Fisheries and Oceans Canada
Pêches et Océans Canada
Canadian Coast Guard
Garde côtière canadienne

SOW – 91.5 m (300 ft) GUYED TOWER REPLACEMENT

DESIGN – BUILD CONTRACT

COAST GUARD COBOURG MCTS SITE

Cold Springs, ON

MARITIME AND CIVIL INFRASTRUCTURE
Prepared by: LL
Approved by: BY
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SECTION: 011100 GENERAL INSTRUCTIONS

PART 1 - GENERAL

1.1 Minimum Standards

.1 Perform work in accordance with National Building Code of Canada (NBCC) and any other code of provincial, territorial or local application. In the case of any conflict or discrepancy, the more stringent requirements shall apply.

- .1 Meet or exceed requirements of:
  - .1 Contract documents;
  - .2 Specified standards, codes and referenced documents.

1.2 Description of Work

.1 Work under this Contract includes but is not limited to the provision of all labour, materials, and equipment required to:

- .1 Design, supply and install one [1] new guyed communication tower, two [2] new waveguide bridges, and four [4] waveguide bridge posts;
- .2 Design, supply and install new foundation and anchors for the guyed tower;
- .3 Supply and install three [3] new Coast Guard antennas;
- .4 Remove existing DF antenna and install on new tower;
- .5 Supply and install all associated cabling and accessories;
- .6 Install one Hamilton Township antenna and associated cabling;
- .7 Supply and install grounding system improvements/extension;
- .8 Demolish and remove existing tower, foundations, anchors and cabling;
- .9 Backfill and compact excavations and supply imported granular materials and topsoil;

.2 The following work will be undertaken by others and is hereby excluded:

- .1 Connection of cables inside shelter and testing for correct operation of all antennas;
- .2 Testing and commissioning of Coast Guard equipment and obstruction lighting;
- .3 Supply of Hamilton Township antenna, cable and terminals;
- .4 Testing and commissioning of Hamilton Township equipment.

1.3 Submittals

.1 Mandatory submittals and schedule for submission are detailed below and in Appendix B. The following identifies general requirements only. The relevant sections must be consulted for a complete listing of mandatory content.

.2 Detailed Schedule:

- .1 Deadline:
  - .1 No later than ten [10] working days following award.
- .2 Deliverables:
  - .1 The contractor shall furnish a high level schedule outlining the major construction milestones. Schedule shall clearly define the anticipated start and finish of the project.

.3 Proof of CWB certification:

- .1 Deadline:
  - .1 No later than ten [10] working days following award.
- .2 Deliverables:
  - .1 Proof of welding shop Certification (CWB div 2) for tower fabricator (Section 011100 – 1.4.1.1).

.4 Design Package

- .1 Deadline:
  - .1 October 31st, 2017
- .2 Deliverables:
  - .1 Drawings stamped and signed by a qualified Professional Engineer licensed to practice in the Province of Ontario. Drawings are to conform to all requirements outlined in Section 033000 and Section 133613 of this document.

.5 Construction Plan:

- .1 Deadline:
  - .1 No less than ten [10] working days prior to beginning fabrication.
- .2 Deliverables:
  - .1 A Construction Plan of sufficient detail to demonstrate that the Contractor has considered

all the challenges of the project and is prepared to undertake the works in a competent and professional manner in accordance with all legislation, including:

- .1 Project Specific Safety Program (Section 013530);
- .2 Project Environmental Protection Plan (Section 013543);
- .3 Detailed Demolition Plan (Section 024116);
- .4 Grounding Plan (Section 260527);
- .5 Concrete Construction Plan (Section 033000); and
- .6 Detailed Tower Erection Plan (Section 133613);

.6 Mill Test Certificates

- .1 Deadline:
  - .1 Upon receipt of metal purchased.
- .2 Deliverables:
  - .1 The contractor shall furnish proof that all metal received for the project is in compliance with CSA and ASTM International standards.

.7 As-built and QA/QC:

- .1 Deadline:
  - .1 No more than twenty eight [28] calendar days after construction.
- .2 Deliverables:
  - .1 The following documents shall be forwarded upon completion of the contract:
    - .1 Set of red-lined as-built drawings (Section 033000 & 133613);

1.4 <u>Contractor Qualifications</u>

.1 The work shall be carried out under the supervision and responsibility of a sole specialized Contractor, capable of performing installations of telecommunication towers.

- .1 The fabrication must be completed by a shop certified to DIVISION 2 or greater by the Canadian Welding Bureau (CWB).

.2 The Contractor shall designate the following key project members, including any subcontractors. The project members shall have completed projects of similar scope and complexity to the work described herein.

.1 Project Manager: Contact information for the main point of contact for the project shall be provided by the contractor.

.2 Site Forman: Contact information for the main point of contact at site shall be provided by the contractor.

.3 Contractor's Engineer: The Contractor's Engineer shall be responsible for overseeing/stamping the work itemized below and must verify compliance with the contract specifications and all applicable codes.

.4 Tower Fabricator: the Contractor shall provide a copy of Canadian Welding Bureau (CWB) certification to the Coast Guard for the tower fabricating company and for each worker assigned to this project.

.5 The contractor shall provide a detailed list of all subcontractors being used to complete the work described herein.

.6 Requests to amend the project team, following contract award, must be forwarded in writing. Coast Guard reserves the right to reject any proposal to amend the project team.

1.5 Required Submissions

.1 A summary of the minimum mandatory submissions required can be found in Appendix B. This summary is not an exhaustive list of all submissions required for the duration of the project.

.2 Additional submissions may be required after award.

1.6 Site Location

.1 The site is located at 8656 McBride Road in Cold Springs, ON:

.1 Coordinates: 44° 03'59.78"N, 78° 12'41.55"W

1.7 Coast Guard Staging Location

.1 Items itemized as supplied by, or salvaged to Coast Guard shall be collected or delivered by the Contractor to the following staging location. The Contractor shall be responsible for all transportation costs between the project site and the identified staging location. Material drop off or access to stored goods outside of regular operating hours shall be at the discretion of Coast Guard and may be subject to cost recovery:

.1 Staging location: CCG Base – Prescott, 401 King St. W., Prescott, ON K0E 1T0.

.2 Advise Coast Guard at least three [3] working days prior to shipping

.1 For Delivery, contact CCG Base Prescott: (613) 925-2865;

.2 Shipping/Receiving hours: Monday through Friday, 9:00AM to 3:00PM.

1.8 Existing Conditions

.1 Bidders must make their own estimate of the difficulties associated with all phases of the works.

.2 The contractor must include in their costs all expenses related to the difficulties of working at the site.

1.9 Contractor's Access to Site

.1 Contractor is responsible for transportation of all labour, materials and equipment to and from the site, including any and all material furnished or itemized for salvage by Coast Guard.

.2 The site is accessible by standard motor vehicle.

1.10 Fees, Permits and Certificates

.1 Contractor shall provide authorities having jurisdiction with all information requested.

  .1 Contractor shall pay fees and obtain certificates and permits required.

.2 Contractor shall pay fees and obtain certificates and permits required.

.3 Contractor shall furnish certificates and permits upon request of Coast Guard.

1.11 Completion, Scheduling and Planning of the Works

.1 Work may commence as early as practical following Coast Guard's acceptance and approval of mandatory submissions.

.2 Work shall be completed no later than March 2, 2018, unless otherwise negotiated and approved in writing.

1.12 Temporary Facilities

.1 The existing communications building can be used for electrical power and for small dry storage.

.2 Contractor shall provide sanitary facilities for work force in accordance with governing regulations and ordinances.

.3 Arrange, pay for, and maintain temporary electrical power supply as required for construction, and water supply as required, in accordance with governing regulations and ordinances.

.4 Maintain emergency spills kit on-site at all times.

1.13 Protection of Existing Work

.1 Care shall be taken to safeguard any existing structures and/or equipment. Upon completion of the work, all rejected materials, materials declared surplus by Coast Guard and debris shall be removed from the site.

1.14 Reference Documents

.1 The most recent publication or edition of any document referenced in this specification should be used unless the referencing clause states that this clause does not apply.

SECTION: 013300 SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 General

.1 This section specifies general requirements and procedures for the Contractor's submissions of documents to Coast Guard for review.

.2 Do not proceed with the work until submitted documents or samples have been reviewed by Coast Guard.

.3 Where items or information is not produced in SI Metric units, converted values are acceptable.

.4 Contractor's responsibility for errors and omissions in submission is not relieved by Coast Guard's review of the submitted documents.

.5 Notify Coast Guard, in writing at time of submission, identifying deviations from requirements of Contract Documents stating reasons for deviations.

.6 Contractor's responsibility for deviations in submission from requirements of Contract Documents is not relieved by Coast Guard's review of submission, unless Coast Guard gives written acceptance of specific deviations.

.7 Make any changes to submissions that Coast Guard may require consistent with Contract Documents and resubmit as directed by Coast Guard.

.8 Provide Coast Guard with a written notice, when resubmitting, of any revisions other than those requested by Coast Guard.

1.2 Submission Requirements

.1 Coordinate each submission with requirements of work and Contract Documents. Individual submissions will not be reviewed until all related information is available.

.2 Allow three [3] working days, or as stipulated in the specifications, for Coast Guard to review the submission.

.3 The Contractor's Engineer shall stamp and sign any submissions requiring a Professional Engineer's seal certifying his approval of samples, verification of field measurements, and compliance with Contract Documents.

SECTION: 013530 HEALTH AND SAFETY REQUIREMENTS

PART 1 - GENERAL

1.1 Scope

.1 The Contractor shall be responsible to develop, implement and enforce a safety program which addresses all elements of the work.

1.2 References

.1 Work under this section shall be undertaken in strict conformance with all listed references, In the case of any conflict or discrepancy the more stringent requirements shall apply.

    .1 Canada Labour Code Part II - January 2008

    .2 NRC-CNRC National Building Code of Canada, 2015

    .3 Any and all other Provincial/Territorial Regulations and Policies; Worker's Compensation Board Policies; Local municipal regulations; pertaining to safety of the contractors workers

1.3 Submittals

.1 Project Specific Safety Program

    .1 Deadline:

        .1 With Construction Plan

    .2 Deliverables:

        .1 Safety Program Document, include:

            .1 A listing of all activities specific to this phase of the project and their Health & Safety risks or hazards;

            .2 Detailed descriptions of how the activities are to be carried out as well as methods for mitigating hazards and risks;

            .3 A listing of personnel responsible for health and safety measures, and Emergency procedures; and

            .4 Material Safety Data Sheets for hazardous products to be utilized in the execution of the works.

