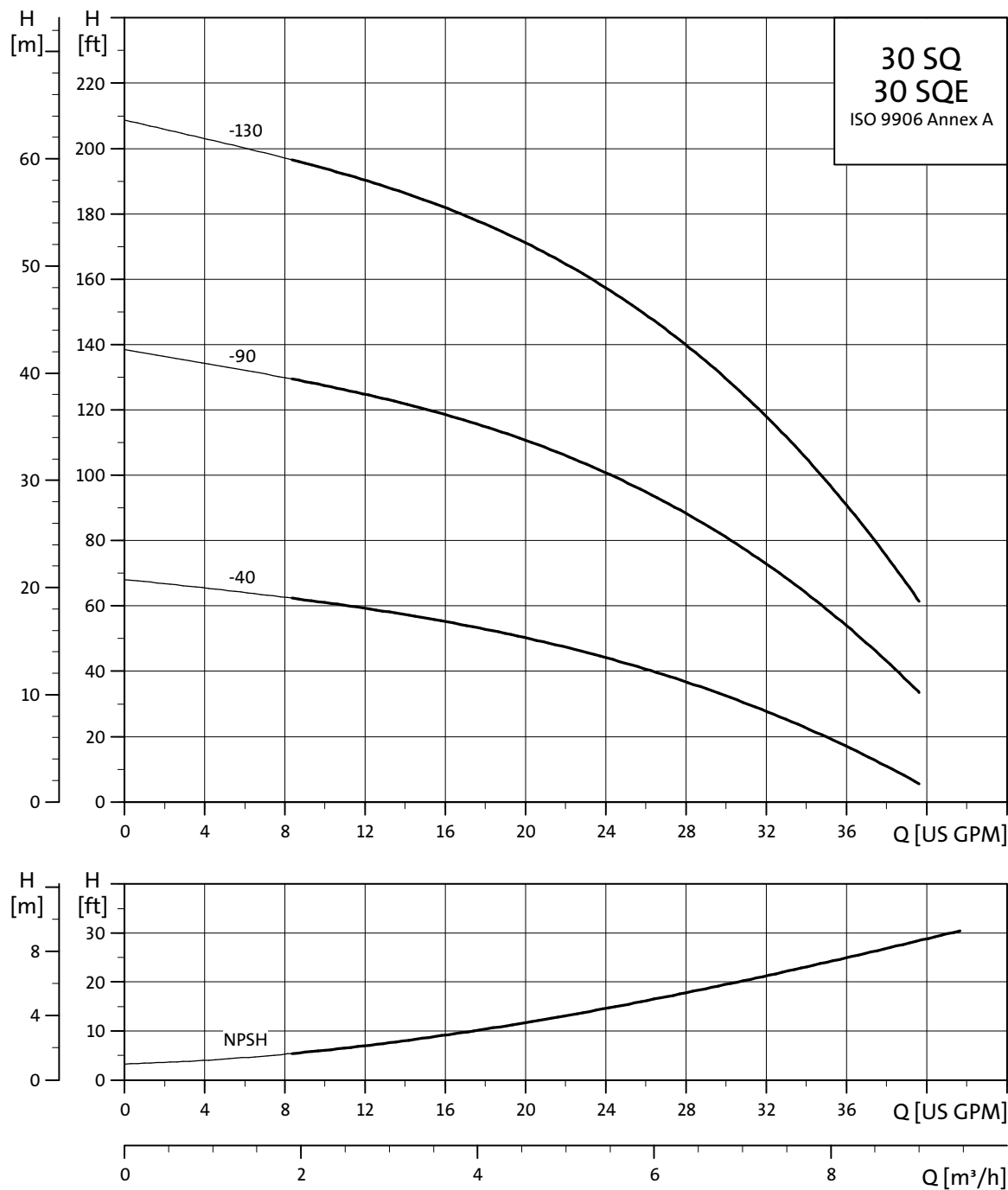
TM04 7465 2010

22 SQ, SQE



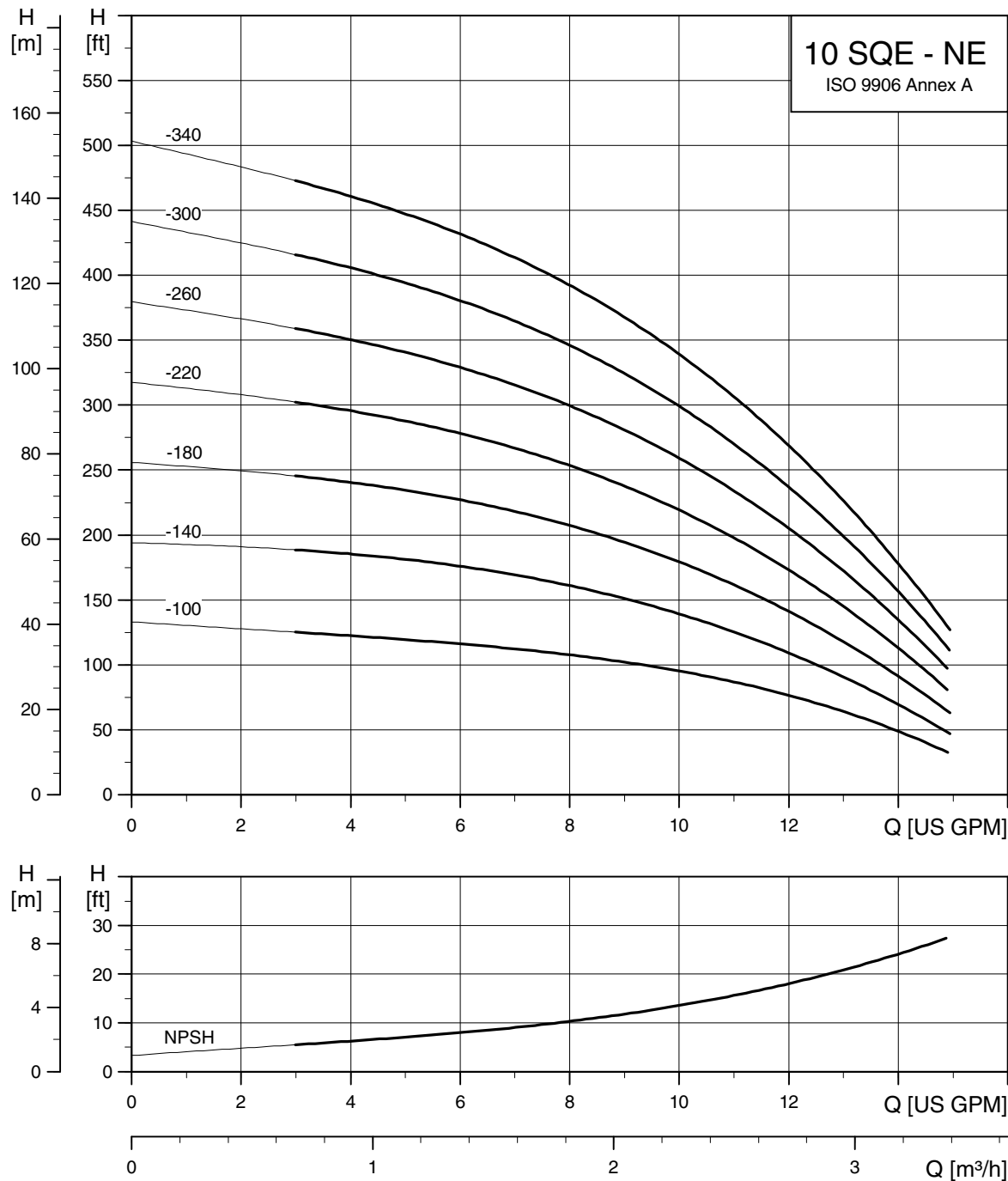
TM04 7466 2010

30 SQ, SQE



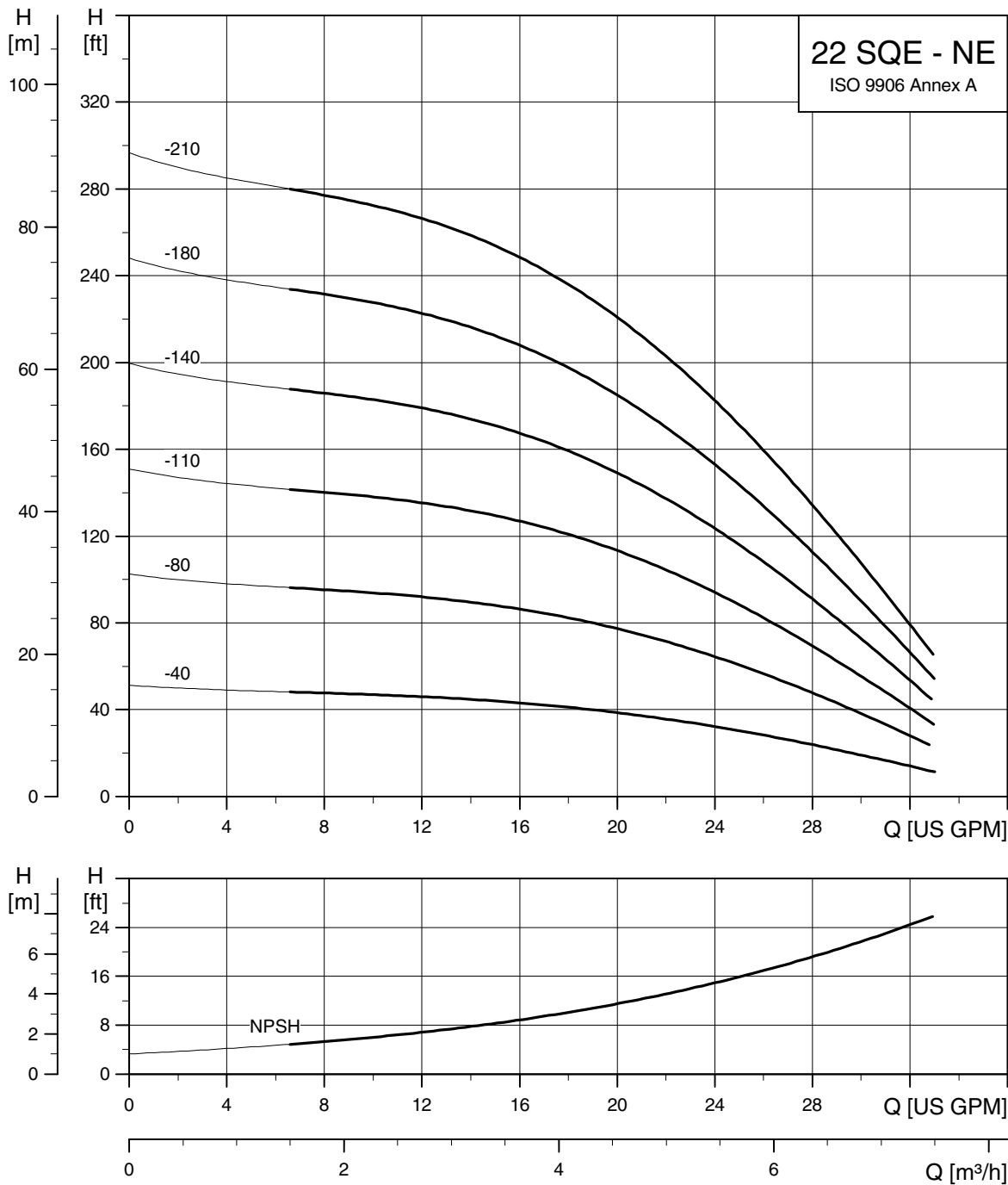
TM04 7467 2010

10 SQE-NE



TM04 7468 2010

22 SQE, SQE-NE



TM04 7469 2010

Electrical data

Supply voltage:	1x200-240V +6%/-10%, 50/60 Hz, PE 1x100-115V +6%/-10%, 50/60 Hz, PE
Operation via generator:	As a minimum, the generator output must be equal to the motor P1[kw] + 10%
Starting current:	The motor starting current is equal to the highest value stated on the motor nameplate
Starting:	Soft Start
Run-up time:	Maximum: 2 seconds
Motor protection:	Motor is protected against: – Dry running – overvoltage – undervoltage – overload – overtemperature.
Power factor:	PF=1
Motor cable:	3 wire, 14AWG XLPE, 5 ft
Motor liquid:	Type SML 2
pH Values:	SQ and SQE: 5 to 9 SQE-NE: 2 to 13
Liquid temperature:	The temperature of the pumped liquid must not exceed 86 °F (30 °C)
Note: If liquids with a viscosity higher than that of water are to be pumped, please contact Grundfos.	

Control units CU 300 and CU 301

Voltage:	1 x 100-240 V – 10 %/+ 6 %, 50/60 Hz, PE
Power consumption:	5 W
Current consumption:	Maximum 130 mA
Enclosure class:	IP 55
Ambient temperature:	During operation: –22 °F to +122 °C (–30 °C to +50 °C) During storage: –22 °F to 140 °F (–30 °C to +60 °C)
Relative air humidity:	95 %.
Pump cable:	Maximum length between CU 300 or CU 301 and pump: 650 ft (198 m)
Back-up fuse:	Maximum: 16 A
Radio noise:	CU 300 and CU 301 comply with EMC Directive 89/336/EEC. Approved according to the standards EN 55014 and EN 55014-2
Marking:	CE, cUL (CU 301)
Load:	Max. 100 mA

Operating conditions

Minimum ambient fluid temperature:	+34 °F (+1 °C)
Maximum ambient fluid temperature:	+86 °F (+30 °C)
Well diameter:	3-inch or larger
Installation depth (maximum):	500 feet below static water level

Storage conditions

Minimum ambient temperature:	–4 °F (–20 °C)
Maximum ambient temperature:	+140 °F (+60 °F)
Frost protection:	If the pump has to be stored after use, it must be stored at a frost-free location, or it must be ensured that the motor liquid is frost-proof.