SECTION: 013543 ENVIRONMENTAL PROCEDURES

PART 1 - GENERAL

1.1 Scope of Work

.1 The contractor must implement and enforce the following procedures throughout the duration of the work to mitigate potential negative impacts on the surrounding environment.

1.2 References

.1 Work under this section shall be undertaken in strict conformance with all listed references, In the case of any conflict or discrepancy the more stringent requirements shall apply.

- .1 Canadian General Standards Board (CGSB)
- .2 Transportation of Dangerous Goods
- .3 Canadian Council of Ministers of the Environment (CCME) Documentation
- .4 Canadian Environmental Protection Act

1.3 Submittals

.1 Contractor shall submit an environmental protection plan

- .1 Deadline:
  - .1 With Construction Plan
- .2 Deliverables:
  - .1 Submit a plan addressing procedures to be implemented to mitigate any negative impact on the environment. Detail:
    - .1 Equipment features (age, spill containment);
    - .2 Staging, refueling, and cleaning areas;
    - .3 Clean-up and/or containment procedures (including concrete/grout);
    - .4 Waste disposal methods and sites; and

PART 2 - PRODUCTS

2.1 General

.1 Avoid use of hazardous products. Use environmentally friendly products where practical.

PART 3 - EXECUTION

3.1 Construction Area

.1 Confine construction activities to as small an area as practical.

.2 Establish material storage, cleaning, and refueling areas where impacts to the surrounding environment will be negligible or readily mitigated.

3.2 Stockpiling of materials

.1 Materials must be stockpiled as far from the shoreline as practical. Tarps must be used to control dust and run-off.

.2 Stockpiled excavated materials shall be skirted using filter fabric to control run-off of fines during rain and to prevent excavation of soils below stockpiles.

3.3 Disposal of Wastes

.1 Clean-up the site at the end of each working day.

.2 All waste material to be disposed of in a legal manner at a site approved by local authorities. Transporter/hauler must be appropriately licensed.

  .1 Recycle or reuse materials where possible.

.3 Fires and burning of rubbish on site not permitted.

.4 Do not bury rubbish and waste materials on site.

3.4 Clearing and Grubbing

.1 Only clear vegetation that interferes with construction once approved to do so by Coast Guard.

3.5 Drainage

.1 Provide temporary drainage and pumping as necessary to keep excavations and site free from water.

  .1 Suspend works during periods of heavy rainfall and add temporary covers to discourage run-off.

  .2 Water pumped from excavation shall be adequately treated to ensure that water returning to the watercourse contains minimal fines. Procedures anticipated for preventing the pumping of fines shall be identified in the environmental protection plan, and may include the following:

    .1 The use of filter bags;

    .2 Straw bale check dams or silt fence;
    .3 Discharge through naturally occurring vegetation.
  .3 The means for controlling silt run-off shall be dependent on the site and the quantity of water pumped, and shall be to the discretion of the CCG site staff.
  .4 Sediment control measures shall be inspected and improved/cleaned/replaced as necessary.

3.6 Pollution Control

.1 The paint on the existing tower has been determined to be lead-based therefore care should be taken to minimize exposure of paint dust or chips to the surrounding environment.

.2 Provide methods, means, and facilities to prevent the contamination of soil, water, and atmosphere from the discharge of pollutants produced by construction operations.

.3 Vehicles, machinery, and equipment shall be in good repair, equipped with emission controls as applicable and operated within regulatory requirements.

.4 Abide by local noise by-laws.

.5 Avoid unnecessary idling of vehicles or heavy machinery.

.6 Limit use of equipment around the shoreline where possible.

.7 Implement and maintain dust and particulate control measures in accordance with provincial requirements:

  .1 All bulk material haul equipment shall be appropriately tarped. Watertight vehicles shall be used to haul wet materials

.8 Designate a cleaning area for tools to limit water use and runoff. Do not allow deleterious materials to enter waterways. Ensure emptied containers are sealed and stored safely for disposal.

.9 The contractor shall take all necessary precautions to guard against the release of any noxious substance or pollutant to the environment. In the event of any spill the Contractor shall take immediate action to contain the release and mitigate any impact.

  .1 Materials and equipment to intercept, contain, and clean-up any spill or other release shall be maintained on site throughout the construction period and must be readily accessible at all times.

  .2 Any uncontrolled release of a known contaminant (spills, fire/smoke) shall be reported to appropriate Provincial Authority and Coast Guard. Spills of deleterious substances to be immediately contained and cleaned up in accordance with provincial regulatory requirements.

.3 Provincial Authority: Ontario Spills Action Centre 1-800-268-6060.

3.7 Traffic

.1 Minimize soil compaction by driving, parking vehicles, and walking, etc. on existing paved roadways/laneways. If soil is impacted by compaction, compensate by restoring areas with new soil, as required.

  .1 Avoid the use of heavy machinery in areas of sensitive slopes. Avoid using machinery on land during wet weather.

SECTION: 014500 QUALITY CONTROL

PART 1 - GENERAL

1.1 Inspection

.1 Coast Guard or its representative shall have access to the work at all times. If parts of the work are prepared off-site or in a shop, access shall be given to such work throughout the duration of the project.

.2 In the event the work must be submitted to special testing, inspection or approvals prescribed by Coast Guard in these specifications or provided for in work-site regulations, the request for inspection must be made without unreasonable delay.

.3 The below list identifies key milestones where the Coast Guard will require an opportunity to take samples/inspect:

.1 Location verification: Coast Guard will confirm correct location for installation upon arrival of the tower at the site. The contractor shall be required to provide access to the site at all times to CCG site staff.

.2 Subgrade verification: Coast Guard will procure services of a Geotechnical Engineer to verify that ground conditions match those identified in the attached geotechnical report. Contractor shall be prepared for up to one day of downtime while the investigation takes place.

.3 Concrete testing: Coast Guard will arrange for concrete testing to take place when concrete is being poured on site.

.4 Paint application results: Coast Guard will confirm the correct locations of painted color bands as well as satisfactory paint coverage before tower erection.

.5 Pre-tensioning: Coast Guard shall witness the pre-tensioning of the all-thread rods to the prescribed torque values.

.6 Tower install and demolition: Coast Guard shall witness the erection of the new tower as well as the demolition of the existing tower.

.7 Installation of transmission lines: Coast Guard will confirm the correct location of all antennas installed on the new tower.

.8 Final completion: Coast Guard will conduct a final inspection upon completion.

1.2 Procedures

.1 Provide Coast Guard with advance notice whenever testing is required in accordance with these specifications, so that all parties involved can be present.

.2 Provide necessary manpower and installations for obtaining and handling samples and material on site.

.3 Provide access to site if the site is of remote nature whereby the contractor is responsible for providing access to the site

1.3 <u>Rejected Work</u>

.1 Remove defective work, whether incorporated into the work or not, which has been rejected by Coast Guard as failing to comply with the contract documents. Replace or re-execute in accordance with the Contract Documents.

1.4 <u>Tests and Mixture Formulas</u>

.1 Supply test reports and required mixture formulas.

1.5 <u>Factory Tests</u>

.1 Submit test certificates as prescribed in the relevant section of the specifications.

1.6 <u>Acceptance of Work</u>

.1 Coast Guard will make acceptance visits of work executed by the Contractor at critical milestones identified in the following sections.

.2 The Contractor shall inform Coast Guard at least five [5] working days before these inspection visits.

.3 All work shall be completed in compliance with the specifications before requesting the visit for inspection. If the work is not completed or deemed non-compliant, the Contractor shall be responsible for all costs incurred for subsequent inspections.

.4 Care is to be taken to minimize destruction to Crown property and appropriate remedies shall be employed where such damage occurs at Contractor’s expense.

SECTION: 016100 COMMON PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 General

.1 Secure Coast Guard approval of all products to be incorporated into the works. Work shall not commence until product data and/or samples have received Coast Guard approval.

.2 Supply and/or fabricate material and equipment of prescribed quality, with performance conforming to established standards.

.3 Use new material and equipment unless otherwise specified.

.4 Ensure replacements parts may be readily procured.

.5 Use products from one manufacturer for material and equipment of same type or classification, unless otherwise specified.

1.2 Manufacturer's Instructions

.1 Unless otherwise specified, comply with manufacturer's latest printed instructions for materials and installation methods.

.2 Notify Coast Guard in writing of any conflict between these specifications and manufacturer's instructions; Coast Guard will designate which document is to be followed.

1.3 Compliance

.1 When material or equipment is specified by standard or performance specifications, upon request of Coast Guard, obtain an independent testing laboratory report from the manufacturer, stating that material or equipment meets or exceeds specified requirements.

1.4 Substitution

.1 Where specific products have been specified, proposals for substitution may only be submitted after award of contract. Such requests must include statements of respective costs of items originally specified and the proposed substitution.

.2 No substitutions will be permitted without prior written approval of Coast Guard. Substitutions will be considered by Coast Guard only when:

  .1 Materials specified in Contract Documents, are not available or,

  .2 Delivery date of materials selected from those materials specified would unduly delay completion of contract or,

.3 Alternative materials to those specified which are brought to the attention of and considered by Coast Guard as equivalent to the material specified will result in a credit to the Contract amount.

.3 Should the proposed substitution be accepted either in whole or in part, the Contractor must assume full responsibility and costs when such substitution affects other work on the project including any and all design or drawing changes required as a result of substitution.

1.5 <u>Submittals</u>

.1 Provide product specifications and/or samples upon request from Coast Guard.

SECTION: 024116 DEMOLITION OF STRUCTURES

PART 1 - GENERAL

1.1 Scope of Work

.1 Work under this section consists of the provision of all labour, materials, and equipment necessary to complete the following activities:

- .1 Disposal of existing obstruction lighting;
- .2 Disposal of existing antennas;
- .3 Demolition of the existing tower, associated guys, bollards and hardware;
- .4 Demolition of guy anchors;
- .5 Demolition of existing concrete tower foundation;
- .6 Demolition of existing waveguide bridge and foundations;
- .7 Disposal of all waste at a licensed waste disposal facility;

1.2 References

.1 Work under this section shall be undertaken in strict conformance with all listed references, In the case of any conflict or discrepancy the more stringent requirements shall apply.

- .1 Canada Labour Code Part II - January 2008.
- .2 NRC-CNRC National Building Code of Canada 2015
- .3 Ontario Occupational Health and Safety Act and Regulations, 2016
- .4 CSA S350-[M1980(R1998)], Code of Practice for Safety in Demolition of Structures.