SQ, SQE motor data

Pump type	Hp	Voltage	Full load amps		Overload amps		Min. well diameter	Discharge
			230V	115V	230V	115V		
5SQE05-90	1/2	230V / 115V	2.1	4.2	5	11	3"	1" NPT
5SQE05-140	1/2	230V / 115V	2.9	6.0	5	11	3"	1" NPT
5SQE05-180	1/2	230V / 115V	3.7	7.7	5	11	3"	1" NPT
5SQE07-230	3/4	230V	4.6	-	8	-	3"	1" NPT
5SQE07-270	3/4	230V	5.3	-	8	-	3"	1" NPT
5SQE07-320	3/4	230V	6.2	-	8	-	3"	1" NPT
5SQE10-360	1	230V	7.2	-	11	-	3"	1" NPT
5SQE10-410	1	230V	8.1	-	11	-	3"	1" NPT
5SQE15-450	1 1/2	230V	9.2	-	12	-	3"	1" NPT
10SQE05-110	1/2	230V / 115V	2.9	6.1	5	11	3"	1 1/4" NPT
10SQE05-160	1/2	230V / 115V	4.1	8.6	8	11	3"	1 1/4" NPT
10SQE07-200	3/4	230V	5.3	-	8	-	3"	1 1/4" NPT
10SQE7-240	3/4	230V	6.0	-	8	-	3"	1 1/4" NPT
10SQE10-290	1	230V	7.7	-	11	-	3"	1 1/4" NPT
10SQE15-330	1 1/2	230V	8.9	-	12	-	3"	1 1/4" NPT
15SQE05-70	1/2	230V / 115V	2.9	6.0	5	11	3"	1 1/4" NPT
15SQE05-110	1/2	230V / 115V	4.0	8.3	5	11	3"	1 1/4" NPT
15SQE07-150	3/4	230V	5.1	-	8	-	3"	1 1/4" NPT
15SQE07-180	3/4	230V	6.2	-	8	-	3"	1 1/4" NPT
15SQE10-220	1	230V	7.4	-	11	-	3"	1 1/4" NPT
15SQE10-250	1	230V	8.4	-	11	-	3"	1 1/4" NPT
15SQE15-290	1 1/2	230V	9.7	-	12	-	3"	1 1/4" NPT
22SQE05-40	1/2	230V / 115V	1.9	3.9	5	-	3"	1 1/2" NPT
22SQE05-80	1/2	230V / 115V	3.4	7.2	5	-	3"	1 1/2" NPT
22SQE07-120	3/4	230V	4.9	-	8	-	3"	1 1/2" NPT
22SQE07-160	3/4	230V	6.4	-	8	-	3"	1 1/2" NPT
22SQE10-190	1	230V	7.9	-	11	-	3"	1 1/2" NPT
22SQE15-220	1 1/2	230V	9.5	-	12	-	3"	1 1/2" NPT
30SQE05-40	1/2	230V / 115V	2.8	5.7	5	-	3"	1 1/2" NPT
30SQE07-90	3/4	230V	5.2	-	8	-	3"	1 1/2" NPT
30SQE10-130	1	230V	7.6	-	11	-	3"	1 1/2" NPT

SQ, SQE and SQE-NE dimensions and weights

SQ, SQE

Model	Hp	Motor size	Discharge size	Dimensions in inches					Approx. ship. wt.
				A	B	C	D	E	
5SQ/SQE05-90	1/2	3"	1" NPT	30.4	19.8	10.6	2.6	2.9	12
5SQ/SQE05-140	1/2	3"	1" NPT	30.4	19.8	10.6	2.6	2.9	12
5SQ/SQE05-180	1/2	3"	1" NPT	31.5	19.8	11.6	2.6	2.9	12
5SQ/SQE07-230	3/4	3"	1" NPT	33.6	19.8	13.7	2.6	2.9	13
5SQ/SQE07-270	3/4	3"	1" NPT	33.6	19.8	13.7	2.6	2.9	13
5SQ/SQE07-320	3/4	3"	1" NPT	34.6	19.8	14.8	2.6	2.9	13
5SQ/SQE10-360	1	3"	1" NPT	38.2	21.3	16.9	2.6	2.9	16
5SQ/SQE10-410	1	3"	1" NPT	38.2	21.3	16.9	2.6	2.9	16
5SQ/SQE15-450	1 1/2	3"	1" NPT	39.3	21.3	18.0	2.6	2.9	16
10SQ/SQE05/110	1/2	3"	1 1/4" NPT	30.4	19.8	10.6	2.6	2.9	12
10SQ/SQE05/160	1/2	3"	1 1/4" NPT	30.4	19.8	10.6	2.6	2.9	12
10SQ/SQE07/200	3/4	3"	1 1/4" NPT	31.5	19.8	11.6	2.6	2.9	13
10SQ/SQE07/260	3/4	3"	1 1/4" NPT	33.6	19.8	13.7	2.6	2.9	13
10SQ/SQE10/290	1	3"	1 1/4" NPT	35.0	21.3	13.7	2.6	2.9	16
10SQ/SQE15/330	1 1/2	3"	1 1/4" NPT	36.14	21.3	14.8	2.6	2.9	16
15SQ/SQE05/70	1/2	3"	1 1/4" NPT	30.4	19.8	10.6	2.6	2.9	12
15SQ/SQE05/110	1/2	3"	1 1/4" NPT	30.4	19.8	10.6	2.6	2.9	12
15SQ/SQE07/150	3/4	3"	1 1/4" NPT	31.5	19.8	11.6	2.6	2.9	13
15SQ/SQE07/180	3/4	3"	1 1/4" NPT	33.6	19.8	13.7	2.6	2.9	13
15SQ/SQE10/220	1	3"	1 1/4" NPT	35.0	21.3	13.7	2.6	2.9	16
15SQ/SQE10/250	1	3"	1 1/4" NPT	36.1	21.3	14.8	2.6	2.9	16
15SQ/SQE10/290	1 1/2	3"	1 1/4" NPT	38.2	21.3	16.9	2.6	2.9	16
22SQ/SQE05/40	1/2	3"	1 1/2" NPT	30.4	19.8	10.6	2.6	2.9	12
22SQ/SQE05/80	1/2	3"	1 1/2" NPT	30.4	19.8	10.6	2.6	2.9	12
22SQ/SQE07/120	3/4	3"	1 1/2" NPT	31.5	19.8	11.6	2.6	2.9	13
22SQ/SQE07/160	3/4	3"	1 1/2" NPT	33.6	19.8	13.7	2.6	2.9	13
22SQ/SQE10/190	1	3"	1 1/2" NPT	38.2	21.3	16.9	2.6	2.9	16
22SQ/SQE15/220	1 1/2	3"	1 1/2" NPT	38.2	21.3	16.9	2.6	2.9	16
30SQ/SQE05/40	1/2	3"	1 1/2" NPT	30.4	19.8	10.6	2.6	2.9	12
30SQ/SQE07/90	3/4	3"	1 1/2" NPT	30.4	19.8	10.6	2.6	2.9	13
30SQ/SQE10/130	1	3"	1 1/2" NPT	35.0	21.3	13.7	2.6	2.9	13

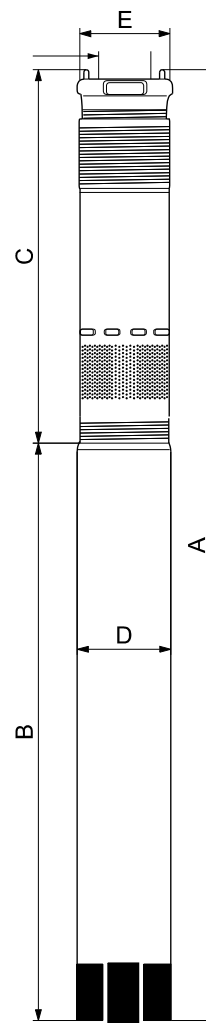
SQE-NE

10SQE-05-100NE	1/2	3"	1 1/4" NPT	30.4	19.8	10.6	2.6	2.9	12
10SQE-05-140NE	1/2	3"	1 1/4" NPT	30.4	19.8	10.6	2.6	2.9	12
10SQE-05-180NE	3/4	3"	1 1/4" NPT	31.5	19.8	11.6	2.6	2.9	13
10SQE-07-220NE	3/4	3"	1 1/4" NPT	33.6	19.8	13.7	2.6	2.9	13
10SQE-10-260NE	1	3"	1 1/4" NPT	35.0	21.3	13.7	2.6	2.9	16
10SQE-10-300NE	1	3"	1 1/4" NPT	36.1	21.3	14.8	2.6	2.9	16
10SQE-10-340NE	1	3"	1 1/4" NPT	38.2	21.3	16.9	2.6	2.9	16
22SQE05-40NE	1/2	3"	1 1/2" NPT	30.4	19.8	10.6	2.6	2.9	12
22SQE05-80NE	1/2	3"	1 1/2" NPT	30.4	19.8	10.6	2.6	2.9	12
22SQE07-110NE	3/4	3"	1 1/2" NPT	31.5	19.8	11.6	2.6	2.9	13
22SQE07-140NE	3/4	3"	1 1/2" NPT	33.6	19.8	13.7	2.6	2.9	13
22SQE10-180NE	1	3"	1 1/2" NPT	38.2	21.3	16.9	2.6	2.9	16
22SQE10-210NE	1	3"	1 1/2" NPT	38.2	21.3	16.9	2.6	2.9	16

Materials of construction

SQ, SQE	
Component	Splined shaft
Valve casing	Polyamide
Discharge chamber	304 stainless steel
Valve guide	Polyamide
Valve spring	316LN stainless steel
Valve cone	Polyamide
Valve seat	NBR rubber
O-ring	NBR rubber
Lock ring	310 stainless steel
Top bearing	NBR rubber
Top chamber	Polyamide
Guide vanes	Polyamide
Impeller	Polyamide w/ tungsten carbide bearings
Bottom chamber	Polyamide
Neck ring	TPU / PBT
Bearing	Aluminum oxide
Suction interconnector	Polyamide
Ring	304 stainless steel
Pump sleeve	304 stainless steel
Pressure equalization cone	Polyamide
Spacer	Polyamide
Sand trap	316 stainless steel
Shaft w/coupling	304 stainless steel
Cable guard	304 stainless steel

SQE-NE	
Component	Splined shaft
Valve casing	PVDF
Discharge chamber	316 stainless steel
O-ring	FPM rubber
Valve cone	PVDF
Valve seat	FPM rubber
Top chamber	PVDF
Empty chamber	PVDF
Top bearing	FPM rubber
Neck ring	PVDF
Lock ring	316 stainless steel
Guide vanes	PVDF
Bottom chamber	PVDF
Impeller w/ tungsten carbide bearing	PVDF
Suction interconnector	PVDF
Ring	316 stainless steel
Shaft w/coupling	Sintered steel
Cable guard	316 stainless steel
Cable guard screws	316 stainless steel
Pressure equalization cone	PVDF
Valve spring	316 stainless steel
Pump sleeve	316 stainless steel
Valve guide	PVDF
Spacer	316 stainless steel



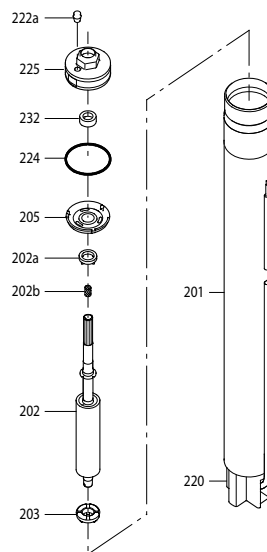
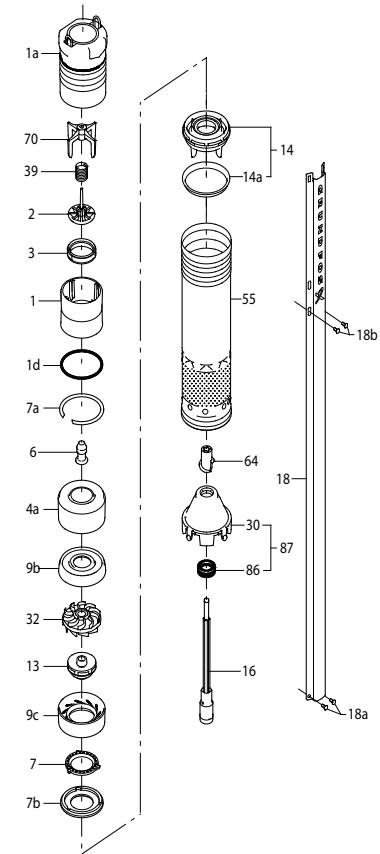
Discharge sizes:
 1" NPT 5SQ/SQE
 1 1/4" NPT 10 - 15 SQ/SQE
 1 1/2" NPT 22-30 SQ/SQE

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Material specification

Pump						
Pos.	Component	Material	DIN W-Nr. SQ/SQE	AISI	DIN W-Nr. SQE-NE	AISI
1	Valve casing	Polyamide	1.4301	304	1.4401	316
1a	Discharge chamber	Stainless steel				
1d	O-ring	NBR rubber				
2	Valve cup	Polyamide				
3	Valve seat	NBR rubber				
4a	Empty chamber	Polyamide				
6	Top bearing	NBR rubber				
7	Neck ring	TPU / PBT				
7a	Lock ring	Stainless spring steel	1.4301	310	1.4401	316
7b	Neck ring retainer	Polyamide				
9b	Chamber top	Polyamide				
9c	Chamber bottom	Polyamide				
13	Impeller with tungsten carbide bearing	Polyamide				
14	Suction inter-connector	Polyamide				
14a	Ring	Stainless steel	1.4301	304	1.4401	316
16	Shaft with coupling	Stainless steel	1.4301	304	1.4401	316
18	Cable guard	Sintered steel				
18a	Screws for cable guard	Stainless steel	1.4301	316	1.4401	316
18b						
30	Cone for pressure equalization	Polyamide				
32	Guide vanes	Polyamide				
39	Spring	Stainless spring steel	1.4406	316LN	1.4406	316LN
55	Pump sleeve	Stainless steel	1.4301	304	1.4401	316
64	Priming screw	Polyamide				
70	Valve guide	Polyamide				
86	Lip seal ring	NBR rubber				
87	Cone for pressure equalization complete	Polyamide / NBR rubber				

Motor						
Pos.	Component	Material	DIN W-Nr. SQ-SQE	AISI	DIN W-Nr. SQE-NE	AISI
201	Stator	Stainless steel	1.4301	304	1.4401	316
202	Rotor	Stainless steel	1.4301	304	1.4401	316
202a	Stop ring	PP				
202b	Filter	Polyester				
203	Thrust bearing	Carbon				
205	Radial bearing	Ceramic tungsten carbide				
220	Motor cable with plug	EPR				
222a	Filling plug	MS 3: NBR MSE 3: FKM				
224	O-ring	FKM				
225	Top cover	PPS				
232	Shaft seal	MS 3: NBR MSE 3: FKM				
	Motor liquid	SML-2				



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CU 301

The CU 301 is a control and communication unit developed especially for the SQE submersible pumps in constant-pressure applications.

The CU 301 control unit provides:

- Full control of the SQE pumps
- two-way communication with the SQE pumps
- possibility of adjusting the pressure
- alarm indication (LED) when service is needed
- possibility of starting, stopping and resetting the pump simply by means of a push-button
- configuration with R100 remote control.

The CU 301 communicates with the pump via mains borne signalling (Power Line Communication), meaning that no extra cables are required between the CU 301 and the pump.

The CU 301 features the following indications (see drawing in right column):

1. Pump running indicator
2. System pressure setting
3. System ON/OFF
4. Button lock indicator
5. Dry-running indicator
6. Service needed in case of:
 - no contact to pump
 - overvoltage
 - undervoltage
 - speed reduction
 - overtemperature
 - overload
 - sensor defective.

The CU 301 incorporates:

- External signal input for pressure sensor
- connection to an operating relay for indication of pump operation.

Optional R100 remote control

Wireless infrared remote control of the CU 301 is possible by means of the R100.

Using the R100, it is possible to monitor and change the operating parameters, see the R100 menu structure on page 32.

The R100 is a valuable tool in case fault finding is required.