1.3 Submittals

.1 Contractor is to provide a demolition plan.

- .1 Deadline:
  - .1 With Construction Plan.
- .2 Deliverables:
  - .1 Method of demolition including all associated tasks and schedule;
  - .2 Methods for protecting the site from demolition debris; and
  - .3 The ultimate disposal location of all waste materials and debris.

.1 Include documentation detailing regulatory approval for waste disposal facility and transporter.

.2 Work under this section shall not proceed until written approval of the demolition plan has been received from the Coast Guard.

.3 Submit copies of certified receipts from the disposal sites for all material removed from the work site upon request.

1.4 Existing Conditions

.1 Photos of the site are provided in Appendix A.

.2 Drawings for the existing tower, guy anchors and foundations are provided in Appendix F.

PART 2 - PRODUCTS

2.1 Not used.

PART 3 - EXECUTION

3.1 General

.1 Work under this section shall only begin after the new tower has been erected, as to minimize the down time of the site.

.2 The existing tower shall not be demolished until the new tower is confirmed to be operational by Coast Guard. Once the new tower is confirmed operational, the existing tower and all attachments shall be taken down safely and removed from site.

.3 Care must be taken to minimize the number of breaks created in the existing grounding system during excavation and foundation removal operations.

.4 Work under this section shall be continuous and proceed without interruption unless otherwise approved be Coast Guard.

.5 Tower may not be felled.

.6 Contractor is to dispose of the following materials and deliver to Coast Guard staging location.

  .1 Existing obstruction lights and lighting controller board; and

  .2 Coast Guard antennas removed from existing tower.

.7 Contractor shall ensure that demolition is undertaken safely. If at any period during demolition the safety of the Contractor’s staff cannot be maintained, take preventative measures, stop work and immediately notify Coast Guard.

.8 Contractor shall ensure that demolition work does not adversely affect adjacent watercourses, groundwater and wildlife or contribute to excess air and noise pollution.

.9 If safety of structure being demolished appears to be endangered, take preventative measures, stop work and immediately notify Coast Guard.

.10 At end of each day, leave work in safe and stable condition.

.11 Demolish all existing concrete foundations in their entirety. Drawings are provided in Appendix F.

3.2 Protection

.1 Implement effective controls to catch/collect all tower debris during demolition, specifically paint.

  .1 Paint on the existing tower has been determined to be Lead-based and as such care should be taken to ensure worker exposure during demolition activities is suppressed.

.2 Implement effective controls to prevent injury to workers, property, and local traffic.

3.3 Preparation

.1 Erect warning signs and barricades.

.2 Ensure all environmental protection/mitigation measures are in place.

.3 Ensure all items identified for salvage have been removed and stored.

3.4 Demolition

.1 Remove and dispose of all Coast Guard antennas.

.2 Remove and dispose of Hamilton Township antenna.

.3 Demolish and dispose of existing steel tower in its entirety.

.4 Demolish existing concrete foundations to 300mm (1 ft.) below grade and fill resultant excavation with 19mm (¾ in.) clear crushed aggregate.

.5 Demolish existing guy anchor foundations to 300mm (1 ft) below grade and fill resultant excavation with 19mm (¾in) clear crushed aggregate.

3.5 Disposal

.1 All material is to be disposed of off-site at a licensed disposal/recycling facility.

3.6 Restoration

.1 The site in its entirety must be restored to an equal or greater condition after completion of construction.

SECTION: 033000 CONCRETE WORK

PART 1 - GENERAL

1.1 Scope of Work

.1 Work of this section includes the design of:

  .1 One [1] reinforced concrete tower foundation;

  .2 Three [3] reinforced concrete guy anchors; and

  .3 Four [4] waveguide post foundations.

.2 Work under this section also consists of the provision of all labour, materials, and equipment necessary to complete the following activities:

  .1 Construction of the tower foundation and guy anchors; and

  .2 The construction of waveguide bridge foundations.

1.2 References

.1 Work under this section shall be undertaken in strict conformance with all listed references, In the case of any conflict or discrepancy the more stringent requirements shall apply.

  .1 Canada Labour Code Part II - January 2008

  .2 NRCC-CNRC National Building Code of Canada 2015

  .3 Ontario Occupational Health and Safety Act and Regulations

  .4 CAN/CSA-A23.1-04 Concrete Materials and Methods of Concrete Construction

  .5 CAN/CSA A23.2-04 Methods of Test and Standard Practices for Concrete

  .6 CAN/CSA A23.3-04 Design of Concrete Structures

  .7 CAN/CSA-G30.18 Billet Steel Bars for Concrete Reinforcement

  .8 CAN/CSA S269.3 Concrete Formwork

  .9 ACI Specification 306 Cold Weather Concreting (if relevant)

1.3 Performance Requirements

.1 The foundation shall be designed to perform as reasonably expected for a life of 50 years.

1.4 Submittals

.1 Submittals shall be forwarded to Coast Guard in accordance with the provisions of Section

013300.

.1 Foundation Design Package

  .1 Deadline:

    .1 With Design Package

  .2 Deliverables:

    .1 The Foundation Design Package shall include drawings showing plan and section views of the foundation.

    .2 Drawings shall be sealed and signed by an engineer licensed to practice in the province of Ontario.

.2 Foundation Construction Plan

  .1 Deadline:

    .1 With Construction Plan

  .2 Deliverables:

    .1 Provide high level summary of mix properties and admixtures to demonstrate compliance with Coast Guard criteria and complete foundation design;

    .2 Concrete placing plan, identifying the location of the source of ready mix concrete, the haul route and any other relevant information required to demonstrate a plan for getting the concrete into the forms in the required amount of time;

    .3 Finishing procedures;

    .4 Curing methods and schedule;

    .5 Clean-up procedures; and

    .6 Mitigation measures to account for hot or cold temperatures where reasonably anticipated during the construction period.

1.5 Quality Assurance

.1 Coast Guard’s minimum inspection requirements are detailed below. The Contractor shall be responsible to notify Coast Guard of the date and time that the works may be inspected. Notice must be provided no less than five [5] working days in advance to permit scheduling of quality assurance testing. All deficiencies in the works identified at the time of inspection shall be remedied to the satisfaction of the Coast Guard, by the Contractor at their expense. Work shall not progress until inspections have been completed and the Contractor has been provided with written notice to proceed with the works.

.1 Subgrade-verification, upon completion of the excavation and prior to the placement of formwork and reinforcement.

.2 Installation of formwork and falsework

.3 Throughout concrete placement

.2 Coast Guard will retain the services of a Geotechnical Consultant to:

.1 Verify exposed subgrade

.2 Witness concrete placement, complete sampling of plastic concrete and undertake at least three strength measurements (one [1] at seven [7] and two [2] at 28 days) during the curing process

.3 The results of the quality control testing will be provided to Contractor.

PART 2 - MATERIALS

2.1 General

.1 All material shall conform to specifications referenced in CAN/CSA-A23.1-04.

2.2 Formwork

.1 Shall be in accordance with Can/CSA S269.3.

2.3 Concrete

.1 Concrete supplier shall be a holder of valid “Certificate of Ready Mixed/Mobile Mix Concrete Production Facilities” as issued by the ‘Ready Mixed Concrete Association of Ontario’ (RMCAO).

.2 Concrete mix to be determined by Contractor and shall be indicated on engineering plans.

.1 The use of calcium chloride as an admixture is not permitted

2.4 Water

.1 Water utilized for the production of concrete must be potable, unless otherwise approved in writing by Coast Guard.

2.5 Reinforcement

.1 Reinforcing steel must be as mandated in CAN CSA A23.1

PART 3 - EXECUTION

3.1 General

.1 Concrete must be placed, finished, and cured in accordance with the Contractor's submitted construction plan and the contractor’s engineered drawings.

  .1 Ensure that the top of the concrete is no less than 150 mm [6 in.] above the surrounding grade, unless otherwise approved.

3.2 Design Requirements

.1 Foundations

  .1 The Contractor's Engineer must design a suitable load bearing foundation for the tower in consideration of the specific soil conditions obtained through a subsurface geotechnical investigation.

    .1 A completed geotechnical investigation can be found in Appendix G.

    .2 Any soil characteristics outlined in the existing site and tower drawings are considered to be incorrect and are not to be used.

  .2 A foundation design based on “normal” soil conditions is unacceptable.

  .3 The foundation design shall account for loads imparted by the new tower and any other loads that could be reasonably anticipated to affect the foundation. All loads shall be identified on the finalized drawings.

  .4 The drawings shall be signed and stamped by a professional engineer licensed to practice in the province of Ontario.

  .5 The drawings shall include references to all applicable standards. As the Canadian Coast Guard is a federal agency, the Canada labour code and National building code (most recent editions) shall be included.

  .6 The design shall clearly indicate in the notes all loads considered in the design of the foundation.

3.3 Preparation

.1 Preparation shall not commence until bearing surfaces have been verified and approved by a Geotechnical Engineer.

.2 Remove all loose and deleterious material.

.3 Construct forms and reinforcement in accordance with the engineer’s specifications.

.4 Surfaces must be heated as necessary to account for climatic conditions at the time of the pour.

3.4 Placement

.1 Concrete placement shall not commence until formwork and reinforcement have been inspected by Coast Guard.

.2 Contractor shall place finish and cure concrete as per CAN CSA A23.1 making all adjustments necessary to account for climatic conditions anticipated during the curing period.

.3 Concrete shall be placed in one continuous pour.

  .1 The development of cold joints shall be avoided. Alternately, cold joints must be previously approved in writing by CCG.

.4 Finish exposed concrete surfaces to provide a lightly brushed non-skid surface, unless otherwise specified in the submitted design.

.5 All exposed 90° edges shall be chamfered.

.6 Cut control joints where specified.

.7 Contractor shall provide samples as required during placement operation for the performance of quality assurance testing.

.8 Concrete shall be finished so as to slope gently away from the center of the slab. No water shall pond on the finished surface.

3.5 Curing

.1 Shall be undertaken in accordance with CAN CSA A23.1 and the Contractor's approved Construction Plan.

  .1 Curing regiment employed must take into account local climatic conditions reasonably anticipated to occur during the curing period.

3.6 Grout

.1 Supply and install load bearing grout between the top of the completed foundation and the tower base/anchor plate.

.2 Edges of grout shall be chamfered.

3.7 Inspection

.1 Concrete pour(s) to be witnessed by Coast Guard representative. Concrete testing to CAN/CSA-A23.2 by testing laboratory will be coordinated by Coast Guard.