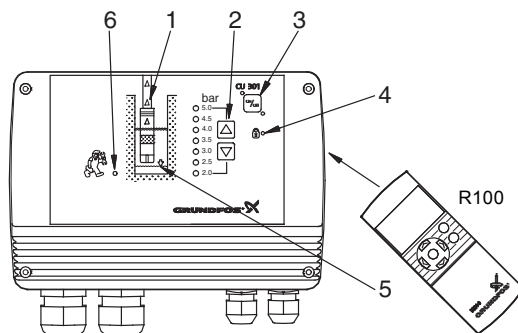


Fig. 15 CU 301 control unit

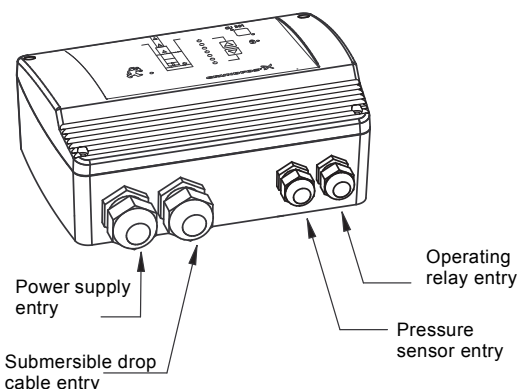


Fig. 16 CU 301 entry ports

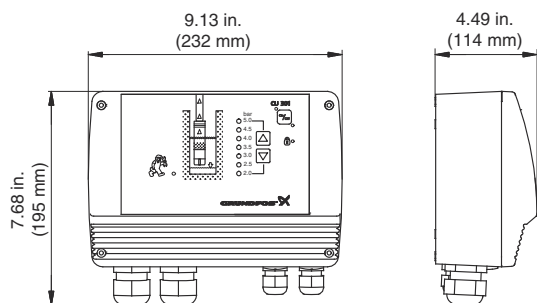
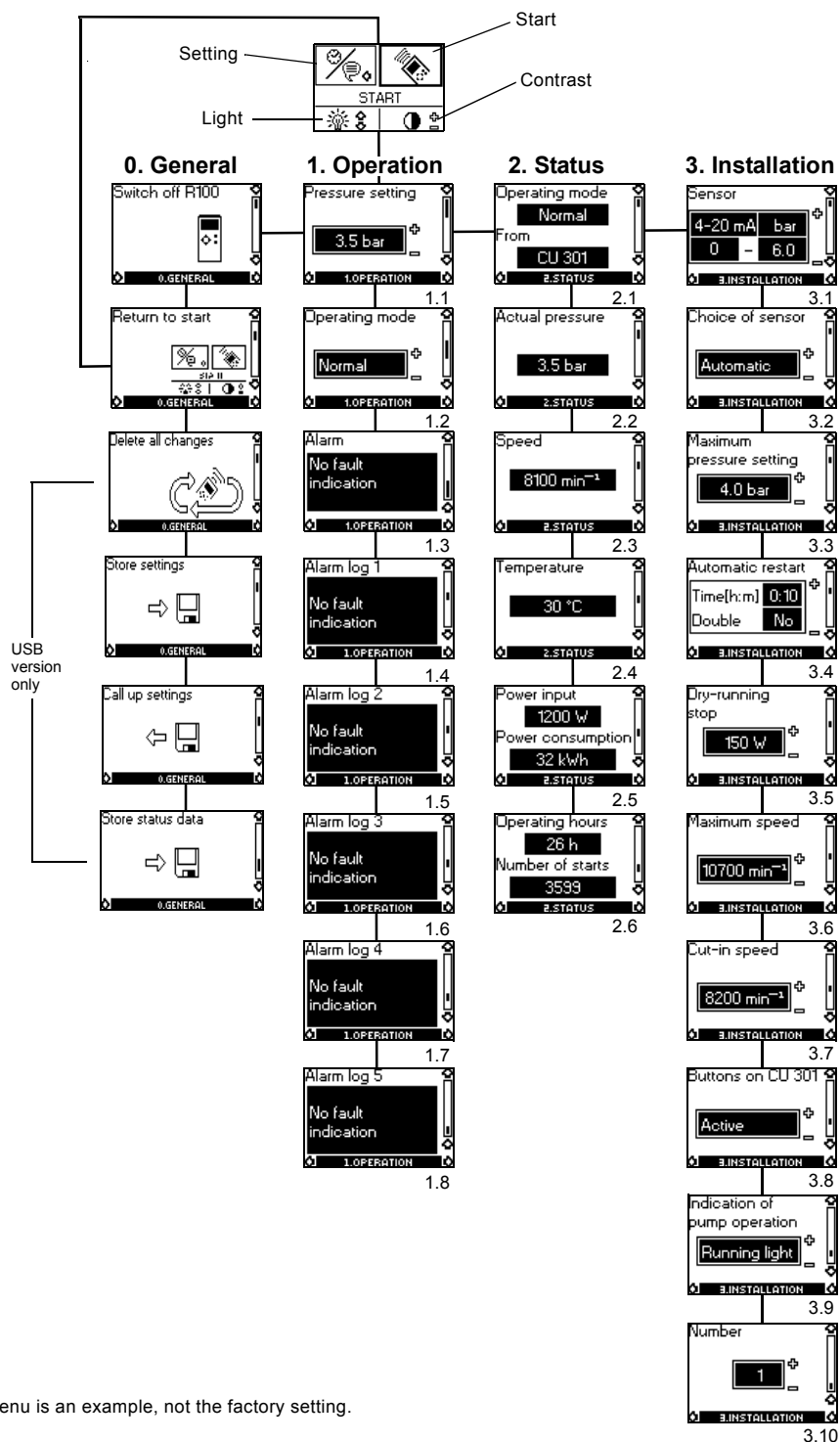


Fig. 17 CU 301 dimensions

R100 menu structure for CU 301 control unit



R100 menus for CU 301

0. General

1. Operation

- 1.1 Setpoint setting
- 1.2 Selection of operating mode
- 1.3 Alarm indication.

2. Status

The indication of:

- 2.1 Actual operating mode
- 2.2 Actual pressure
- 2.3 Actual motor speed
- 2.4 Actual motor temperature
- 2.5 Actual power input and accumulated motor power consumption
- 2.6 Accumulated number of operating hours and accumulated number of starts.

3. Installation

- 3.1 Sensor parameters
- 3.2 Choice of sensor
- 3.3 Setting of maximum pressure setpoint
- 3.4 Setting of automatic restart time
- 3.5 Setting of the dry-running stop limit
- 3.6 Setting of the maximum motor speed
- 3.7 Setting of the cut-in motor speed
- 3.8 Activating or deactivating the on/off-button and the buttons for system pressure setting on the CU 301
- 3.9 Indication of pump operation
- 3.10 Allocation of identification number.

CU 300

The CU 300 is a control and communication unit developed especially for the SQE submersible pumps for control applications other than constant pressure.

The CU 300 control unit provides:

- Flexible pump control based on various sensor inputs
- two-way communication with the SQE pumps
- alarm indication of pump operation by LED's on the front
- possibility of starting, stopping and resetting the pump simply by means of a push-button
- communication with R100 remote control.

The CU 300 communicates with the pump via mains borne signalling (Power Line Communication), meaning that no extra cables are required between the CU 300 and the pump.

The following alarms can be indicated by the CU 300:

- No contact
- overvoltage
- undervoltage
- dry running
- speed reduction
- overtemperature
- overload
- sensor alarm.

The CU 300 incorporates:

- External signal input for two analog sensors and one digital sensor
- relay output for external alarm indication
- control according to the signals received, e.g. of flow, pressure, water level and conductivity.

R100 remote control

Wireless infrared remote control of the CU 300 is possible by means of the R100.

Using the R100, it is possible to monitor and change the operating parameters, see the R100 menu structure on page 35.

The R100 is a valuable tool in case fault finding is required.

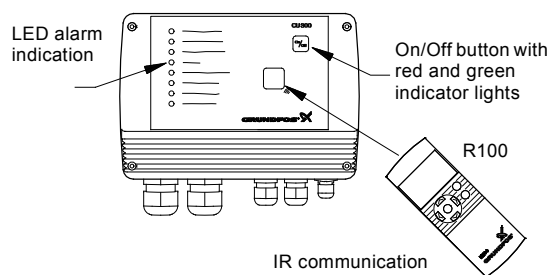


Fig. 18 CU 300 control unit with R100

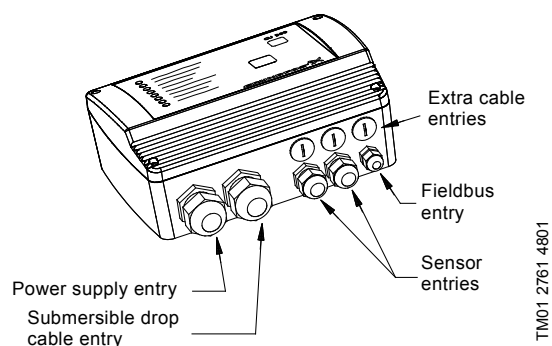


Fig. 19 CU 300 control unit, external entry ports

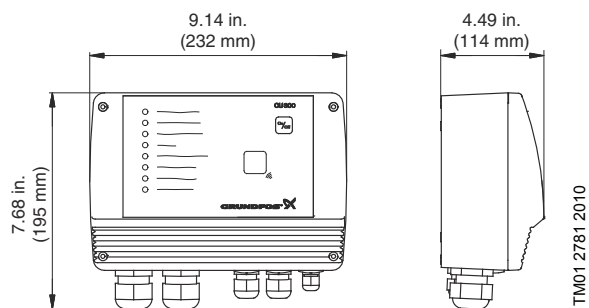
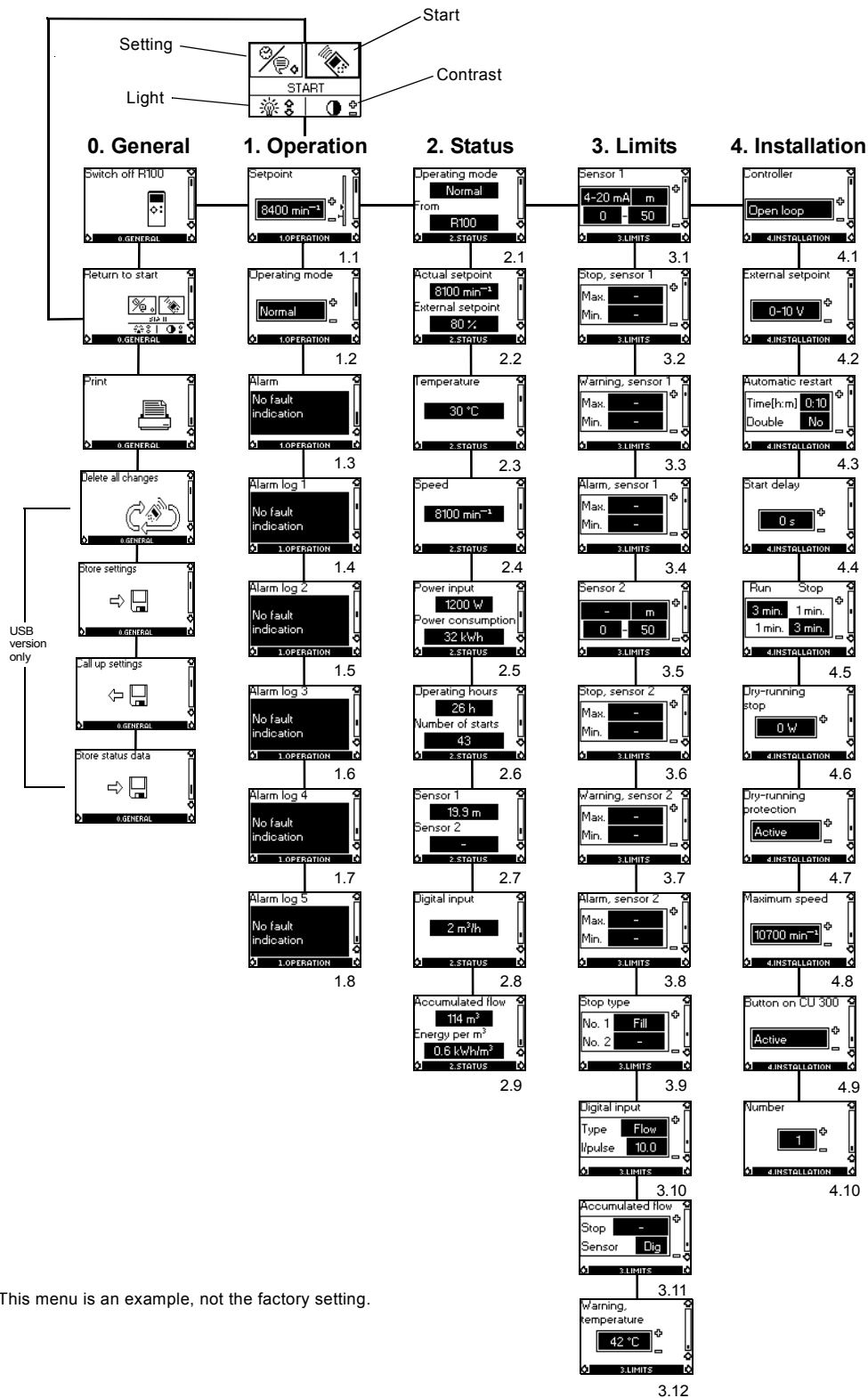


Fig. 20 CU 300 dimensions

R100 menu structure for the CU 300



Note: This menu is an example, not the factory setting.

R100 menus for CU 300

0. General

1. Operation

- 1.1 Setpoint setting
- 1.2 Selection of operating mode
- 1.3 Alarm indication.

2. Status

The indication of:

- 2.1 Actual operating mode
- 2.2 Actual and external setpoint
- 2.3 Actual motor temperature
- 2.4 Actual motor speed
- 2.5 Actual power input and accumulated motor power consumption
- 2.6 Accumulated number of operating hours and accumulated number of starts
- 2.7 Actual values of sensors 1 and 2, respectively
- 2.8 Actual values of the digital input
- 2.9 Accumulated flow, and the power used to pump.

R100 offers the possibility of making a number of settings.

3. Limits

The setting of:

- 3.1 Sensor 1 parameters
- 3.2 Min. and max. stop limits of sensor 1
- 3.3 Min. and max. warning limits of sensor 1
- 3.4 Min. and max. alarm limits of sensor 1
- 3.5 Sensor 2 parameters
- 3.6 Min. and max. stop limits of sensor 2
- 3.7 Min. and max. warning limits of sensor 2
- 3.8 Min. and max. alarm limits of sensor 2
- 3.9 Filling or emptying
- 3.10 Setting of the function of the digital sensor connected to the digital input
- 3.11 The setting of the water quantity stop limit and the setting of the sensor to detect water quantity
- 3.12 The setting of the temperature warning limits of the motor electronics.

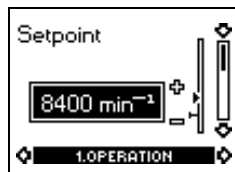
4. Installation

- 4.1 Selection of controller — open loop, closed loop
- 4.2 Setting of external setpoint
- 4.3 Setting of automatic restart time
- 4.4 Allocation of individual start delays
- 4.5 Setting of the stop and run times for the dewatering function
- 4.6 Setting of the dry-running stop limit
- 4.7 Activating or deactivating the dry-running protection
- 4.8 Setting of the maximum motor speed
- 4.9 Activating or deactivating the on/off-button on the CU 300
- 4.10 Allocation of ID number where more than one CU 300 is installed.

Examples of R100 displays

Menu OPERATION

Setpoint setting



1.1

From factory, the pump is set to maximum speed, 10,700 rpm. R100 makes it possible to reduce the pump speed by changing the setpoint. The speed can be set to 3,000 - 10,700 rpm, at 100 rpm intervals.

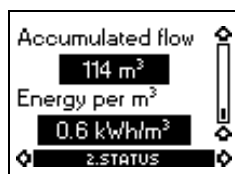
The unit of the setpoint is automatically changed according to the unit of the sensor connected to sensor input 1.

Example: Sensor input 1 is connected to a pressure sensor using the unit feet (ft) and the range 0-60. Consequently, the setpoint of display 1.1 can be set to between 0-60 ft.

Menu STATUS

The displays appearing in this menu are status displays only. It is not possible to change settings in this menu.

Accumulated flow



2.9

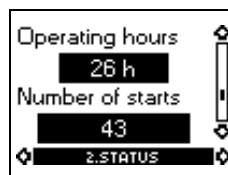
In display 2.9, the water quantity (m³)* pumped is shown. The value shown is the accumulated flow registered by the sensor selected in display 3.11.

The power used to pump 1 m³ is shown in the display as energy per m³ (kWh/m³).

It is possible to read the status of the accumulated flow and energy per m³ at any time.

*Water quantity in units of gpm can be chosen.

Accumulated number of operating hours and number of starts



2.6

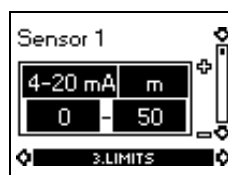
The number of operating hours and the number of starts are values accumulated from the time of installation and they cannot be reset.

Both values are stored in the motor electronics, and they are kept even if the CU 300 is replaced.

The number of operating hours is registered every two hours of continuous operation.

Menu LIMITS

Sensor 1



3.1

The setting of sensor 1.

Depending on the type of sensor, the following settings can be made:

- Sensor outputs:
 - (not active), 0-10 V, 2-10 V, 0-20 mA, 4-20 mA
- setting range unit: m³/h, m, %, gpm, ft
- sensor minimum value: 0-249 (0, 1, 2, 3.....249)
- sensor maximum value: 1-250 (1, 2, 3, 4.....250).

CU 321 variable frequency drive

Features

- Complete solution from one manufacturer
- Easy setup: simply select pump model and choose pressure setpoint
- Four pump choices: offered in most popular sizes, both 3 and 5 hp: 15, 25, 40, and 75 gpm
- Matched pump and motor: 3 hp pump on 3 hp motor and 5 hp pump on 5 hp motor
- Respects original operating designs; operates pump and motor within its designed rpm and hp ratings
- Built-in protection features: soft-start, dry run, overload, over / under voltage, sensor alarm
- Wide voltage range:
 - 3 hp unit:
Single or 3-phase 208-240 VAC (+/-10 %)
 - 5 hp input:
Single or 3-phase 208-240 VAC (+/-10 %).

Applications

For 4" or larger wells. Main applications:

- Domestic and light commercial water supply
- irrigation
- livestock watering
- water transfer.

Components

- Compact, efficient, and reliable CU 321 variable frequency drive
- rugged stainless steel pump end and proven, reliable, 3-phase 230V motor
- pressure sensor
- minimum 4 gal diaphragm tank (sold separately).



TM04 7510 2110

Fig. 21 CU 321 variable frequency drive and sensor

Sizing

Step 1

Calculate maximum head requirements at rated flow conditions:

$H_{\max}$ = dynamic head + system psi (in feet) + friction loss + above grade elevation.

Step 2

Select pump from System Sizing Matrix as follows:

Select a model in which the calculated value of $H_{\max}$ is below the value in Column 2.

Example

The choice for a 40 gpm model with an $H_{\max}$ of 150 would be the 40S30-9.

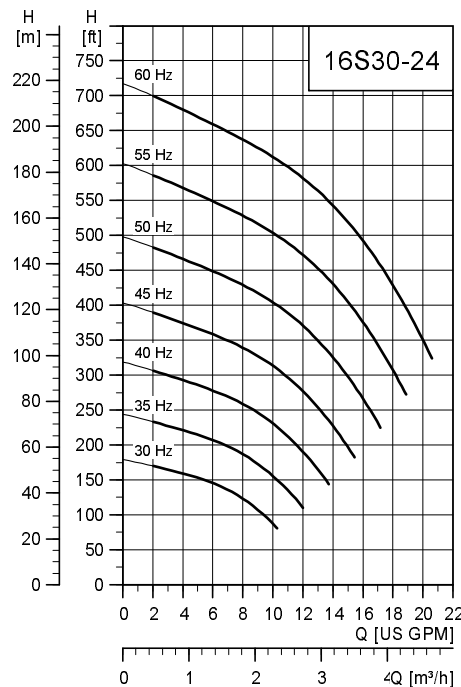
System sizing matrix		
Pump type	Column 1	Column 2
	Shutoff head (0 gpm) @ 1500 rpm min. speed	Head @ rated gpm @ 3600 rpm max. speed
	TDH [ft]	TDH [ft]
3 hp		
16S30-24	128	490
25S30-15	80	305
40S30-9	45	185
75S30-5	30	105
5 hp		
16S50-38	200	825
25S50-26	105	530
40S50-15	75	310
75S50-8	45	175

CU 321 variable frequency drive

SQ, SQE, SQE-NE, CU 321

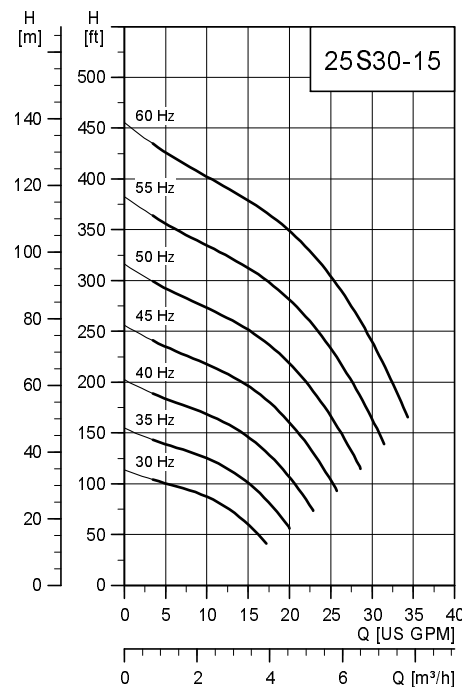
Performance curves - CU 321 variable speed

16 gpm - Model 16S30-24



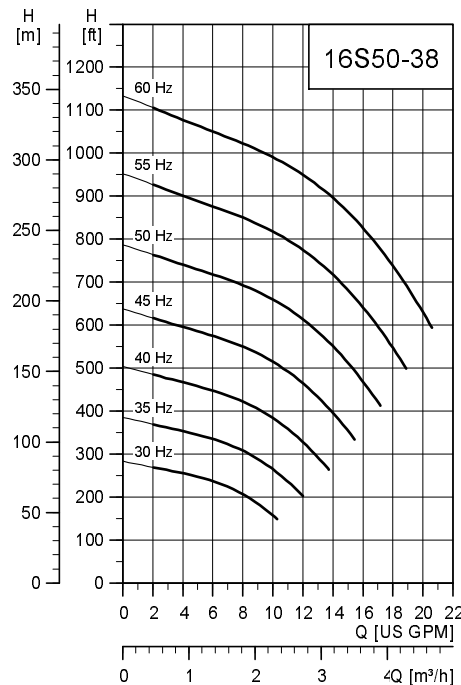
TM04 7523 2110

25 gpm - Model 25S30-15



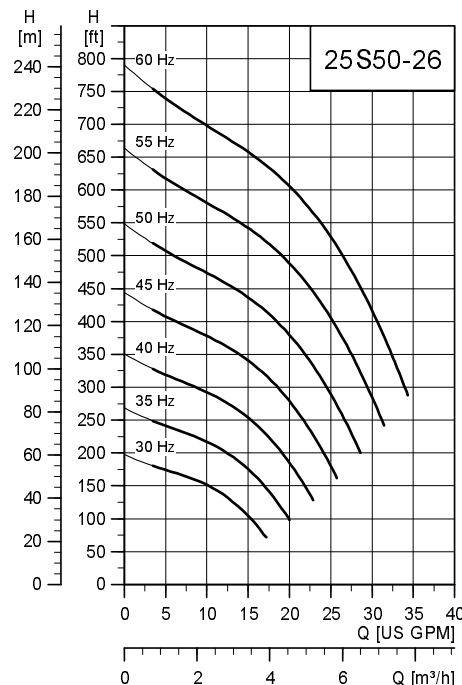
TM04 7525 2110

16 gpm - Model 16S50-38



TM04 7524 2110

25 gpm - Model 25S50-26

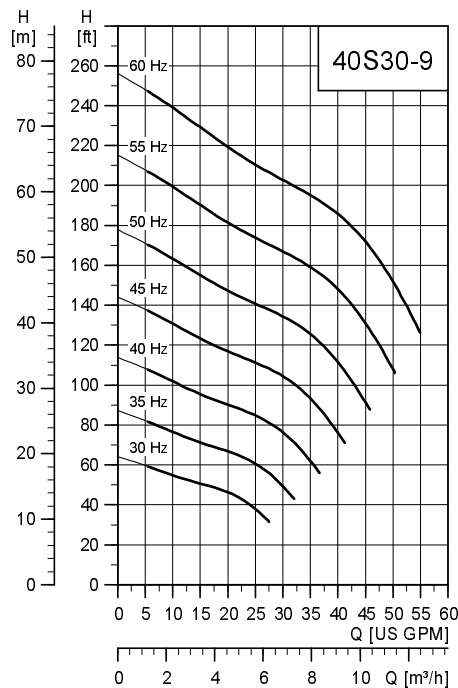


TM04 7526 2110

CU 321 variable frequency drive

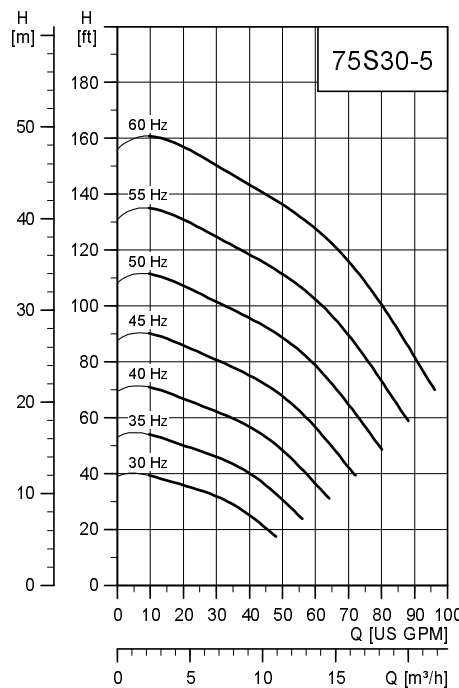
SQ, SQE, SQE-NE, CU 321

40 gpm - Model 40S30-9



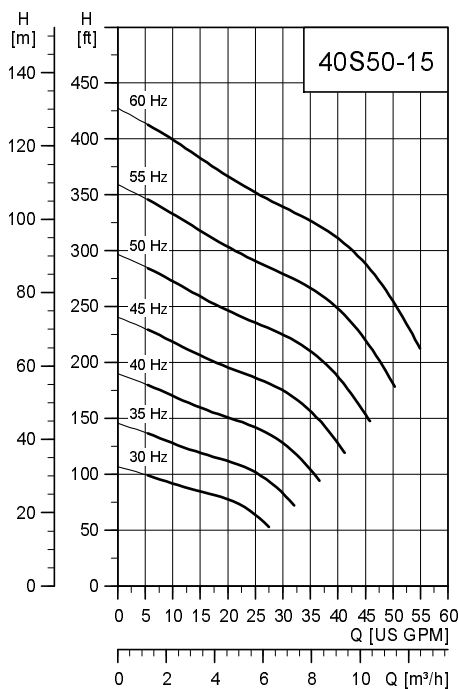
TM04 7527 2110

75 gpm - Model 75S30-5



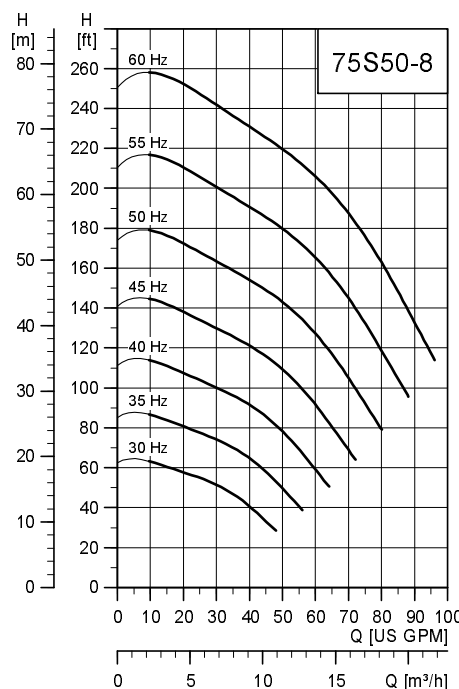
TM04 7530 2110

40 gpm - Model 40S50-15



TM04 7529 2110

75 gpm - Model 75S50-8



TM04 7531 2110

CU 321 variable frequency drive



TM04 7510 2110

Description	Hp	Input Ph	Input volts	Product number
CU321 Constant Pressure Kit	3	1	200 - 240	96581690
CU321 Constant Pressure Kit	5	1	200 - 240	96632970
CU321 Constant Pressure Kit	5	3	200 - 240	96581691
Sensor	-	-	-	96437852

Note: Kit includes CU321 and pressure sensor

CU 301 Constant Pressure System



TM04 7509 2110

Description	Product number
Constant Pressure Kit (CU 301 and Transducer)	96438895

CU 300 Status Box & R100

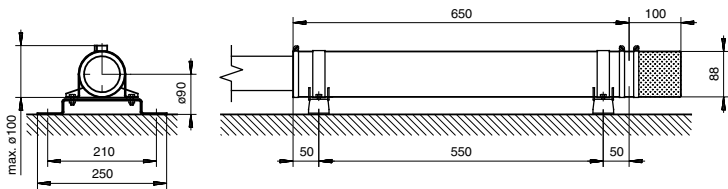


TM04 7508 2110

Description	Product number
CU300 Status Box	96422776

Description	Product number
R100 (for wireless infrared communication with the CU 301 / CU 300)	96615297

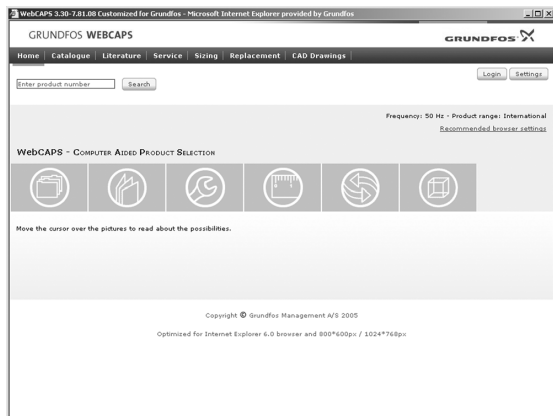
SQ, SQE flow sleeves



TM01 3292 3798

Description	Product number
SQ, SQE flow sleeve, complete	96037505

WebCAPS

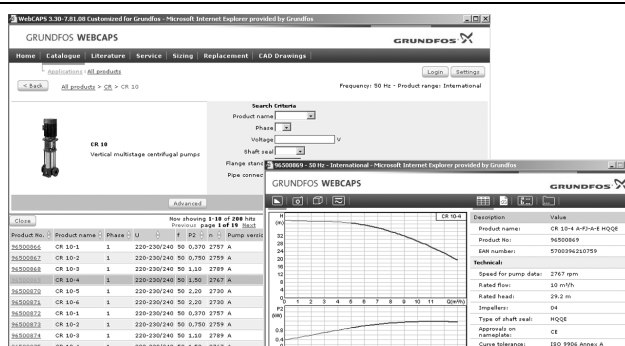


WebCAPS is a **Web**-based **C**omputer **A**ided **P**roduct
Selection program available on www.grundfos.com.

WebCAPS contains detailed information on more than 185,000 Grundfos products in more than 20 languages.

In WebCAPS, all information is divided into 6 sections:

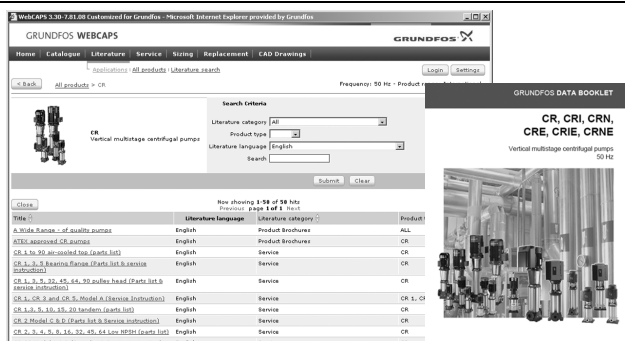
- Catalog
- Literature
- Service
- Sizing
- Replacement
- CAD drawings.



Catalog

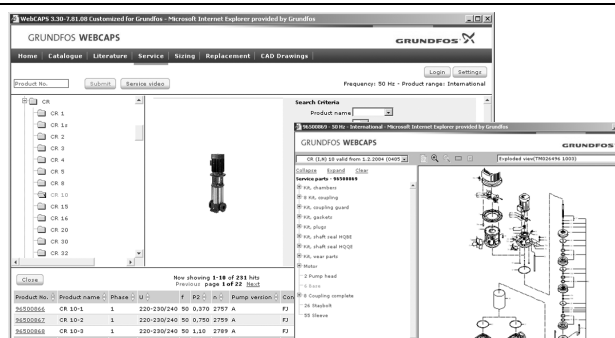
This section is based on fields of application and pump types, and contains

- technical data
- curves (QH, Eta, P1, P2, etc) which can be adapted to the density and viscosity of the pumped liquid and show the number of pumps in operation
- product photos
- dimensional drawings
- wiring diagrams
- quotation texts, etc.