SECTION: 133613 STEEL TOWERS

PART 1 - GENERAL

1.1 Scope of Work

.1 Work under this section includes the supply of all labor, material, and equipment required to complete the following:

  .1 Design, supply and installation of the new 91.5 m [300 ft] guyed tower including all appurtenances. Appurtenances shall include but are not necessarily limited to:

    .1 Supply and install of fall arrest system.

    .2 Design, supply, and install of anti-climb system.

    .3 Supply and install new antennas and associated cabling.

    .4 Supply and install of new obstruction lighting system.

1.2 References

.1 CSA S37-13 - Antenna Towers and Antenna Supporting Structures

.2 CAN/CSA-W47.1 - Certification of Companies for Fusion Welding of Steel Structures

.3 CAN/CSA W59 - Welded Steel Construction (Metal-Arc Welding)

.4 CSA Z259.2.4-15 – Fall Arresters and Vertical Rigid Rails

.5 ASTM A780 / A780M – 09(2015) - Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings

.6 CAN/CSA-G164-M92 (R2003) - Hot Dip Galvanizing of Irregularly Shaped Articles

.7 Canada Labour Code Part II – January 2008

.8 Health and Welfare Canada Limits of Exposure to Radio-Frequency Fields Frequencies from 3 KHz – 300 GHz, Safety Code 6

.9 TC CAR Standard 621.19 - Standards Obstruction Markings

.10 SSPC-SP 1 Solvent Cleaning

.11 SSPC-SP 7/NACE No. 4, Brush-Off Blast Cleaning

.12 Standards and Guidelines for Communication Sites, Motorola, R-56, recent edition

1.3 Submittals

.1 Submittals shall be forwarded to Coast Guard in accordance with the provisions of section 013300.

.2 Tower Design Package

.1 Deadline:

.1 With Design Package.

.2 Deliverables:

.1 Engineering Plans

.1 Engineering plans must contain all details required by these specifications and the information specified in S37-13. The unit system shall be the metric system. The plans must be approved by Coast Guard before proceeding with fabrication or construction.

.2 Engineering plans shall be sealed by a Professional Engineer licensed to practice in the province of Ontario.

.3 Any changes to Engineering Plans must be approved by Coast Guard. Changes will be highlighted on Engineering Plans and an As-Built set of Engineering Plans will be submitted at the conclusion of the project.

.4 Engineering Plans shall contain, at minimum, the following data:

.1 Reference design standard.

.2 All design loads for specified load conditions.

.3 All analysis, calculations, and reactions for foundations, guys, and tower. A capacity profile of tower giving designed % load capacity for tower legs, diagonals, guys, and foundations should also be provided.

.4 Leg diameters for each section, types of connections and typical details.

.5 Details of ice guards, attachments of antennas, anti-climb devices, transmission line placement and all other appurtenances.

.6 Any other information deemed relevant by the Design Engineer

.3 Tower Erection Plan

.1 Deadline:

.1 With Construction Plan (Section 011100)

.2 Deliverables:

        - .1 A construction plan of adequate detail to clearly show Coast Guard that the work will be undertaken in a competent and safe manner. Plan must clearly demonstrate procedures and methods to be employed to:
            - .1 Place new tower on new foundation;
            - .2 Ensure structural integrity during hoisting and guying of incomplete structure;
            - .3 Monitor that Turn of Nut has been completed;
            - .4 Field remedies to address any damage to the coating system incurred during erection;
        - .2 Coast Guard reserves the right to request additional documentation verifying the suitability of the proposed labour and equipment anticipated to be employed in the erection of the tower. Certification required may include:
            - .1 Hoisting equipment type, capacity and associated certification;
            - .2 Stamped drawing for erection plan.
- .4 As-built Drawings / QC Control documentation
    - .1 Deadline:
        - .1 28 calendar days following installation (Section 011100)
    - .2 Deliverables:
        - .1 Red-lined drawings showing all changes from the sealed design drawings (if any).
        - .2 Those documents identified within the following section and any additional documents assembled in accordance with the Contractors established quality control program.

1.4 Guarantee

- .1 The Contractor shall guarantee that all material and workmanship used in the fabrication and construction of the towers is in accordance with all applicable specifications listed in this section.
- .2 For a period of three [3] years from the date of installation, the Contractor shall replace, free of charge, all defective components. A failure of 10% or more of a particular item shall be interpreted as failure in all similar units. All these items shall be replaced by units of a superior design at no cost to Coast Guard.

1.5 Contractor’s Quality Control

- .1 The following activities shall be completed by the contractor at the contractor’s expense as a demonstration that the delivered product is of the quality prescribed within the specification.

.2 Contractor shall provide Steel Mill Test Certificates as outlined in Section 011100 – 1.3.6 of this specification.

.3 Tests for thickness and uniformity of galvanized coating shall be made as considered necessary by Coast Guard. If required, contractor shall pay for testing, all costs to be included in the tender price. Coast Guard reserves the right to request documentation verifying the thickness of galvanization.

.4 Ground resistance testing

1.6 Quality Assurance

.1 Coast Guards minimum inspection requirements are detailed below:

  .1 Throughout tower erection

  .2 Upon completion for the testing of Cables

    .1 The Contractor shall inform the Coast Guard at least three days in advance of the installation of the cables and antennas so that Coast Guard can perform quality checks after the connectors and all supports and grounding kits are in place.

.2 Coast Guard shall supply a qualified person to fully inspect the new tower for compliance with CSA S37-13, before final acceptance of the works.

PART 2 - PRODUCTS

2.1 General

.1 Structural steel must conform to CSA Standard G40.21, Grade 300W, or better. All materials used in the tower is to be new and in conformance with requirements of CSA S37-13.

.2 All mounts, mount hardware, and line hangers shall be heavy-duty hot dip galvanized or stainless steel.

.3 Guys shall be one continuous length Grade 180 Guy Strand for diameters 13mm (1/2 in) and below, or Bridge Strand for diameters greater than 13mm (1/2 in) unless otherwise approved by Coast Guard. Cut ends of strand shall be capped with a stainless steel hose clamp or ear clips. Provide full articulation at each end of guy as per CAN/CSA S37-13 by means of shackles.

.4 Turnbuckles and shackles shall be Crosby or approved equivalent, manufactured from AISI 1035 steel, heat treated, and shall be hot dip galvanized. (Provide locking device for turnbuckle, vinyl coated cable or approved equal.)

.5 Antennas are to have ice guards located at least 2 feet above them of sufficient size to completely shield the antenna from falling ice. Mid-level obstruction lights shall also be protected by ice guards.

.6 Bolts shall be hot-dip galvanized with hexagonal heads and be supplied with hexagonal nuts. The unthreaded part of the bolt shall be long enough for full bearing of the adjoining parts and enough washers shall be placed on each bolt under the nut to prevent the nut from reaching the end of the bolt threads when tightened.

2.2 Fall arrest system

.1 Provide fall arrest system as per drawings provided.

.2 Must be a rail system, cable systems are prohibited.

.3 Rail and trolley must meet all requirements of CSA Z259.2.4-15

  .1 Trylon TSF, Turris Corp., Honeywell Safety Products USA, Inc. or approved equivalent type, complete with trolley.

2.3 Antennas

.1 Three [3] antennas will be supplied by Contractor.

  .1 Sinclair SD214-SF2P2SNM(D00), 4 dipole VHF antenna per data sheet found in Appendix E: Drawings and Data Sheets.

    .1 Mounting locations: as indicated in Appendix D: Antenna and Cable Schedule.

.2 One [1] antenna will be supplied by Coast Guard.

  .1 Cubic AA1301FW DF antenna as per manual included in Appendix E.

    .1 Mounting location: as indicated in Appendix D.

    .2 Mounting instructions are provided in Appendix E.

.3 One [1] antenna will be supplied by the Hamilton Township.

  .1 SD212-SF2P2SNM(D00), 2 dipole VHF antenna per data sheet found in Appendix E.

    .1 Mounting location: as indicated in Appendix D.

  .2 The antenna, cabling, connectors, and grounding kits will be delivered to site by others.

PART 3 - EXECUTION

3.1 Design - General

.1 The 91.5 m (300 ft) tower shall be designed in accordance with CSA S37-13 to support all antennas indicated in Appendix D: Antenna and Cable Schedule. The antennas indicated in Appendix D should be considered to be 85% of the capacity of the tower to allow for future antenna.

.2 The Contractor shall design all tower accessories, including new mounts for all antennas, climbing facility with a fall arrest assembly, anti-climb panels, and ice shields.

.3 All antennas, lines and mounts should be incorporated in the tower design.

.4 The tower shall be designed by a qualified professional engineer registered in Canada, holding a certificate to practice.

.5 The tower shall be designed to resist all loads specified in CAN/CSA S37-13 as well as maximum loads caused by all equipment installed on the tower as described in this document and shown in attached drawings. Site specific wind pressure is to be used as per CAN/CSA S37-13.

.6 Tower design shall account for all Transport Canada requirements for obstruction markings.

.7 Unless otherwise specified, loads shall be determined in accordance with CAN/CSA S37-13 Antennas, Towers and Antenna Supporting Structures, latest edition; reliability Class I.

.8 Tower sections are to be parallel for the length of the structure (no tapered sections may be used).

.9 The bottom section of the tower is to have articulation to the tower base foundation. Tower manufacturer is to supply an unpainted galvanized ‘star mount base’ assembly or other approved structural fitting and a receiving plate mount that attaches to the tower base foundation.

.10 Anchorage steel below grade that is not encased in concrete shall be galvanized and further corrosion protection shall be provided.

.11 Contractor shall submit Engineering Plans outlining materials, dimensions, loading and any other pertinent details for tower construction to Coast Guard for approval prior to fabrication.

.12 The tower design package shall include pulse tables for the new tower. The pulse tables shall be provided at 5°C increments for temperatures ranging between -20°C and 40°C.

3.2 Design – Climbing Apparatus

.1 The tower shall be equipped with a climbing apparatus in compliance with applicable CSA S37-13 requirements.

.2 The climbing apparatus shall provide an unobstructed climbing path and maintain the required climbing clearance radius as per CSA S37-13.

.1 The climbing face shall be selected to avoid all obstructions such as antennas, antenna mounts, lighting, cables and waveguide bridges.

.3 Climbing apparatus configuration, shall comply with CSA S37-13 and Canada Labour Code. Rungs shall be horizontal, have adequate clearance and line up vertically.

3.3 Design – Fall Arrest System

.1 The Contractor shall supply a fall arrest system to meet CSA S37-13 and CSA Z259.2.4-15 requirements.