Literature

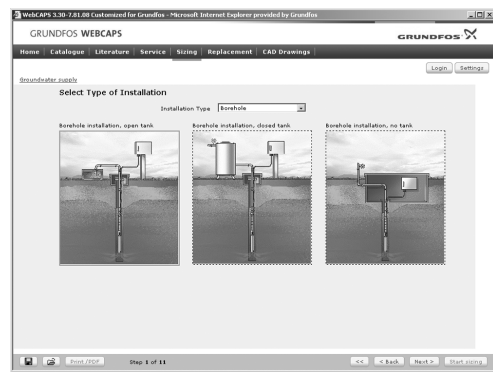
In this section you can access all the latest documents of a given pump, such as

- product guides
- installation and operating instructions
- service documentation, such as Service kit catalog and Service kit instructions
- quick guides
- product brochures, etc.

Service

This section contains an easy-to-use interactive service catalog. Here you can find and identify service parts of both existing and discontinued Grundfos pumps.

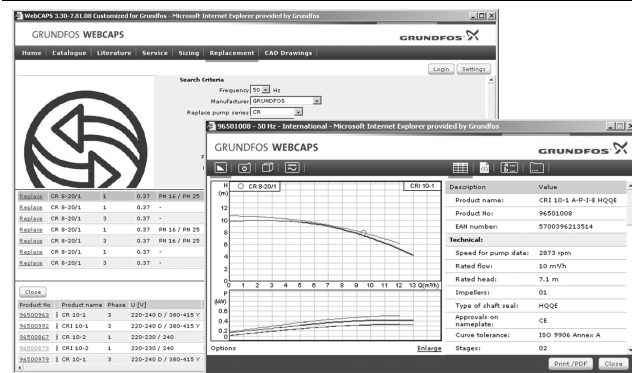
Furthermore, this section contains service videos showing you how to replace service parts.



Sizing

This section is based on different fields of application and installation examples, and gives easy step-by-step instructions in how to

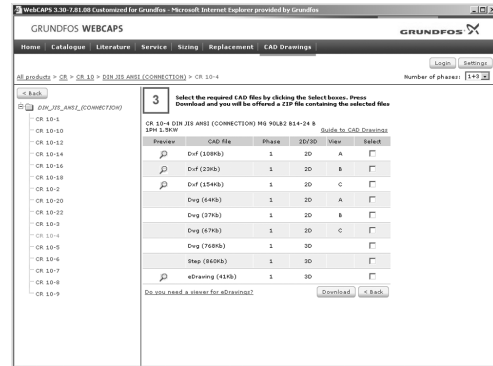
- select the most suitable and efficient pump for your installation
- carry out advanced calculations based on energy consumption, payback periods, load profiles, life cycle costs, etc.
- analyse your selected pump via the built-in life cycle cost tool
- determine the flow velocity in wastewater applications, etc.



Replacement

In this section you find a guide to selecting and comparing replacement data of an installed pump in order to replace the pump with a more efficient Grundfos pump. The section contains replacement data of a wide range of pumps produced by other manufacturers than Grundfos.

Based on an easy step-by-step guide, you can compare Grundfos pumps with the one you have installed on your site. When you have specified the installed pump, the guide will suggest a number of Grundfos pumps which can improve both comfort and efficiency.



CAD drawings

In this section it is possible to download 2-dimensional (2D) and 3-dimensional (3D) CAD drawings of most Grundfos pumps.

These formats are available in WebCAPS:

2-dimensional drawings:

- .dxf, wireframe drawings
- .dwg, wireframe drawings.

3-dimensional drawings:

- .dwg, wireframe drawings (without surfaces)
- .stp, solid drawings (with surfaces)
- .eprt, E-drawings.

WinCAPS



Fig. 1 WinCAPS CD-ROM

WinCAPS is a **Windows-based Computer Aided Product Selection** program containing detailed information on more than 185,000 Grundfos products in more than 20 languages.

The program contains the same features and functions as WebCAPS, but is an ideal solution if no Internet connection is available.

WinCAPS is available on CD-ROM and updated once a year.

L-SQ-PG-001 0610	US
Repl. 02/06	
© 2006, 2010 Grundfos Pumps Corp.	

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GRUNDFOS Pumps Corporation
17100 West 118th Terrace
Olathe, Kansas 66061
Phone: +1-913-227-3400
Telefax: +1-913-227-3500

GRUNDFOS Canada Inc.
2941 Brighton Road
Oakville, Ontario L6H 6C9 Canada
Phone: +1-905 829 9533
Telefax: +1-905 829 9512

Bombas GRUNDFOS de Mexico S.A. de C.V.
Boulevard TLC No. 15
Parque Industrial Stiva Aeropuerto
Apodaca, N.L. Mexico 66600
Phone: +52-81-8144 4000
Telefax: +52-81-8144 4010

www.grundfos.com

GRUNDFOS 

Electrical Submersible Sampling Pump

Grundfos Redi-Flo2® Environmental Pumps

The Grundfos Redi-Flo2® electrical submersible pump provides smooth, uninterrupted water flow during ground water sampling to depths down to 280 feet (85m). Both high flow rates needed for purging and low flows recommended for sampling are achieved with the same pump.

FEATURES

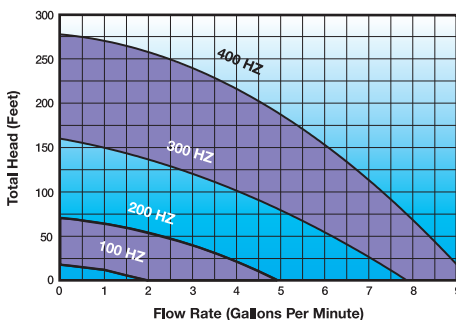
- **Chemically inert materials**
Maximum sample integrity and easy decontamination
- **1.8 inch (4.6cm) diameter**
Easy access into 2" (5cm) or larger wells
- **Flow rates range from 8 GPM (30 LPM) to as little as 100ml/min**
Controlled with the simple push of a button
- **Low velocities and agitation**
Ideal for sampling and purging
- **Portable solid state converter**
Eliminates the need for control valves
- **Continuous flow**
Ensures a cleaner, simpler sample catch
- **Dedicated or Portable configurations available**

OPERATION

Designed for long-term reliability in dedicated monitoring wells, the Redi-Flo2® provides optimal sample quality. Whether doing traditional purging prior to sampling or low draw-down passive sampling when operated with the Redi-Flo VFD (Variable Frequency Drive) flow control is easy!

Purging and sampling with the same pump is extremely efficient. The unique design and superior materials allow for easy operation, decontamination and maintenance as well as disassembly and reassembly.

PERFORMANCE



Redi-Flo2® pump as a portable system mounted on Geo Reel



Dedicated Redi-Flo2® pump setup with tubing, All-In-One motor lead and integrated safety cable, and well cap



Add confidence using the Geotech all-in-one motor lead with integrated safety cable

CALL GEOTECH TODAY (800) 833-7958

Geotech Environmental Equipment, Inc.

2650 East 40th Avenue • Denver, Colorado 80205

(303) 320-4764 • (800) 833-7958 • FAX (303) 322-7242

email: sales@geotechenv.com website: www.geotechenv.com

Electrical Submersible Sampling Pump



Grundfos Redi-Flo2® Environmental Pumps

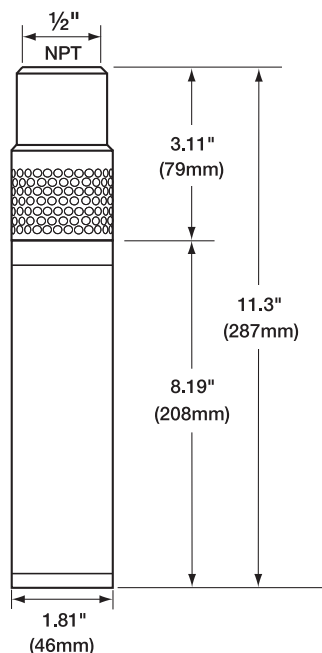
CUSTOM ACCESSORIES

Professional accessories make your job easier, your equipment last longer, and protect your investment!

Geotech has a shroud specifically designed for use with the Grundfos Redi-Flo2® in wells 4" (10cm) in diameter or larger. The Redi-Flo2® electrical submersible pump was designed to stay cool by the action of the water passing rapidly over the body of the stainless steel and PTFE pump. In 2" (5cm) diameter wells this is achieved automatically. In larger diameter wells the pump may overheat, causing permanent damage to the inner workings. The Geotech pump shroud can help you avoid damage to your Redi-Flo2® pump, and help you to protect your investment, project after project.

If your site plan requires all the water passing through your pump be disposed of and not allowed to return to the well, ask your sales representative about our custom stainless steel check valve.

DIMENSIONS



SPECIFICATIONS

Electric

Full Load Rating	.5 HP/220V/3 PH/400 Hz/5.5A
Maximum Current (SFA)	5.5 amps
Motor Protection	Thermal overload – Thermik Geratebau, Series SY6 (176°F/80°C)
Current Overload	Incorporated into Redi-Flo VFD (9.0A for 10 seconds)

Piping Connection

Discharge Port	1/2" Female NPT
-----------------------	-----------------

Operating Conditions

Minimum Ambient Fluid Temp.	34°F (1°C)
Maximum Ambient Fluid Temp.	80°F (28°C)

Motor Fluid

Motor Lubricating Fluid	Deionized (DI) Water
--------------------------------	----------------------

Dimensions & Weight (Pump & Motor)

Dimensions	11.3" L x 1.81" D (28.7cm L x 4.6cm D)
Net Weight	5.5 lbs. (2.5 kg), excluding motor lead

Lead Lengths

Standard Lengths in Feet	30, 50, 75, 100, 125, 150, 175, 200, 250, 300 (9, 15, 23, 30, 38, 46, 53, 61, 76, 91 meters)
Custom Lengths	Available in 1 ft. (0.3m) increments from 30 to 300 ft. (9-91m)



Redi-Flo2®
Cooling
Shroud



Redi-Flo2® Stainless Steel Check Valve

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Electrical Submersible Sampling Pump



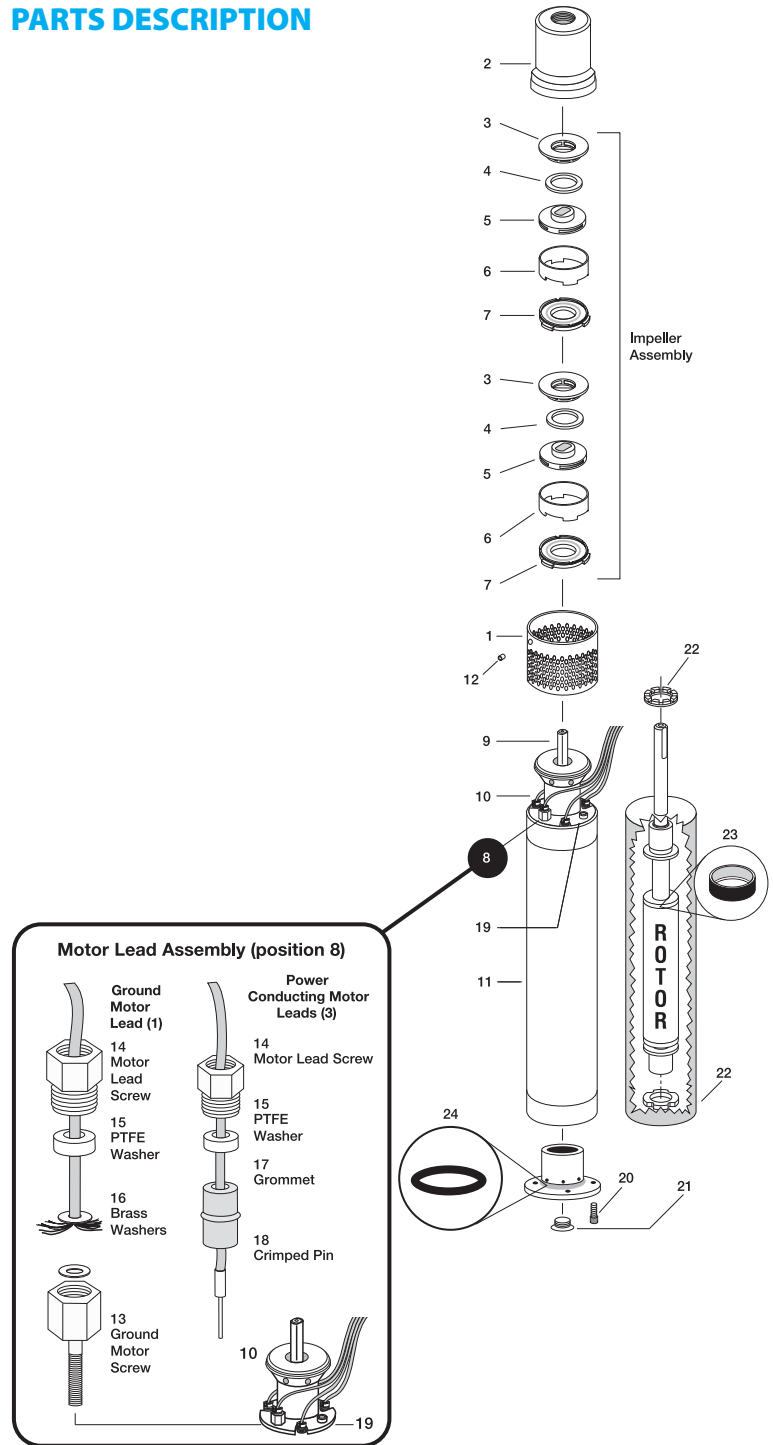
Grundfos Redi-Flo2® Environmental Pumps

PUMP COMPONENTS

Pos. No.	Part Description	No. Used Per Pump	Part Number
1	Inlet Screen	1	1A0004
2	Pump Housing ½" NPT	1	1A0044
3	Guide Vane	2	See Service Kits
4	Wear Ring	2	"
5	Impeller	2	"
6	Spacer Ring	2	"
7	Wear Plate	2	"
8	Motor Lead Assembly	4	See Pos. 13-18
9	Shaft, Rotor	1	Not Available*
10	Suction Interconnector	1	1A5004
11	Stator Housing	1	Not Available*
12	Set Screw	1	See Service Kits
13	Ground Motor Screw	1	"
14	Motor Lead Screw	4	"
15	PTFE Washer	4	"
16	Brass Washer	2	"
17	Grommet	3	"
18	Crimped Pin	3	"
19	Motor Screw (long)	2	"
20	Motor Screw (short)	6	"
21	Filling Screw w/O-Ring	1	"
22	Motor Thrust Washers	2	"
23	Lip Seal	1	ID5566
24	Bearing Housing O-Ring	2	See Service Kits

*Not economical to replace, must purchase complete pump/motor.

PARTS DESCRIPTION



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email: sales@geotechenv.com website: www.geotechenv.com

5 Specifications

Specification		Basic value	Model				
			U-51	U-52	U-52G	U-53	U-53G
Sensor probe	Measurement temperature range	–10°C to 55°C	✓	✓	✓	✓	✓
	Maximum sensor outer diameter	Approx. 96 mm					
	Sensor length	Approx. 340 mm					
	Cable length	2 m (standard) 10 m/30 m (options)					
	Mass	Approx. 1800 g					
	Auto calibration function	Uses pH 4 standard solution.					
	Measurement depth	30 m max.	✓	✓	✓	✓	✓
	Wet-part materials*3	PPS, glass, SUS316L, SUS304, FKM, PEEK, Q, titanium, FEP membrane, POM					
	Waterproofing standard	IP-68					
Control unit	Outer dimensions (W × D × H)	115 × 66 × 283 mm	✓	✓	—	✓	—
		115 × 66 × 335 mm	—	—	✓	—	✓
	Mass	Approx. 800 g	✓	✓	✓	✓	✓
	LCD	320 × 240 mm graphic LCD (monochrome) with backlight	✓	✓	✓	✓	✓
	Memory data items	10000	✓	✓	✓	✓	✓
	Communication interface	USB peripheral	✓	✓	✓	✓	✓
	Batteries	C-size dry cells (×4)	✓	✓	✓	✓	✓
	Waterproofing standard	IP-67	✓	✓	✓	✓	✓
	GPS unit	● Reception method (12 channel parallel) ● Measurement precision [With PDOP (high precision): 30 m or less (2 drms)]	—	—	✓	—	✓
	Estimated battery life*1	—	70 hours (no backlight)			500 measurements (no backlight)	
	Storage temperature range	–10°C to 60°C	✓	✓	✓	✓	✓
	Ambient temperature range	–5°C to 45°C					

5 Specifications

Specification		Basic value	Model				
			U-51	U-52	U-52G	U-53	U-53G
pH measurement Two calibration	Measurement method	Glass electrode method	✓	✓	✓	✓	✓
	Range	pH 0 to 14					
	Resolution	0.01 pH					
	Precision*2	±0.1 pH					
Dissolved oxygen measurement ● Salinity conversion (0 to 70 PPT, automatic) ● Automatic temperature compensation	Measurement method	Polarographic method	✓	✓	✓	✓	✓
	Film thickness	25 µm					
	Range	0 mg/L to 50.0 mg/L					
	Resolution	0.01 mg/L					
	Precision*2	0 mg/L to 20 mg/L: ±0.2 mg/L 20 mg/L to 50 mg/L: ±0.5 mg/L					
Electrical conductivity measurement ● Auto range ● Automatic temperature conversion (25°C)	Measurement method	Four-AC-electrode method	✓	✓	✓	✓	✓
	Range	0 S/m to 10 S/m (0 mS/cm to 100 mS/cm)					
	Resolution	0.000 mS/cm to 0.999 mS/cm: 0.001					
		1.00 mS/cm to 9.99 mS/cm: 0.01					
		10.0 mS/cm to 99.9 mS/cm: 0.1					
	Precision*2	0.0 mS/m to 99.9 mS/m: 0.1 0.100 S/m to 0.999 S/m: 0.001 1.00 S/m to 9.99 S/m: 0.01					
Salinity measurement	Measurement method	Electrical conductivity conversion	✓	✓	✓	✓	✓
	Range	0 PPT to 70 PPT (parts per thousand)					
	Resolution	0.1 PPT					
	Precision	±3 PPT					
TDS (total dissolved solid) measurement ● Conversion coefficient setting	Measurement method	Electrical conductivity conversion	✓	✓	✓	✓	✓
	Range	0 g/L to 100 g/L					
	Resolution	0.1% of full-scale					
	Repeatability	±2 g/L					
	Precision	±5 g/L					
Seawater specific gravity measurement ● σt, σ0, σ15 display	Measurement method	Electrical conductivity conversion	✓	✓	✓	✓	✓
	Range	0 σt to 50 σt					
	Resolution	0.1 σt					
	Precision	±5 σt					

Specification		Basic value	Model				
			U-51	U-52	U-52G	U-53	U-53G
Temperature measurement	Measurement method	Platinum temperature sensor	✓	✓	✓	✓	✓
	Range	−10°C to 55°C					
	Resolution	0.01°C					
	Sensor	Platinum temperature sensor, JIS Class B (0.3 + 0.005 t)					
Turbidity measurement	Measurement method		—	LED forward 30° transmission/ scattering method		Tungsten lamp 90° transmission scattering method	
	Range			0 NTU to 800 NTU		0 NTU to 1000 NTU	
	Resolution			0.1 NTU		0.01 NTU	
	Precision *2			±5%of readout or ±1 NTU, whichever is larger		● ±0.5NTU (for 0 NTU to 10 NTU measurement range) ● 3% of readout or 1 NTU, whichever is larger (for 10 NTU to 1000 NTU measurement range)	
	Turbidity sensor wiper			—		✓	
Water depth measurement	Measurement method	Pressure method	—	—	✓	✓	✓
	Range	0 m to 30 m					
	Resolution	0.05 m					
	Precision *2	±0.3 m					
ORP (oxidation reduction potential) measurement	Measurement method	Platinum electrode method	✓	✓	✓	✓	✓
	Range	−2000 ~ +2000 mV					
	Resolution	1 mV					
	Precision *2	±15 mV					

*1: Battery life is estimated under following conditions.

- Continuous operation
- Using batteries: C-size alkaline dry cells
- Ambient temperature of the control unit: 20°C or more
- Backlight off

*2: The precision is defined by measuring the standard solution in the following cases.

- Turbidity and conductivity: after four point calibration
- pH and DO: after two point calibration
- Water depth and ORP: after one point calibration

*3: Metallic parts are made of stainless steel. Immersing in seawater may erode metallic parts.

6 Reference

6.1 Consumable parts

● Sensor

Name	Model	No.	Description
pH sensor	#7112	3014057312	Standard type pH sensor
pH sensor ToupH	#7113	3200170923	Tough glass type pH sensor
ORP sensor	#7313	3200170920	
DO sensor	#7543	3200170924	
Reference electrode	#7210	3200043582	
R bush unit	—	3200043587	Reference electrode liquid junction
TURB cell U-52	#7800	3200172803	For U-52/U-52G
TURB cell U-53	#7801	3200172800	For U-53/U-53G
Membrane cap	—	3200170194	For DO sensor

● Standard solution and inner solution

Name	Model	No.	Description
pH 4 (For automatic calibration) 500 mL	#100-4	3200043638	Standard solution for auto calibration. Also used for manual pH span calibration.
pH 4 (For automatic calibration) 4 L	#140-4	3200174430	
pH 7 500 mL	#100-7	3200043637	Standard solution for pH zero-point calibration.
pH 9 500 mL	#100-9	3200043636	Standard solution for pH manual span calibration.
Powder for ORP standard solution 10 packs	#160-51	3200043618	For ORP calibration.
Powder for ORP standard solution 10 packs	#160-22	3200043617	
Inner solution for DO sensor, 50 mL	#306	3200170938	Internal solution for DO sensor.
Internal solution for pH, 250 mL	#330	3200043641	Supplementary internal solution for pH reference electrode.

● Others

Name	Model	No.	Description
Silicone grease	—	3014017718	Silicone grease for coating sensor O-ring.
Sponge brush unit	—	3200169531	Brush for cleaning sensor probe.
O-ring set for reference electrode	—	3200169376	O-rings for reference electrode.
O-ring set for DO sensor	—	3200169426	O-rings for DO sensor.
Rubber cap set for sensor guard	—	3200169428	Rubber caps used between sensor guard and sensor probe.
O-ring set for pH and ORP sensor	—	3200169520	O-rings for pH and ORP sensors.
Wiper unit	—	3200169789	Rubber wiper for U-53/U-53G turbidity sensors.
Protective cap (blk) for pH sensor	—	3200175019	Cap attached to tip of pH sensor for sensor probe storage.
Rubber cap (whit) for DO sensor	—	3200175020	Cap attached to tip of DO sensor for sensor probe storage.

6.2 Options sold separately

Name	Model	No.	Description
Bag	U-5030	3200174772	Storage bag for sensor probes and flow cell. Can be carried in one hand.
Flow cell assy	—	3200156570	Used when collecting measurement samples by pump.
Probe guard	—	3200167002	Used for taking measurements in locations where there is a current or where there is a thick layer of sludge.
Communication cable	—	3200174823	A PC connection cable. Comes with data collection software.

3.3 Calibration

To obtain correct measurement values, the sensors need to be calibrated using standard solution before measurement. You can select simultaneous auto calibration of the pH, COND and TURB sensors in pH4 standard solution and DO and DEP sensors simultaneously in air, or manual calibration of individual measurement parameters. You can check the result of the previous calibration using the procedure on “ 3.5.4 Checking the calibration record ” (page 70).

Note

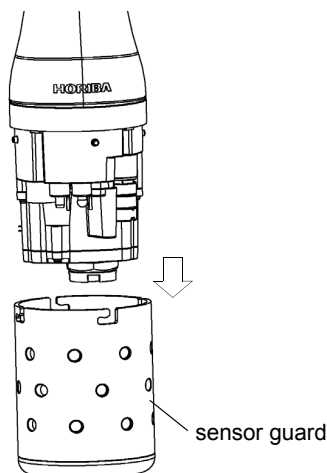
- Wait at least 20 minutes after turning the system power ON before calibrating the DO sensor.
- Make the DO and COND compensation settings before calibration since these settings are applied during calibration.
- You can select only the desired parameters for calibration and calibrate just those parameters (see “ 3.2.4 Sensor selection ” (page 25)).
- Use about 200 mL of standard solution in the calibration cup.
- Calibration data is stored in the sensor probe.

3.3.1 Auto calibration

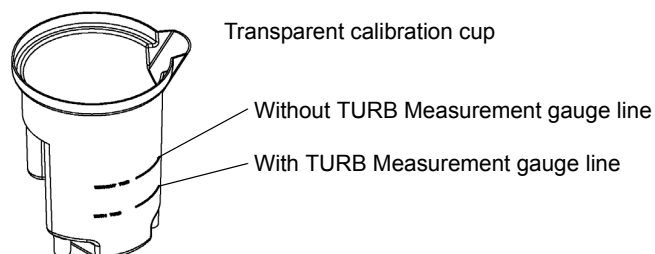
Tip

- The following parameters are calibrated (at 25°C):
 pH: Set to 4.01 (zero-point calibration); the span is adjusted to the factory default value.
 COND: 0.449 S/m (4.49 mS/cm, span calibration); the zero point is adjusted to the factory default value.
 TURB: 0 NTU (zero-point calibration); the span is adjusted to the factory default value.
 DO: 8.92 mg/L (span calibration); the zero point is adjusted to the factory default value.
 DEP: 0 m (zero-point calibration); the zero point is adjusted to the factory default value.
- If the air temperature changes, the readout value may not be stable. Ensure that the ambient air temperature is the same temperature as the calibration solution, because the internal probe temperature sensor and external temperature sensor (in the calibration solution) are used for the auto calibration. Allow the probe and standard solution to equilibrate for 1 hour if a thermometer is not available to verify that these temperatures are the same.
- Do not hold the probe while performing the auto calibration. Body temperature may elevate the internal temperature sensor measurement creating DO calibration error.

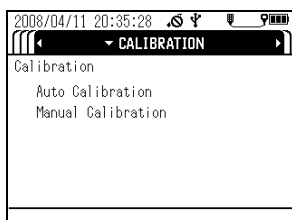
1. Remove the sensor guard and wash the sensor probe 2 or 3 times with deionized water.



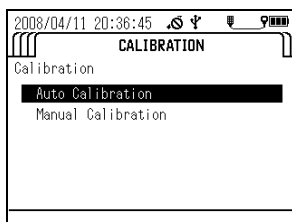
2. Remove the transparent calibration cup.
3. Fill the transparent calibration cup to the line with pH 4 standard solution.
The transparent calibration cup has With TURB Measurement and Without TURB Measurement gauge lines.



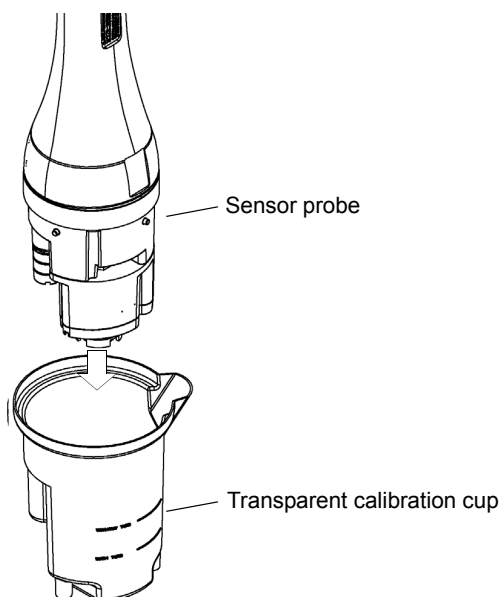
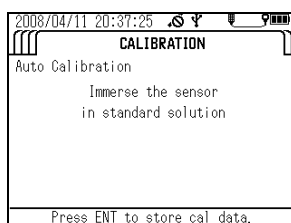
4. Press the control unit's CAL key to set the calibration mode.



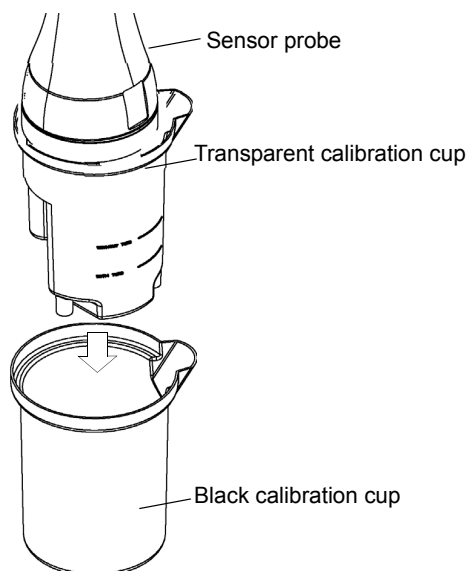
5. Press the down (▽) key to move the cursor to "Auto Calibration", then press the ENTER key.



6. Immerse the sensor probe in the transparent calibration cup. Check that the pH sensor, ORP sensor, reference electrode, COND sensor, TURB sensor and temperature sensor are submerged in the pH 4 standard solution and check that there are no air bubbles on the sensor.



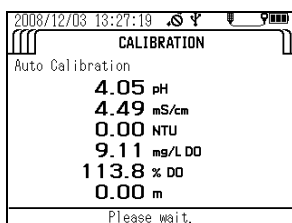
7. With the sensor probe still in the transparent calibration cup, place the transparent calibration cup into the black calibration cup.



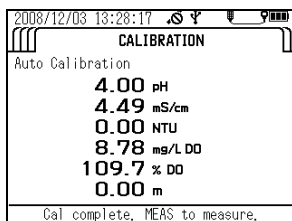
8. When all the sensor values have stabilized, press the ENTER key to start calibration.

Note

Do not remove the sensor probe from the calibration solution. U-53 turbidity data will display “----” until the calibration is completed.



Calibration is finished when the message "Cal complete. MEAS to measure." appears. Press the MEAS key to set the measurement screen, then start measurement.



If a calibration error occurs, start calibration after first resolving the issue according to the instructions in “ 4.6 Troubleshooting ” (page 89).

3.3.2 Manual calibration

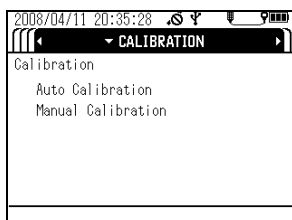
The procedures below describe how to calibrate each sensor individually.

Note

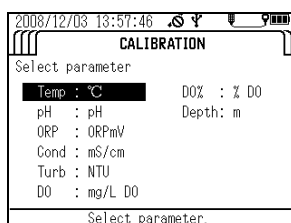
The displayed units are the units set by selecting "Unit for report" in the "SETTINGS" screen.

● Temperature (TEMP) calibration

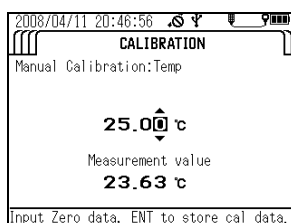
1. Fill a bucket or similar container with water of a known temperature, and insert the sensor probe in it.
Wait 5 minutes before starting calibration to allow the sensor probe temperature to stabilize.
2. Press the control unit's CAL key to set the calibration mode.
3. Press the down (▽) key to move the cursor to “Manual Calibration”, then press the ENTER key.



- In the parameter selection screen, move the cursor to “Temp”, then press the ENTER key.



- Press the up (△) and down (▽) keys to set the calibration value - the temperature of the water containing the submerged sensor probe.



- Check that “Measurement value” has stabilized, then press the ENTER key to start calibration.

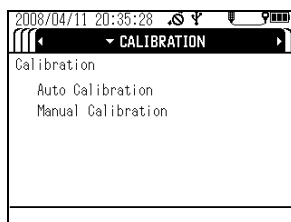
Calibration is finished when the message “Cal complete. CNT to measure.” appears.

● pH calibration

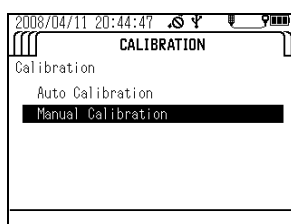
Note

You can select one calibration point (zero-point calibration) or two calibration points (zero-point calibration and span calibration). Carry out two calibration procedures to ensure good measurement precision throughout all measurement ranges.