.2 The fall arrest system shall be free from obstructions for the complete height of the tower.

.3 The fall arrest system shall be supported at spans not more than 1 m, or to meet the manufacturer's instructions.

.4 The fall arrest system shall run up the tower or ladder in a manner to facilitate climbing. The fall arrest rail shall be straight and true to prevent trolley binding.

.5 The extension of the fall arrest system beyond the top of the tower must be structurally supported for the entire height.

.6 Proper manufactured stop hardware is to be installed at the top of the fall arrest rail to prevent accidental dislodging of the trolley from the rail.

.7 The fall arrest system shall be supplied complete with one [1] new trolley that will be turned over directly to the Coast Guard at the completion of the contract.

3.4 Design – Anti Climb Panels

.1 The tower shall include one [1] set of anti-climb panels.

.2 Anti-climb panels must fully enclose the perimeter of the tower. Protection of the ladder assembly only is prohibited.

.3 Each panel shall be no less than 3.05m [10 ft] in height.

.4 The anti-climb shall incorporate a framed, heavy gauge expanded wire mesh cage which shall be bolted flush to the tower face using round headed hardware that cannot be used as a step or hand hold.

.5 The anti-climb panels will have a barrier panel internal to the tower at the top and bottom to prevent access.

.6 The anti-climb shall be hinged on the climbing face.

.7 Operable panels shall be framed, hinged on one vertical side, with a latching mechanism

.8 The anti-climb must be hinged on the climbing face of the tower, and must allow for locking of the panel.

.9 Anti-climb panels shall be included in the design drawings of the tower and shall be galvanized steel or stainless.

3.5 Fabrication

.1 Each tower segment shall be designated with a number that is easily read after galvanizing. This mark shall be stamped into each piece in such a manner, or in such a place, as will not injure or reduce the strength of the piece. The marks on like pieces shall be in the same relative position on each piece. The markings indicated on each piece shall correspond with that shown on the erection drawings.

.2 All members shall be fabricated in accordance with the Engineering Plans and as per CSA S37-13.

.3 All like parts shall be interchangeable. All like parts shall have the same number.

.4 In any bending or reworking of any material, methods employed shall ensure that the physical properties of the material are not impaired.

.5 All welding shall be performed in accordance with CSA Standard W59 latest revision and shall be undertaken by a fabricator approved by the Canadian Welding Bureau to the requirements to CSA Standard W47, latest revision.

.6 Special mounting arrangements shall be incorporated into the tower sections for the secure mounting of:

  .1 All lighting fixtures, junction boxes, and cable supports.

  .2 Fall arrest system extension where it extends above the top of the tower;

  .3 Ground lugs or grounding attachments.

.7 The Contractor shall ensure that electrical continuity exists between all tower sections.

3.6 Galvanizing

.1 All materials, structural steel, pipe and fittings, including bolts, nuts and washers shall be hot dip galvanized to the requirement of CSA S37-13 and CSA-G164 and as otherwise specified therein.

.2 All materials shall be completely fabricated before galvanizing (except the tapping of nuts).

.3 Before galvanizing, the steel shall be thoroughly cleaned of all paint, grease, rust, scale or other materials that will interfere with proper binding of the zinc with the steel.

.4 Tests for thickness and uniformity of coating shall be made as considered necessary by Coast Guard. Tests shall be conducted in full accordance with the requirements of CSA S37-13. If required, contractor shall pay for testing, all costs to be included in the tender price.

.5 The Contractor shall touch up in the field all steel members of the tower where the galvanized finish has been scraped or chipped during erection using zinc-enriched or Galvicon paint, or an approved equal.

.6 Steel members that have a slightly damaged finish shall be given three coats of zinc-enriched paint applied according to the manufacturer's printed instructions.

3.7 Handling of Material and Transportation

.1 The tower and parts are to be built so they may be safely transported to the site from the manufacturer's premises.

.2 Materials shall be handled and stored in the plant and on the job site in such a manner that no damage shall be done to the materials of any existing building or structure.

.3 Special care shall be taken to ensure that galvanizing is not damaged during handling and erection of materials.

.4 Storage of materials on the site will be the responsibility of the Contractor.

3.8 Tower Installation

.1 Prior to site mobilization, Contractor shall submit a Construction Plan detailing construction tasks, methods, and equipment required to complete work to Coast Guard for review. Construction Plan should include methods of completing work, equipment required, as well as hazards and mitigation for hazards for each work task.

.2 The Contractor is to provide the CCG Project Authority with the maximum advance notice of mobilization to coordinate the mobilization of CCG representation to this location.

.3 The contractor shall be responsible to obtain accurate measurements pertaining to elevation differences between the tower base and guy anchors.

.4 The tower shall be erected in a manner that will not bend, scrape, distort, or injure the component parts of the galvanizing.

.5 The Contractor shall be responsible to ensure that no members of the tower are over stressed during erection.

.6 Every failure of the tower sections to join together properly shall be reported to the Coast Guard.

.7 Upon completion of erection, the tower shall be inspected by the Contractor for damage. Any damaged or missing items, including nuts, bolts, etc., shall be replaced. The tightness of all bolts shall be rechecked at this time.

  .1 Any members damaged during erection shall be replaced at the Contractor’s expense.

.8 The Contractor shall be responsible for any damages done to the work of others, or to adjoining structures and property during erection.

.9 The Contractor shall touch up in the field all steel members of the tower where the galvanized finish has been scraped or chipped during erection using zinc-enriched or Galvicon paint, or an approved equal.

.10 The guy tensions shall be adjusted to within +15% and -5% of the stipulated design tensions noted in the design drawings and as per the requirements of CSA S37-13.

.11 The tension calculations shall consider the ambient temperature at the time of adjustment.

.12 Full consideration of anchor location with respect to the tower base must be incorporated into the calculation of correct guy tensions.

.13 The Contractor shall complete final adjustment of vertical alignment and twist and ensure it meets those requirements of CSA S37-13.

.14 Install no-climb sign on the access panel of the lower anti-climb (sign to be provided by Coast Guard).

.15 The Contractor is responsible for installing temporary obstruction lighting in accordance with Transport Canada requirements as required.

3.9 <u>Guys</u>

.1 The top and bottom guy at each anchor location shall be equipped with two 1.82m (6 ft) guy markers installed in front of the guy grounding connections.

.2 Guy markers shall be yellow weather resistant material and vandal resistant.

.3 On each guy, a large U-Bolt clip is to be installed 305 mm (1 ft) in front of the grounding connection and guy markers on each guy to protect the connections from ice damage. Guy markers may be cut into shorter pieces to fit around the ground connections.

.4 Contractor shall balance initial guy tensions by local topography and anchor locations as significant elevation changes are present on the property. See Topographic map in Appendix C: Site Layout & Topography.

3.10 Antennas

.1 Care shall be taken to ensure that no damage is done to any antenna or mounting hardware during removal, storage and handling of any antenna.

.2 Antenna details and mounting locations are provided in Appendix D: Antenna and Cable Schedule.

3.11 Transmission Lines

.1 All transmission lines shall be as indicated in Appendix D: Antenna and Cable Schedule.

.2 All cabling shall be mounted to mounting plates included in the fabrication of the tower. Cabling shall be supported at intervals and with materials as recommended by manufacturer. Support intervals must also meet CSA S37-13 requirements. The cables are to be supported by proper hoisting grips during installation and attached to the tower using clips designed to remove tension from the cables.

  .1 The use of wrap lock/tie wrap devices to secure TX lines or cables is not acceptable.

.3 All lines shall be mounted on the outside of the tower. Location of cabling is to be submitted to the Coast Guard for approval, and shall be represented on the stamped tower drawings

.4 Antennas shall be mounted to the tower leg at the azimuth indicated in Appendix D: Antenna and Cable Schedule.

.5 Cables to antennas 1 to 4 shall run from the CCG equipment building via a new waveguide bridge (see Section 323000) to the antennas. Transmission lines shall be routed through new CommScope 204673-6 6 Port Entrance Panel, 2 x 3 type cable entry panel. Contractor shall provide any materials required for weather proof cable entry.

  .1 Contractor must terminate all antenna cables inside shelter to length determined by Coast Guard.

.6 Cables to antenna 6 shall run from the Hamilton Township's equipment building via new waveguide bridge. Contractor shall provide any materials required for weather proof cable entry.

.7 The cables are to be terminated at the upper end with connectors appropriate for that cable.

.8 The free ends will extend into the equipment buildings/racks and will be terminated by the contractor at a location to be determined by Coast Guard at the time of installation.

.9 Cable and connector types are specified in Appendix D: Antenna and Cable Schedule.

.10 Every effort shall be made to ensure that the external connections are made waterproof using the best commercial practice.

3.12 Warranty

.1 Contractor shall warranty all galvanizing work for a period of not less than three [3] years.

.2 Contractor shall warrant all painted items for three [3] years for 90% coverage.

    .1 For clarity: for a period of three years following installation any damage to the paint from normal environmental conditions prevalent at the site shall be repaired by the Contractor at no cost to the Owner in a manner approved by the Owner

3.13 System Commissioning and Testing

.1 The Contractor shall inform the Coast Guard at least three days in advance of the installation of the cables and antennas so that Coast Guard can perform quality checks after the connectors and all supports and grounding kits are in place.

.2 The contractor shall allow for a half day (approximately 4 hours) commissioning time period by Coast Guard and must be prepared for any on tower rework which may arise from the testing task.

.3 DF Antenna Cutover

    .1 Contractor shall remove DF antenna from existing tower and install on the new tower in the same day. Coast Guard staff will then test the system for proper operation and commission its use on the new tower.

.4 The Contractor shall be prepared for any on tower rework which may arise from the testing task.

SECTION: 260527 GROUNDING

PART 1 - GENERAL

1.1 Scope of Work

.1 Work under this section includes the supply of all labor, material, and equipment required to complete the following:

  .1 Installation of ground system comprising: copper-clad steel ground rods, bonding and conductors. Conductors shall be exothermic (cad weld) or irreversible mechanical compression lugs.

  .2 Installation of Corrosion Protection in accordance with CSA S37-13 each guy anchor.

  .3 Supply and installation of new Ground Bus Bars.

1.2 References

.1 Canada Labour Code Part II – January 2008

.2 Ontario Occupational Health and Safety Act and Regulations for Construction Projects – 2011

.3 National Building Code of Canada – 2015

.4 CAN/CSA S37-13 Antennas, Towers, and Antenna-Supporting Structures

.5 CAN/CSA C22.1-15 Canadian Electrical Code

.6 Motorola R56 – Standards and Guidelines for Communication Sites

.7 Ontario Provincial Standard Specification – OPSS 1010 Material Specification for Aggregates – Base, Sub-base, Select Sub-grade, and Backfill Material

.8 Ontario Provincial Standard Specification – OPSS 1004 Material Specification for Aggregates – Miscellaneous

1.3 Disposal of Wastes

.1 All excess materials shall be disposed of in a legal manner by Contractor.

1.4 Submittals

.1 Submittals shall be forwarded to Coast Guard in accordance with the provisions of section 013300.

.2 Grounding Plan

  .1 Deadline

        - .1 With Construction Plan
    - .2 Deliverables
        - .1 Drawings detailing the installation of the grounding system.

1.5 Existing conditions

- .1 The existing grounding shall be reused.
    - .1 The new tower grounding system shall be connected to the existing system
    - .2 Care must be taken to minimize the number of breaks created in the existing grounding system during excavation and foundation removal operations.
- .2 Before commencing work under this section the Contractor must establish the location of all buried services which may interfere with the execution of the work.

PART 2 - PRODUCTS

2.1 Materials

- .1 Ground rods shall be 19mm (3/4 in) diameter copper-clad steel, 3 m (10 ft) in length.
- .2 Buried ground cable shall be 4/0 AWG stranded tinned copper conductor.
- .3 Exposed ground cable shall be ½” galvanized aircraft cable.
- .4 Ground cable/rod connections shall be made with exothermic connectors.
- .5 Cathodic protection that meets requirements of CSA S37-13.

2.2 Quality Control

- .1 Grounding work shall be undertaken to industry standards for Telecommunication Tower Sites and any deviation from these industry standards shall be made known to Coast Guard.

2.3 Ground Bus Bar

- .1 Harger Custom Entrance Panel available from Alliance Corporation in Mississauga, ON.
    - .1 Part # EPK6CCG as shown in the drawings provided in Appendix I: Ground Bus Bars.

PART 3 - EXECUTION

3.1 General

- .1 Contractor shall field verify all dimensions and details before proceeding with work.

.2 Safeguard existing antennas, transmission lines, and other tower attachments, as well as the tower members and connections; do not alter or otherwise impair the performance of any of these items during the course of work without written approval of Coast Guard.

.3 Ensure existing tower, guy anchors, buildings, generator, and fencing are not disturbed by excavation and backfill activities.

.4 Any areas requiring excavation shall be investigated by Contractor to ensure they are free of any underground utilities. If the location of underground utilities interferes with the installation of grounding system, notify Coast Guard.

.5 In areas where topsoil is present, strip 152 mm (6 in) topsoil and stockpile. Upon completion of backfilling, spread topsoil evenly over affected areas.

3.2 Site Grounding Installation

.1 Approximate locations and quantities of ground rods are indicated in Appendix E: Drawings & Data Sheets. Contractor shall field verify all ground rod and cable installation locations to ensure there is sufficient access for drilling/excavation equipment.

.2 All ground cables will be buried 610 mm (24 in) below grade.

.3 All trenches shall be backfilled to 152 mm (6 in) below grade with imported Granular 'A' fill. Backfill in 6 inch lifts and compact to 95% standard proctor.

  .1 Top 152 mm (6 in) of backfill in compound area shall be 19 mm (5/8 in) clear stone.

  .2 Top 152 mm (6 in) of backfill in non-compound, areas shall be stripped topsoil. Import additional topsoil as required.

3.3 Tower Grounding Ring

.1 Supply and install three [3] ground rods 120° apart in a 2 m (6.5 ft) diameter ring around the new tower base.

.2 Supply and install 4/0 AWG tinned copper cable in a 2 m (6.5 ft) diameter loop. Connect cable to the ground rods using satisfactory connections.

.3 Supply and install three [3] lengths of aircraft cable from exothermic welded connections to each leg of new tower.

.4 Connect tower ground ring to existing radials and building ground loop with 4/0 AWG tinned copper cable.

3.4 Site Grounding Installation – Guy Anchor Ground

.1 Supply and install one [1] ground rod approximately underneath the guy grounding connections. Supply and install a 4/0 AWG tinned copper cable from the ground rod to the guy cable.

  .1 Ground rod connection should be exothermic, while guy connection should be connected via an appropriate Burndy KSU tinned-copper connector or equivalent.

  .2 Ensure wire does not touch guy grip, and that cable is routed with minimal bends.

.2 Supply and install two [2] additional ground rods 6 m (20 ft) beyond tower guy anchor, forming a 'V' as per Appendix E: Drawings & Data Sheets.

.3 Supply and install 4/0 AWG tinned copper cable, connecting the three ground rods at each guy using exothermic welded connections.

3.5 Site Grounding Installation - Waveguide Ground

.1 Supply and install 4/0 AWG tinned copper cable from two new waveguide piers to existing ground system.

3.6 Site Grounding Installation – Cable Entry Port Grounding

.1 Supply and install 4/0 AWG tinned copper cable from new data entry port to existing ground system.

3.7 Ground Bus Bar

.1 Install Ground Bus Bars as per manufacturer instructions as well as per guidelines provided in Appendix I: Ground Bus Bar

3.8 Cathodic Protection

.1 Guy anchors are to have corrosion protection installed as per CSA S37-13 requirements.

.2 Should cathodic protection be used for this portion of the work, the sacrificial anode shall be buried in the vicinity of the guy anchor and must rest below the frost line.

SECTION: 265536 OBSTRUCTION LIGHTING

PART 1 - GENERAL

1.1 Scope of Work

.1 Work under this section includes the supply of all labor, material, and equipment required to complete the following:

  .1 The supply and install new obstruction lighting system c/w lighting controller.

  .2 The removal of existing obstruction lighting and lighting controller.

1.2 References

.1 The most recent publication or edition of any document referenced in this specification should be used unless the referencing clause states that this clause does not apply.

.2 Work under this section shall be undertaken in strict conformance with all listed references. In the case of any conflict or discrepancy the more stringent requirements shall apply.

.3 CSA S37-13 - Antenna Towers and Antenna Supporting Structures

.4 Canada Labour Code Part II

.5 TC CAR Standard 621.19 - Standards Obstruction Markings

.6 National Building Code of Canada – 2010

.7 Ontario Occupational Health and Safety Act and Regulations for Construction Projects

1.3 Submittals

.1 As built drawings of lighting system.

PART 2 - MATERIALS

2.1 General

.1 The tower is to be lit as per Chapter 8 of TC Cars 621.19 requirements: Dual Red/White Medium Intensity System, Configuration “E”

.2 Main system components, available from RVA Lighting & Masts Inc.:

  .1 RVA LS9-E1-120 (D1RW-C13-009 White/Red LED Beacon w/controller & photocell)

  .2 Dialight RTO-6R07-002 Red LED DOLs at tower mid-point

  .3 RVA WK9-E1-LED Wiring Kit (Teck connectors, fittings, small JBs)

.4 TC-814 Teck 90 Cable, 8C #14 (for beacon)

.5 TC-214 Teck 90 Cable, 2C #14 (for DOLs)

.6 TC-314 Teck 90 Cable 3C #14 (for photocell)

.3 Cable fittings shall be water-tight and designed specifically for use with Teck 90 cables.

.4 Substitution for above specified materials is not permitted.

PART 3 - EXECUTION

3.1 Lights

.1 Contractor shall provide drawings and schematics indicating all elements of the system to Coast Guard for approval. Contractor shall also supply a Maintenance and Operations manual for lighting system.

.2 A complete spares package to replace any component in the control panel shall be supplied, as well as a spare light sensor.

.3 Install one [1] combined CL-865/CL-864 top-mount flashing light.

.4 Install two [2] dual CL-810 mid-level lights.

3.2 Controller

.1 Install one [1] RVA lighting controller.

.2 Remove and salvage existing lighting controller.

3.3 Photocell

.1 The contractor shall route the photocell through the new cable entry port to the new CCG waveguide bridge, after construction of the new tower and waveguide bridge.

3.4 Installation Details

.1 The lighting system power cables shall have a junction box with a drip loop on the tower just above the Waveguide Bridge junction. The junction box shall have a screened end drip tube on the bottom.

.2 The power to the top of the tower shall come from the top of the box. It shall also have a serviceable drip loop.

.3 Every effort shall be made to ensure that the external connections are made waterproof using the best practices.

.4 All junction boxes shall have drip loops on all the cables in and out of the box.

.5 All junction boxes shall have screened end drain tubes on the bottom.

.6 All lighting cables are to have an individual drip box and drip loop installed just above the Waveguide Bridge except for the photocell circuit which can be one continuous length of cable.

.7 All cables shall be mounted on the outside of the tower. Location of cabling is to be submitted to the Coast Guard for approval.

.8 All cabling shall be mounted to mounting plates included in the fabrication of the tower. Cabling shall be supported at intervals and with materials as recommended by manufacturer. Support intervals must also meet CSA S37-13 requirements. The cables are to be supported by proper hoisting grips during installation and attached to the tower using clips designed to remove tension from the cables.

  .1 The use of wrap lock/tie wrap devices to secure TX lines or cables is not acceptable.

3.5 <u>System Commissioning and Testing</u>

.1 The Contractor shall inform the Coast Guard at least three days in advance of the installation of lighting system so that Coast Guard can prepare to oversee the installation.

.2 Coast Guard staff will supply power to the lighting controller panel and connect the alarm outputs from the lighting controller panel to the Coast Guard alarm communication system. Coast Guard staff will test the monitoring and alarm system and accept the system on site as operational.

.3 The contractor shall allow for a half day (approximately 4 hours) commissioning time period by Coast Guard and must be prepared for any on tower rework which may arise from the testing task.

SECTION: 312310 EXCAVATION AND BACKFILL

PART 1 - GENERAL

1.1 Scope

.1 Work of this section consists of the excavations for the new guyed tower foundation, waveguide bridge posts and guy anchor locations.

1.2 References

.1 Canada Labour Code Part II – January 2008

.2 CSA-S37-13 - Antenna Towers and Antenna Supporting Structures

.3 Ontario Occupational Health and Safety Act and Regulations for Construction Projects – 2011

.4 Ontario Provincial Standard Specification – OPSS 1010 Material Specification for Aggregates – Base, Subbase, Select Subgrade, and Backfill Material

.5 Ontario Provincial Standard Specification – OPSS 1004 Material Specification for Aggregates – Miscellaneous

PART 2 - MATERIALS

2.1 Not used.

PART 3 - EXECUTION

3.1 Excavation

.1 Excavation for tower foundation and anchors shall be undertaken as per engineering plans submitted by Contractor.