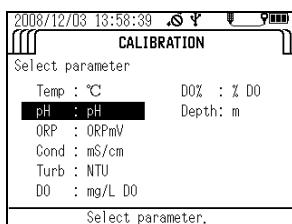
- Calibrate the zero point. Wash the transparent calibration cup 2 or 3 times with deionized water, then fill it to the reference line with pH 7 standard solution.
- Wash the sensor probe 2 or 3 times in deionized water to remove any dirt, then submerge the sensor probe in the transparent calibration cup.
- Press the control unit’s CAL key to set the calibration mode.



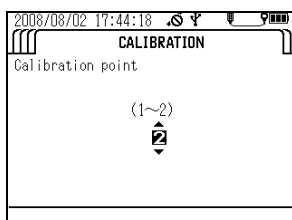
- Press the down (▽) key to move the cursor to "Manual Calibration", then press the ENTER key.



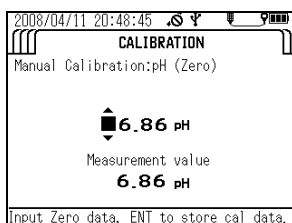
5. In the parameter selection screen, move the cursor to "pH", then press the ENTER key.



6. Set the number of calibration points, then press the ENTER key.



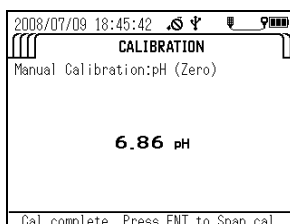
7. Press the up (△) and down (▽) keys to set the pH value of the pH 7 standard solution containing the submerged sensor probe at the measurement temperature



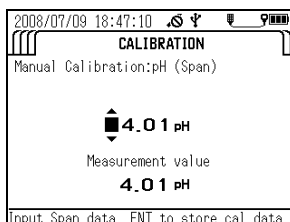
Temp. (°C)	pH 4 standard solution Phthalate	pH 7 standard solution Neutral phosphate	pH 9 standard solution Borate
0	4.01	6.98	9.46
5	4.01	6.95	9.39
10	4.00	6.92	9.33
15	4.00	6.90	9.27
20	4.00	6.88	9.22
25	4.01	6.86	9.18
30	4.01	6.85	9.14
35	4.02	6.84	9.10
40	4.03	6.84	9.07
45	4.04	6.84	9.04

8. Check that "Measurement value" has stabilized, then press the ENTER key to start calibration.

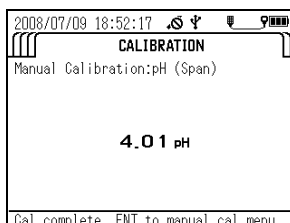
9. Press the ENTER key to start the span calibration procedure when the message "Cal complete. Press ENT to Span cal." appears.



10. Wash the transparent calibration cup 2 or 3 times with deionized water, then fill it to the reference line with pH 4 or pH 9 standard solution.
11. Wash the sensor probe 2 or 3 times in deionized water to remove any dirt, then submerge the sensor probe in the transparent calibration cup.
12. Press the up (Δ) and down (∇) keys to set the pH value of the pH 4 or pH 9 standard solution containing the submerged sensor probe at the measurement temperature.



13. Check that "Measurement value" has stabilized, then press the ENTER key to start calibration.
14. Calibration is finished when the message "Cal complete. ENT to manual cal menu." appears. Press the ENTER key to return to the calibration parameter

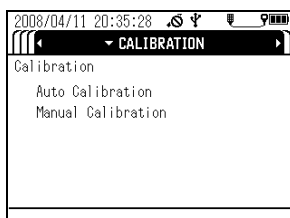


● ORP calibration

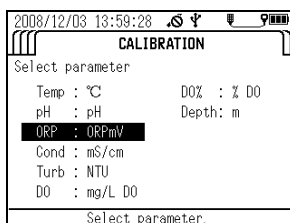
Note

- If the prepared ORP standard solution is left in open air for one hour or more, the solution may be transformed. For this reason ORP standard solution cannot be stored. Calibrate within one hour of preparing the solution.
- When measuring sample with low concentrations of oxidants and reductants after conducting an operational check using a standard substance, the measured values may not stabilize or the results of measurement might not be repeatable. If this is the case, start the measurement after immersing the sensors in the sample water sufficiently.
- Note that when measuring the ORP of solution with extremely low concentrations of oxidants and reductants, such as tap water, well water, or water treated with purifying equipment, there may be less responsiveness, repeatability, and stability, in general.
- When alkaline ion water is left for 5 minutes, its ORP undergoes changes significantly. Always measure alkaline ion water promptly.

1. Fill a clean beaker with one bag of ORP standard powder No. 160-22 or No. 160-51. Add 250 mL of deionized water and agitate the solution thoroughly (there will be some excess quinhydrone (a black powder) that floats on the surface when agitating the solution). Fill the transparent calibration cup to the reference line with this standard solution.
2. Wash the sensor probe 2 or 3 times in deionized water to remove any dirt, then submerge the sensor probe in the transparent calibration cup.
3. Press the control unit's CAL key to set the calibration mode.
4. Press the down (▽) key to move the cursor to "Manual Calibration", then press the ENTER key.



5. In the parameter selection screen, move the cursor to ORP, then press the ENTER key.



6. Press the up (△) and down (▽) keys to set the mV value of the ORP standard solution containing the submerged sensor probe at the measurement temperature.

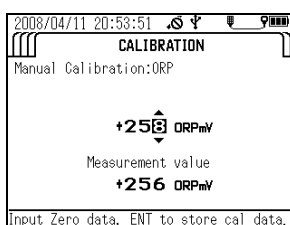


Table 1 Indicated value of ORP standard solution at various temperatures (mV)

Temperature	160-22	16051
5	+274	+112
10	+271	+107
15	+267	+101
20	+263	+95
25	+258	+89
30	+254	+83
35	+249	+76
40	+244	+69

7. Check that "Measurement value" has stabilized, then press the ENTER key to start calibration.
8. Calibration is finished when the message "Cal complete. ENT to manual cal menu." appears. Press the ENTER key to return to the calibration parameter selection screen.

● Conductivity (COND) calibration

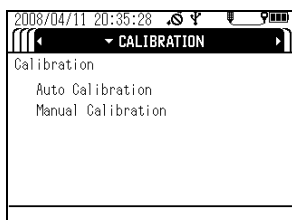
Note

- To support a wide range of sample concentrations, electrical conductivity is divided into three measurement ranges: 0.0 mS/m to 99.9 mS/m, 0.090 S/m to 0.999 S/m, and 0.9 S/m to 9.99 S/m.
- When manually calibrating conductivity, you can select two calibration points (one zero-point calibration point and a span calibration point for one of the three measurement ranges) or four calibration points (one zero-point calibration point and span calibration points for all three measurement ranges). Carry out the four calibration points to ensure good measurement precision throughout all measurement ranges.
- Make the compensation setting before calibration since this setting is applied during calibration. (Refer to “ 6.5.3 Temperature coefficient ” (page 104)).

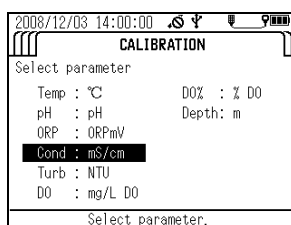
1. Prepare the standard solution. Dry Potassium chloride (KCl) powder (high-grade commercially available) at 105°C for two hours, and leave it to cool in a desiccator.
2. Consult the following table and weigh potassium chloride (KCl), then prepare three standard potassium chloride (KCl) solutions following the procedure below.

Potassium chloride (KCl) standard solution	Conductivity (COND) value	Potassium chloride (KCl) mass (g) at solution temperature of 25 °C	Calibration range
0.005 mol/L	71.8 mS/m (0.718 mS/cm)	0.373	0.0 mS/m to 99.9 mS/m (0.00 mS/cm to 0.999 mS/cm)
0.050 mol/L	0.667 S/m (6.67 mS/cm)	3.73	0.090 S/m to 0.999 S/m (1.00 mS/cm to 9.99 mS/cm)
0.500 mol/L	5.87 S/m (58.7 mS/cm)	37.2	0.9 S/m to 9.99 S/m (10.0 mS/cm to 99.9 mS/cm)

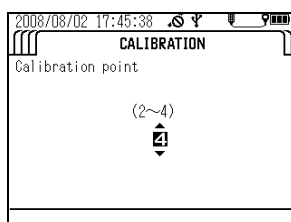
3. Dissolve the weighed Potassium Chloride (KCl) in deionized water.
4. Put the dissolved Potassium Chloride (KCl) into a 1 L measuring flask, and fill to the 1 L mark with deionized water.
5. Calibrate the zero point. Wash the sensor probe 2 or 3 times in deionized water to remove any dirt, then remove all moisture from the sensor probe (it will be calibrated in air).
6. Press the control unit's CAL key to set the calibration mode.
7. Press the down (▽) key to move the cursor to "Manual Calibration", then press the ENTER key.



8. In the parameter selection screen, move the cursor to "Cond", then press the ENTER key.

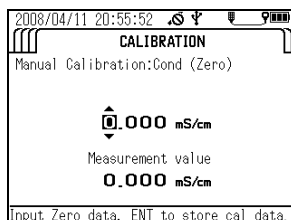


9. Set the number of calibration points, then press the ENTER key.

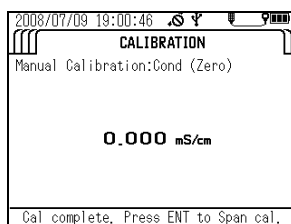


The instructions below assume that four calibration points have been set.

10. Press the up (△) and down (▽) keys to set the "Cond" value to 0.0 mS/m (0.000 mS/cm).
11. Check that "Measurement value" has stabilized, then press the ENTER key to start calibration.



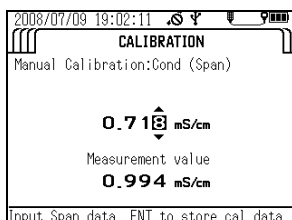
12. When the message "Cal complete. Press ENT to Span cal." appears, press the ENTER key to start the first span calibration procedure.



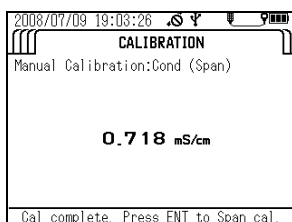
13. Wash the transparent calibration cup 2 or 3 times with deionized water, then fill it to the reference line with 71.8 mS/m (0.718 mS/cm) standard solution.
14. Wash the sensor probe 2 or 3 times in deionized water to remove any dirt, then submerge the sensor probe in the transparent calibration cup.

15. Press the up (Δ) and down (∇) keys to set the "Cond" value to 71.8 mS/m (0.718 mS/cm).

Calibration range = 0 mS/m to 99.9 mS/m (0 mS/cm to 0.999 mS/cm)

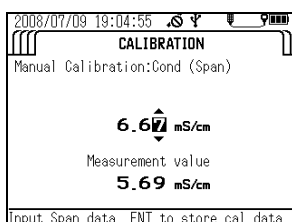


16. Check that "Measurement value" has stabilized, then press the ENTER key to start calibration.
17. When the message "Cal complete. Press ENT to Span cal." appears, press the ENTER key to start the next span calibration procedure.

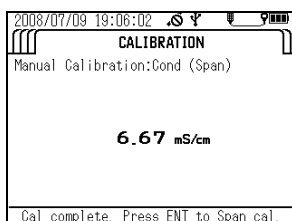


18. Wash the transparent calibration cup 2 or 3 times with deionized water, then fill it to the reference line with 0.667 S/m (6.67 mS/cm) standard solution.
19. Wash the sensor probe 2 or 3 times in deionized water to remove any dirt, then submerge the sensor probe in the transparent calibration cup.
20. Press the up (Δ) and down (∇) keys to set the "Cond" value to 0.667 S/m (6.67 mS/cm).

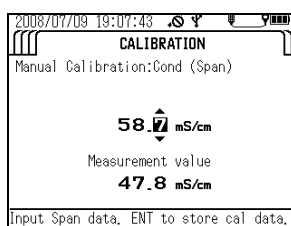
Calibration range = 0.100 S/m to 0.999 S/m (1.00 mS/cm to 9.99 mS/cm)



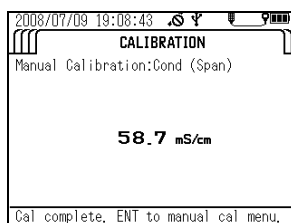
21. Check that "Measurement value" has stabilized, then press the ENTER key to start calibration.
22. When the message "Cal complete. Press ENT to Span cal." appears, press the ENTER key to start the next span calibration procedure.



23. Wash the transparent calibration cup 2 or 3 times with deionized water, then fill it to the reference line with 5.87 S/m (58.7 mS/cm) standard solution.
24. Wash the sensor probe 2 or 3 times in deionized water to remove any dirt, then submerge the sensor probe in the transparent calibration cup.
25. Press the up (Δ) and down (∇) keys to set the "Cond" value to 5.87 S/m (58.7 mS/cm).
Calibration range = 1.00 S/m to 10.00 S/m (10.0 mS/cm to 100.0 mS/cm)



26. Check that "Measurement value" has stabilized, then press the ENTER key to start calibration.
27. Calibration is finished when the message "Cal complete. ENT to manual cal menu." appears. Press the ENTER key to return to the calibration parameter selection screen.



● Turbidity (TURB) calibration

Note

- To support a wide range of sample concentrations, turbidity is divided into three measurement ranges: 0.0 to 9.9 NTU, 10 to 100 NTU, and over 100 NTU.
- When manually calibrating turbidity, you can select two calibration procedures (one zero-point calibration procedure and a span calibration procedure for one of the three measurement ranges), three calibration procedures (one zero-point calibration procedure and a span calibration procedure for two of the three measurement ranges) or four calibration procedures (one zero-point calibration procedure and span calibration procedures for all three measurement ranges). Carry out the four calibration procedures to ensure good measurement precision throughout all measurement ranges.
- Always use the calibration cup provided. Using other containers can create effects from ambient light that cause incorrect calibration.

● Preparing the standard solutions

1. Weigh out 5.0 g of hydrazine sulfate (commercial special grade or above), and dissolve it in 400 mL of deionized water. Dissolve 50 g of hexamethylene tetramine (commercial special grade or above) in 400 mL of deionized water in another flask.
2. Mix the two solutions and add deionized water until the total solution volume is 1000 mL, and mix well. Store this solution at a temperature of $25^{\circ}\text{C} \pm 3^{\circ}\text{C}$ for 48 hours.

The turbidity value (TURB) of this solution is equivalent to 4000 NTU.

3. Dilute 4000 NTU-solution 5 times (use a pipette to measure 50 mL of the 4000 NTU solution and pour it into a 250 mL measuring flask, and fill up to 250 mL meniscus)
The turbidity value (TURB) of this solution is equivalent to 800 NTU.

4. Dilute 800 NTU solution 10 times (use a pipette to measure 25 mL of the 800 NTU solution and pour it into a 250 mL measuring flask, and fill up to 250 mL meniscus)
The turbidity value (TURB) of this solution is equivalent to 80 NTU.

5. Dilute 80 NTU solution 10 times (use a pipette to measure 25 mL of the 80 NTU solution and pour it into a 250 mL measuring flask, and fill up to 250 mL meniscus)
The turbidity value (TURB) of this solution is equivalent to 8 NTU.

Note

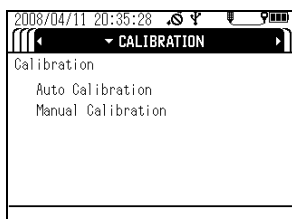
Instead of the standard solutions above, you can use other standard solutions of known concentration measured with other standard instruments.