.2 Keep excavations free of water while work is in progress.

3.2 Backfill

.1 Backfill for tower foundation and anchors shall be undertaken as per engineering plans submitted by Contractor.

SECTION: 323000 SITE IMPROVEMENTS

PART 1 - GENERAL

1.1 Scope

.1 Work under this section includes the supply of all labor, material, and equipment required to complete the following:

 .1 The design, fabrication, supply and installation of miscellaneous site structures such as guy anchor bollards;

 .2 The supply and installation of a new cable entry panel;

  .1 The existing cable entry panel shall be made water tight after discontinuing its use.

 .3 The repair or replacement of Coast Guard equipment or property damaged by Contractor during fieldwork.

  .1 The need to repair or replace any equipment or property shall be determined by Coast Guard representative.

1.2 References

.1 CSA-S37-13 - Antenna Towers and Antenna Supporting Structures

.2 CAN/CSA-W47.1 - Certification of Companies for Fusion Welding of Steel Structures

.3 CAN/CSA W59 - Welded Steel Construction (Metal-Arc Welding)

.4 Canada Labour Code Part II – January 2008

.5 Ontario Occupational Health and Safety Act and Regulations for Construction Projects – 2011

.6 National Building Code of Canada – 2015

PART 2 - MATERIALS

2.1 Bollards

.1 The bollards are to be comprised of 150mm (6 in) diameter galvanized steel pipe, 3.05 m (10 ft) in length. This shall be imbedded in a 1.8 m (6 ft) long 457mm (18 in) diameter concrete filled sono tube.

.2 The galvanized pipes are to be top filled with concrete to provide a crown. The bollard, including cement and pipe, is to be painted international orange or hazard yellow.

2.2 Landscaping

.1 Top 152 mm (6 in) of backfill in gravel covered areas shall be 19 mm (5/8 in) clear stone.

.2 Top 152 mm (6 in) of backfill in grass covered areas shall be stripped topsoil. Import additional topsoil as required.

PART 3 - EXECUTION

3.1 Bollards

.1 At each guy anchor, there shall be three (3) bollards installed.

  .1 The bollards are to be located on each side of the anchor and one at the end of the anchor on the side opposite to the direction of the guy, so as to best protect the guy anchor and tie plate from being struck.

.2 Bollards are to be installed as specified in Contractor's Final Design Package

3.2 Waveguide Bridges

.1 The waveguide bridges shall provide support for cabling and complete protection for the antenna, ground, and power cabling running from the Coast Guard shelter and from the Township shelter. In addition, the waveguide bridges shall provide easy access to all cables they protect.

.2 Maximum spacing between waveguide bridge posts shall be 3.05 m (10 ft).

.3 The waveguide bridges must be independent of and not directly connected to the tower structure or building. The waveguide bridges shall be designed to carry all initial and proposed cables or conduits as indicated on the antenna and transmission line schedule. The waveguide bridges shall support the cables at intervals to prevent sagging and to meet the manufacturer's standards.

.4 Waveguide protection should incorporate a peaked, sloped or horizontal roof of solid plate construction located above the standard channel support for the cables and conduit.

.5 The Contractor shall provide suitable adjustable plate extensions to the Waveguide Bridges to protect the lines between the buildings and the tower. These plates must taper to the full width of the building cable entrances and the tower.

.6 Design, supply, and install waveguide bridges from the existing Coast Guard equipment building to the new tower and from the Township shelter to the new tower as per the drawings in Appendix E. Waveguide bridges shall support all lighting cables, as well as cables for the antennas. See Appendix A for photos of existing waveguide bridge.

3.3 Cable Entrance Panel

.1 Install cable entrance panel (CommScope 204673-6 6 Port Entrance Panel, 2 x 3) on the inside and outside of the CCG equipment shelter in location specified in Appendix E. Installation is to meet manufacturer's standards.

.2 Modify flashing to ensure weather and moisture resistance.

.3 Supply and install appropriate cap and boot assemblies for specified cables

.4 After removing the existing tower, the existing entrance panel is to remain accessible but must be sealed to ensure weather and moisture resistance.

APPENDIX A: SITE LOCATION AND PHOTOGRAPHS

Figure 1: Project Site
Cobourg MCTS Site
TX: 44° 03'59.78"N, 78° 12'41.55"W

Figure 2: Cobourg MCTS Site

Figure 3: Cobourg MCTS Tower

Figure 4: Cobourg MCTS Shelter

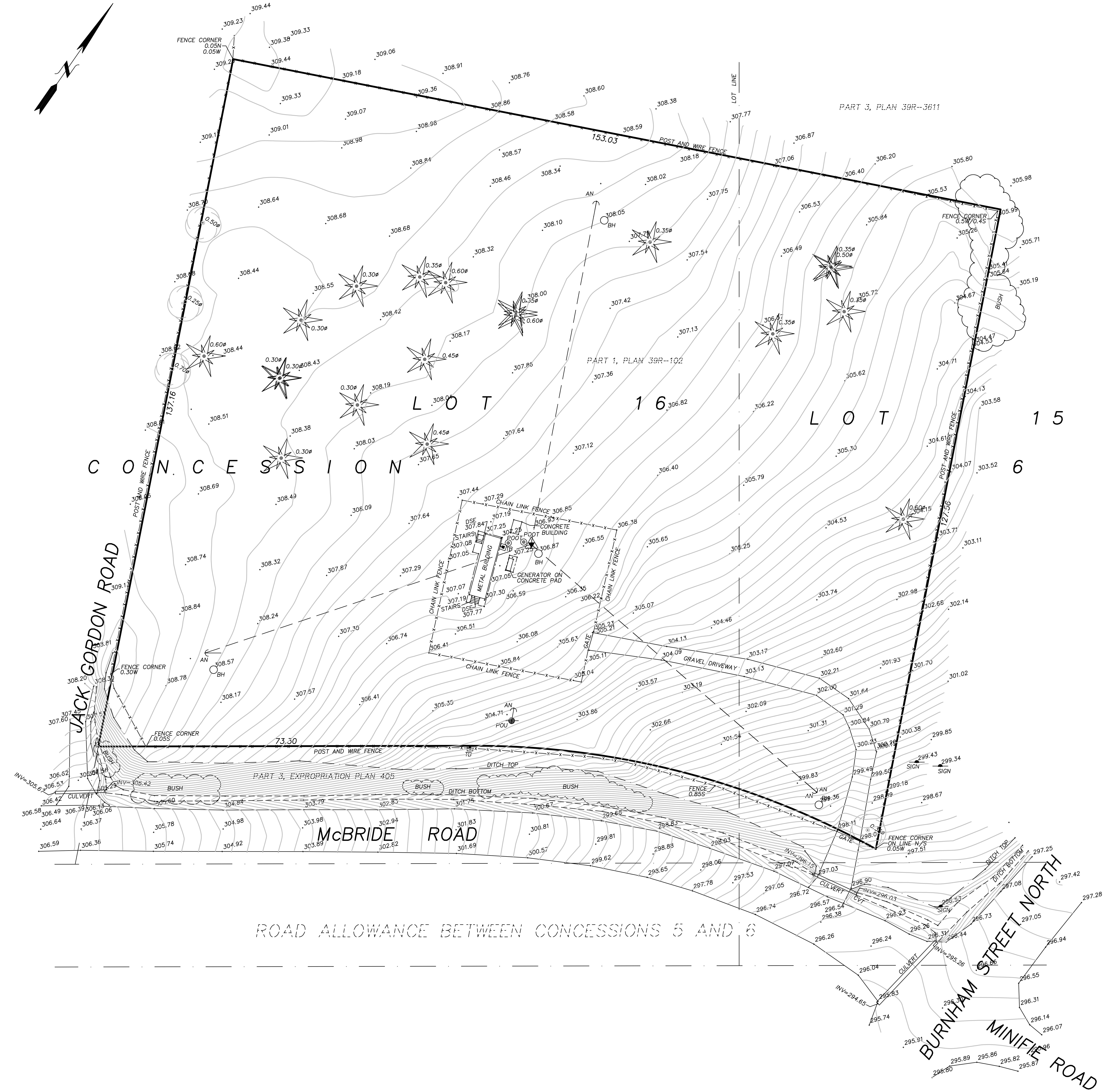
Figure 5: Cobourg MCTS Compound

APPENDIX B: SUMMARY OF SUBMITTALS

Following Contract Award

Deadline	Submission Description	*Section(s)*
10 working days following award	Detailed schedule	*011100 – 1.3.2*
	Proof of CWB div. 2 certification of fabrication shop	*011100 – 1.3.3*
	Listing of all subcontractors	*011100 – 1.4.2.5*
October 31, 2017	Design Package	
	a) Foundation Design Package	*033000 – 1.4.1.1*
	b) Tower Design Package	*133613 – 1.3.2*
10 working days prior to beginning fabrication	Construction Plan	
	a) Project Specific Safety Program	*013530 – 1.3.1*
	b) Project Environmental Protection Plan	*013543 – 1.3.1*
	c) Detailed Demolition Plan	*024116 – 1.3.1*
	d) Grounding Plan	*260527 – 1.4.2*
	e) Foundation Construction Plan	*033000 – 1.4.1.2*
	f) Tower Erection Plan	*133613 – 1.3.3*
28 calendar days after construction	As-built and QA/QC documents	*033000 & 133613*
Upon Coast Guard request	Mill Test Certificates	*011100 – 1.3.6*
	Product specifications and/or samples	*016100 – 1.5*
	Copies of certified receipts from the disposal sites	*024116 – 1.3.3*

APPENDIX C: SITE LAYOUT & TOPOGRAPHY



KEY PLAN – NOT TO SCALE

TOPOGRAPHIC DETAIL OF
McBRIDE ROAD & BURNHAM STREET NORTH
TOWNSHIP OF HAMILTON
COUNTY OF NORTHUMBERLAND

SCALE 1 : 500 METRES
0 1 2 3 4 5 10 20
IVAN B. WALLACE O.L.S. LTD.

LEGEND

DSE	denotes Door Sill Elevation
⟵ AN	denotes Anchor Point
◎ POOT	denotes Other Pole
□ TB	denotes Terminal Box
●	denotes Sign
✳ 0.10ø	denotes Coniferous Tree w/Trunk Diameter
○ 0.10ø	denotes Deciduous Tree w/Trunk Diameter
× 123.45	denotes Spot Elevation
SAPLING	denotes Deciduous Sapling
SAPLING	denotes Coniferous Sapling
○ BH	denotes Borehole Elevation at Ground

CAUTION

This is not a plan of survey and shall not be used except for the purpose indicated in the title block.