● U-52, U-53 turbidity calibration

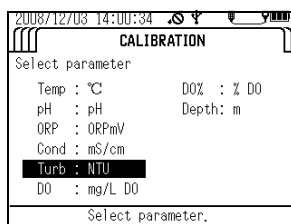
Set the number of calibration points.

You can set between 2 and 4 points.

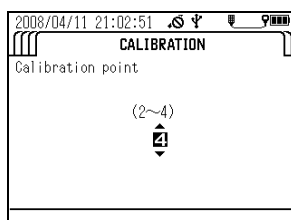
1. Press the control unit's CAL key to set the calibration mode.
2. Press the down (∇) key to move the cursor to "Manual Calibration", then press the ENTER key.



3. In the parameter selection screen, move the cursor to "Turb", then press the ENTER key.

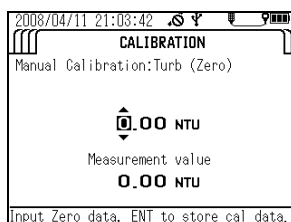


4. Press the up (△) and down (▽) keys to set the number of calibration points, then press the ENTER key.

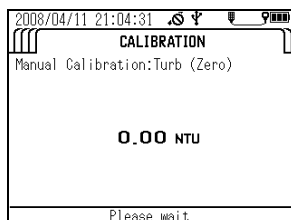


The instructions below assume that four calibration points have been set.

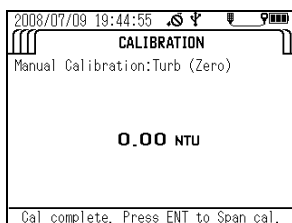
5. Calibrate the zero point. Wash the transparent calibration cup 2 or 3 times with deionized water, then fill it to the reference line with deionized water.
6. Wash the sensor probe 2 or 3 times in deionized water to remove any dirt, then submerge the sensor probe in the transparent calibration cup.
7. Press the up (△) and down (▽) keys to set the "Turb" value to 0.0 NTU.



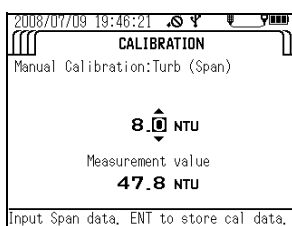
8. Check that "Measurement value" has stabilized, then press the ENTER key to start calibration.



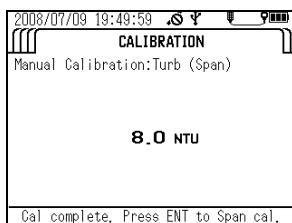
9. When the message "Cal complete. Press ENT to Span cal." appears, press the ENTER key to start the first span calibration procedure.



10. Wash the transparent calibration cup 2 or 3 times with deionized water, then fill it to the reference line with 8 NTU standard solution, or a standard solution of known concentration between 0.1 and 10 NTU.
11. Wash the sensor probe 2 or 3 times in deionized water to remove any dirt, then submerge the sensor probe in the transparent calibration cup.
12. Press the up (Δ) and down (∇) keys to set the "TURB" value to 8 NTU, or to the known concentration of the standard solution between 0.1 and 10 NTU. (Input range = 0 NTU to 9.9 NTU (U-51) or 0 NTU to 9.99 NTU (U-52))

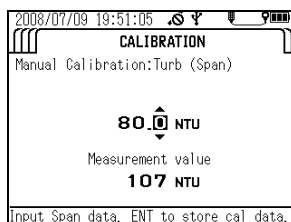


13. Check that "Current measurement value" has stabilized, then press the ENTER key to start calibration.
14. When the message "Cal complete. Press ENT to Span cal." appears, press the ENTER key to start the next span calibration procedure.

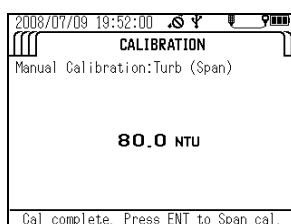


15. Wash the transparent calibration cup 2 or 3 times with deionized water, then fill it to the reference line with 80 NTU standard solution, or a standard solution of known concentration between 10 and 100 NTU.
16. Wash the sensor probe 2 or 3 times in deionized water to remove any dirt, then submerge the sensor probe in the transparent calibration cup.

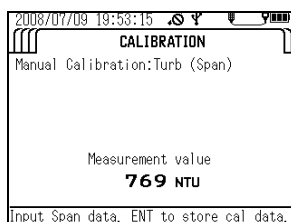
17. Press the up (Δ) and down (∇) keys to set the "Turb" value to 80 NTU, or to the known concentration of the standard solution between 10 and 100 NTU. (Input range = 10.0 NTU to 99.9 NTU)



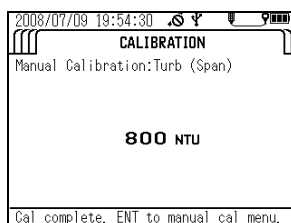
18. Check that "Measurement value" has stabilized, then press the ENTER key to start calibration.
19. When the message "Cal complete. Press ENT to Span cal." appears, press the ENTER key to start the next span calibration procedure.



20. Wash the transparent calibration cup 2 or 3 times with deionized water, then fill it to the reference line with 800 NTU standard solution, or a standard solution of known concentration 100 NTU above.
21. Wash the sensor probe 2 or 3 times in deionized water to remove any dirt, then submerge the sensor probe in the transparent calibration cup.
22. Press the up (Δ) and down (∇) keys to set the "TURB" value to 800 NTU, or to the known concentration of the standard solution 100 NTU above. (Input range = 100 NTU to 800 NTU (U-51), 100 NTU to 1000 NTU (U-52))



23. Check that "Measurement value" has stabilized, then press the ENTER key to start calibration.
24. Calibration is finished when the message "Cal complete. ENT to manual cal menu." appears. Press the ENTER key to return to the calibration parameter selection screen.



● Dissolved oxygen (DO) calibration

Note

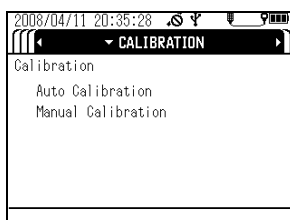
- You can select one calibration procedure (span calibration) or two calibration procedures (zero-point calibration and span calibration). Carry out the two calibration procedures to ensure good measurement precision throughout all measurement ranges.
- It is necessary to prepare new solution before calibration of the Dissolved Oxygen (DO) sensor.
- The calibration cup (included) cannot be used to manually calibrate the DO sensor. Use a suitable bottle in which the DO sensor and the temperature sensor can be immersed.
- Wait at least 20 minutes after turning the system power ON before calibrating the DO sensor.
- Make the compensation setting before calibration since the setting is applied during calibration.
- The DO sensor is affected by flow. When performing span calibration with saturated dissolved oxygen water, move the cable slowly up and down (move the sensor probe at a rate of roughly 20 to 30 cm a second) or agitate the saturated dissolved oxygen water.

1. Prepare the standard solution.

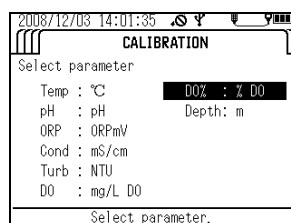
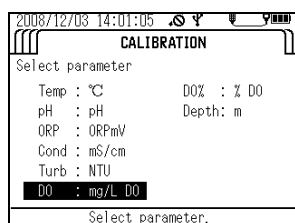
- Add about 50 g of sodium sulfite to 1000 mL of water (either deionized water or tap water) and stir the mixture to dissolve the sodium sulfite in it.
- Pour 1 to 2 liters of water into a suitable flask (either deionized water or tap water). Using a air pump, feed air into the water and aerate the solution until oxygen is saturated.

2. First, calibrate the zero point. Press the control unit's CAL key to set the calibration mode.

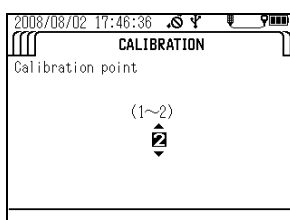
3. Press the down (▽) key to move the cursor to "Manual Calibration", then press the ENTER key.



4. In the parameter selection screen, move the cursor to DO or DO%, then press the ENTER key.

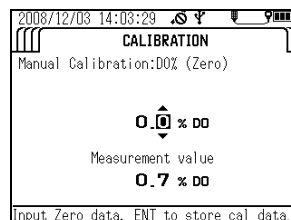
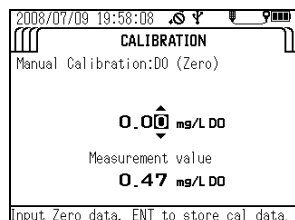


5. Set the number of calibration procedures, then press the ENTER key.

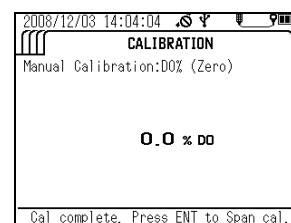
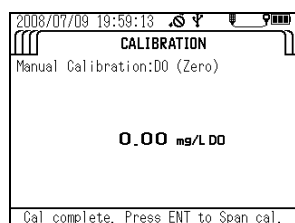


The instructions below assume that two calibration points have been set.

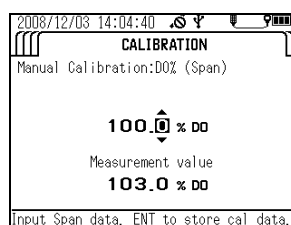
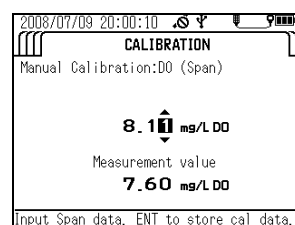
6. Wash the sensor probe 2 or 3 times in deionized water to remove any dirt, then submerge the sensor probe in the bottle.
7. Press the up (Δ) and down (∇) keys to set the DO value to 0.00 mg/L or 0.0%.



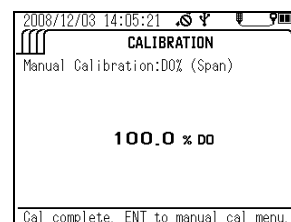
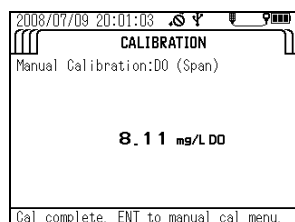
8. Check that "Measurement value" has stabilized, then press the ENTER key to start calibration.
9. When the message "Cal complete. Press ENT to Span cal." appears, press the ENTER key to start the span calibration procedure.



10. Wash the sensor probe 2 or 3 times with deionized water to remove any dirt, then submerge the sensor probe in the container filled with the span solution.
11. Press the up (Δ) and down (∇) keys to set the DO value to the saturated dissolved oxygen value (mg/L) of the water at that temperature or the dissolved oxygen saturation ratio.



12. Check that "Measurement value" has stabilized, then press the ENTER key to start calibration.
13. Calibration is finished when the message "Cal complete. ENT to manual cal menu." appears. Press the ENTER key to return to the calibration parameter selection screen.



**Amounts of saturated dissolved oxygen in water at various temperatures
(salinity=0.0%)**

JIS K0101

Temp. (°C)	DO (mg/L)	Temp. (°C)	DO (mg/L)	Temp. (°C)	DO (mg/L)	Temp. (°C)	DO (mg/L)
0	14.16						
1	13.77	11	10.67	21	8.68	31	7.42
2	13.40	12	10.43	22	8.53	32	7.32
3	13.04	13	10.20	23	8.39	33	7.22
4	12.70	14	9.97	24	8.25	34	7.13
5	12.37	15	9.76	25	8.11	35	7.04
6	12.06	16	9.56	26	7.99	36	6.94
7	11.75	17	9.37	27	7.87	37	6.86
8	11.47	18	9.18	28	7.75	38	6.76
9	11.19	19	9.01	29	7.64	39	6.68
10	10.92	20	8.84	30	7.53	40	6.59

ISO5814

Temp. (°C)	DO (mg/L)	Temp. (°C)	DO (mg/L)	Temp. (°C)	DO (mg/L)
0	14.62				
1	14.22	11	11.03	21	8.91
2	13.83	12	10.78	22	8.74
3	13.46	13	10.54	23	8.58
4	13.11	14	10.31	24	8.42
5	12.77	15	10.08	25	8.26
6	12.45	16	9.87	26	8.11
7	12.14	17	9.66	27	7.97
8	11.84	18	9.47	28	7.83
9	11.56	19	9.28	29	7.69
10	11.29	20	9.09	30	7.56

● Span setting values for calibration in air

The software should display these values when auto calibration is performed.

Use this table to input values for manual span calibrations in air.

— Tip —

The DO measurement value of “air-saturated water” and air are different.

Due to the pressure difference against the membrane in air versus the membrane in water, the measurement value in air is about 10% higher than the value of air-saturated water on average.

Amounts of saturated dissolved oxygen in air at various temperatures

Following tables are applicable only to the air calibration of the U-50 DO sensor. Do not use them for other purpose.

Air calibration value in adopting evaluation based on JIS K0101

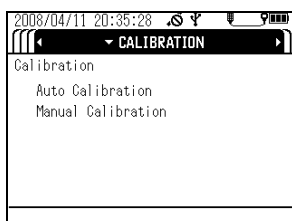
Temp (°C)	DO (mg/L)	Temp (°C)	DO (mg/L)	Temp (°C)	DO (mg/L)	Temp (°C)	DO (mg/L)
0	15.58						
1	15.15	11	11.74	21	9.55	31	8.16
2	14.74	12	11.47	22	9.38	32	8.05
3	14.34	13	11.22	23	9.23	33	7.94
4	13.97	14	10.97	24	9.08	34	7.84
5	13.61	15	10.74	25	8.92	35	7.74
6	13.27	16	10.52	26	8.79	36	7.63
7	12.93	17	10.31	27	8.66	37	7.55
8	12.62	18	10.10	28	8.53	38	7.44
9	12.31	19	9.91	29	8.40	39	7.35
10	12.01	20	9.72	30	8.28	40	7.25

Air calibration value in adopting evaluation based on ISO5814

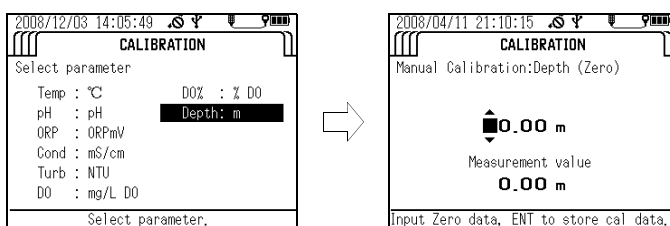
Temp. (°C)	DO (mg/L)	Temp. (°C)	DO (mg/L)	Temp. (°C)	DO (mg/L)
0	16.08				
1	15.64	11	12.13	21	9.80
2	15.21	12	11.86	22	9.61
3	14.81	13	11.59	23	9.44
4	14.42	14	11.34	24	9.26
5	14.05	15	11.09	25	9.09
6	13.70	16	10.86	26	8.92
7	13.35	17	10.63	27	8.77
8	13.02	18	10.42	28	8.61
9	12.72	19	10.21	29	8.46
10	12.42	20	10.00	30	8.32

● Water depth (DEPTH) calibration

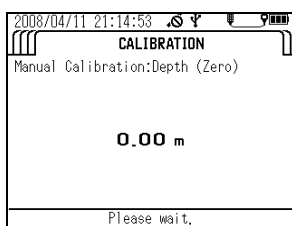
1. Calibrate the zero point. Wash the sensor probe 2 or 3 times in deionized water to remove any dirt, then remove all moisture from the sensor probe (it will be calibrated in air).
2. Press the control unit's CAL key to set the calibration mode.
3. Press the down (▽) key to move the cursor to "Manual Calibration", then press the ENTER key.



4. In the parameter selection screen, move the cursor to "Depth", then press the ENTER key.



5. Press the up (△) and down (▽) keys to set the "Depth" value to 0.00 m.
6. Check that "Measurement value" has stabilized, then press the ENTER key to start calibration.



7. Calibration is finished when the message "Cal complete. ENT to manual cal menu." appears. Press the ENTER key to return to the calibration parameter selection screen.