CONTOURS

Contours shown hereon are drawn at 0.20 metre intervals.

DISTANCE NOTES – METRIC

Distances are in metres and can be converted to feet by dividing by 0.3048.

ELEVATIONS

Elevations are geodetic and referred to the Canadian Geodetic Vertical Datum (CGVD28) by direct measurement to a Real Time Network.

IBW
SURVEYORS

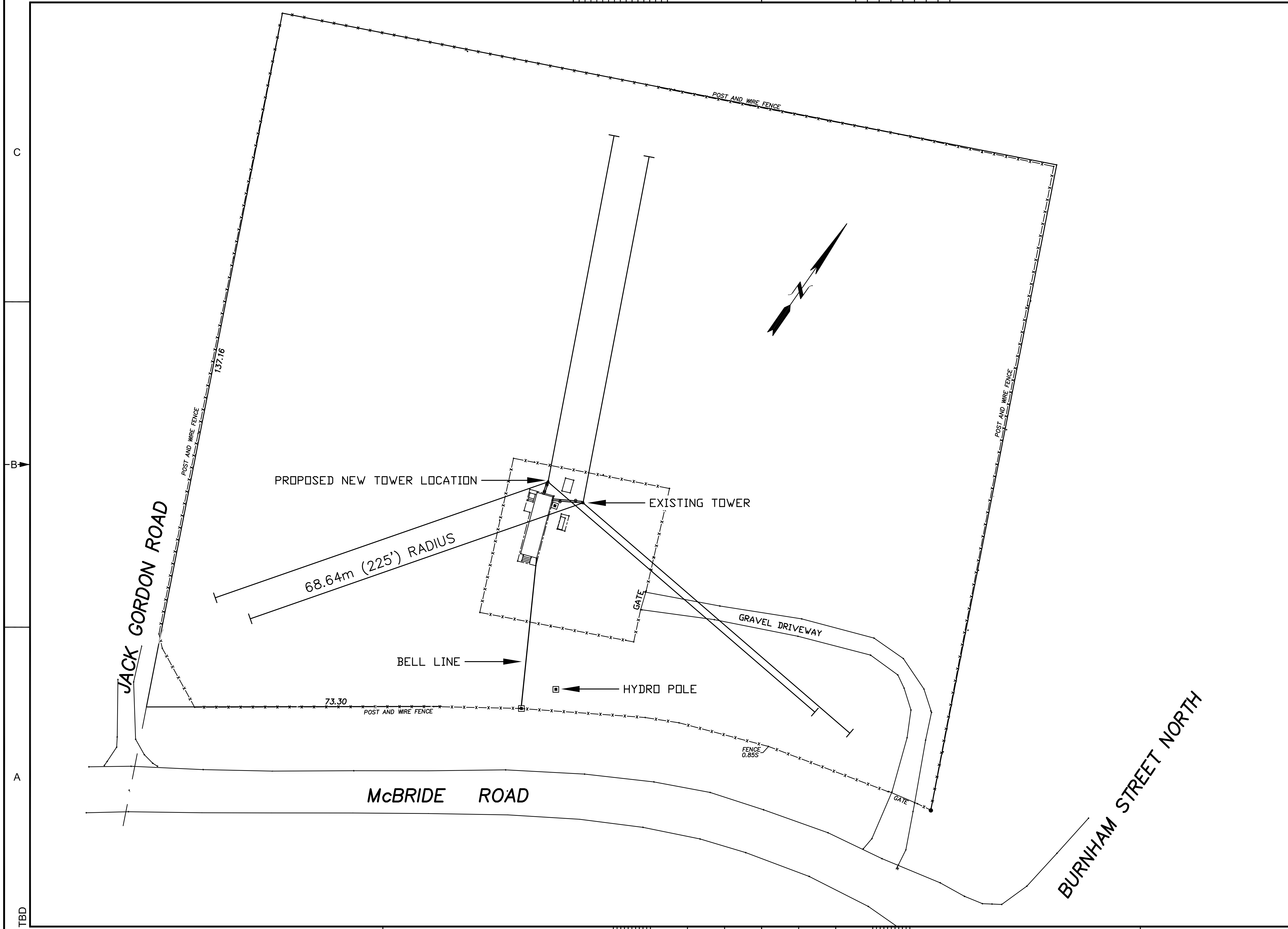
71 Mearns Court, Bowmanville, Ontario, L1C 4N4 | ibwsurveyors.com | 1.800.667.0696

PARTY CHIEF: RB	DRAWN BY: DGC	CHECKED BY: CC	PLOT DATE: JAN. 31, 2017
FILE NAME: 4-4752_TOPO		copies available at LandSurveyRecords.com	

rev.	Date	Initials	Remarks	rev.	Date	Initials	Remarks	rev.	Date	Initials	Remarks
1	2017.01.23	DGC	DRAFT TOPO	1	yyyy.mm.dd	*	*	1	yyyy.mm.dd	*	*

CAD PRODUCED DRAWING
PRODUIT PAR DAO

REPORT ANY ERRORS OR OMISSIONS TO ILS MANAGER
SIGNALER LES ERREURS OU LES OMISSIONS AU GESTIONNAIRE SLI



Fisheries and Oceans Canada
Pêches et Océans Canada
Canadian Coast Guard
Garde côtière Canadienne

Vendor / Sous-traitant

0	DESCRIPTION	BY	yyyy-mm-dd
rev	description	by par	date

Asset - Actif

COBOURG MCTS
TOWER REPLACEMENT

Drawing - Dessin

PLOT PLAN

designed - conception date
YYYY-MM-DD

drawn - dessiné date
LL 2017-06-13

checked - vérifié date

approved - approuvé date

CCG ref. no. - no. réf. GCC
EWT 8055-450

scale - échelle
NTS

drawing no. - no. dessin
TBD

sheet-feuille
01/01

rev
0

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ANSI B

APPENDIX D: ANTENNA AND CABLE SCHEDULE

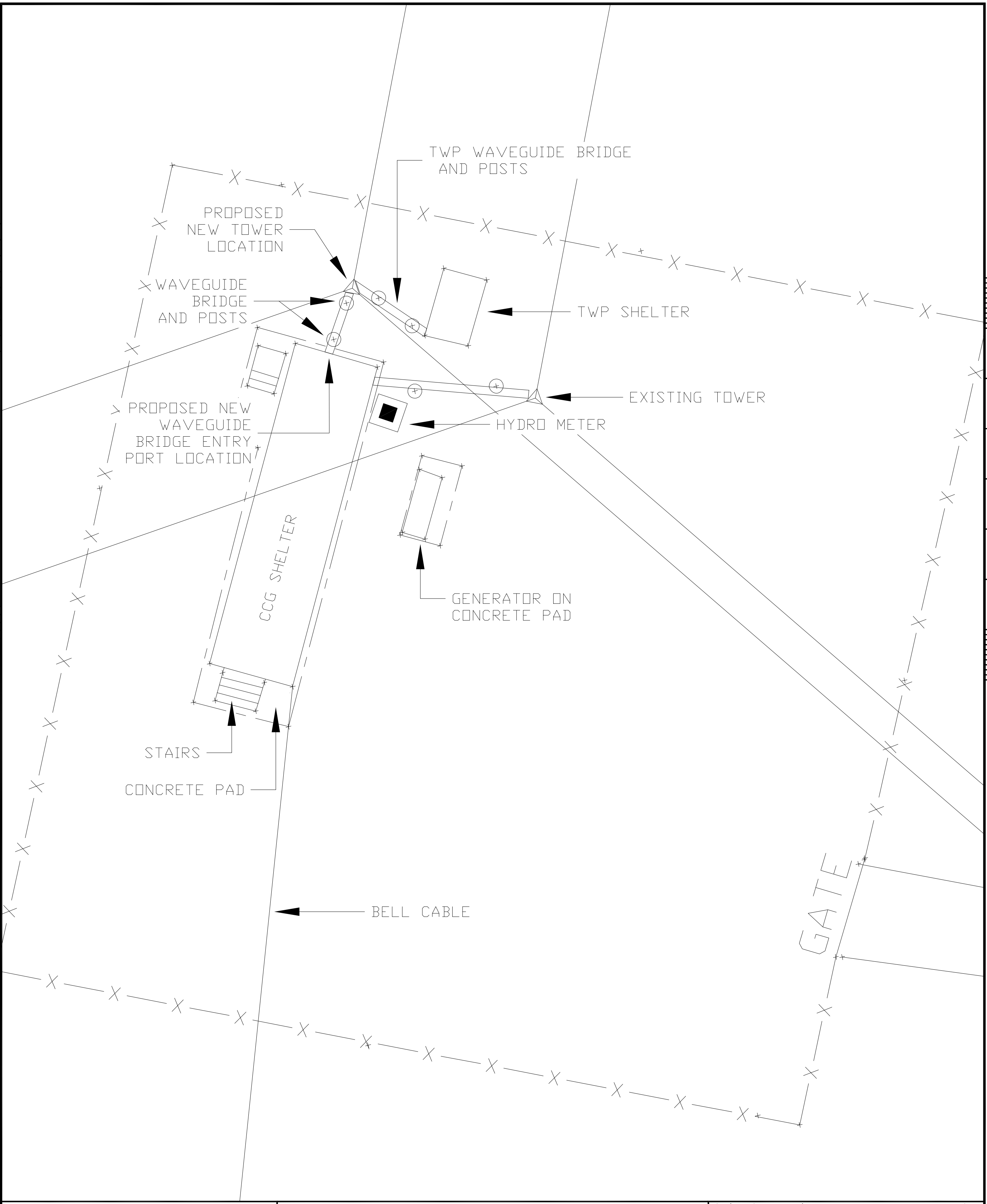
SCHEDULE - ANTENNA AND TRANSMISSION LINES

ELEMENT / ANTENNA	OWNER	DESCRIPTION	CURRENT ELEVATION	PROPOSED ELEVATION	AZIMUTH	EXISTING TX LINE	REQUIRED TX LINE	CONNECTOR	SERVICE REQUIRED
1	CCG	1301FW (1)	96.5 m (316 ft)	96.5 m (316 ft)	OMNI	LDF7-50A (1)	AVA5-50FX	Type N	Remove antenna from existing tower; Install on new tower;
						-	8 conductor #20awg c/w outer shield	Amphenol PT06W-16-8S	
2	CCG	SD214-SF2P2SNM(D00)	87.6 m (287 ft)	88 m (289 ft)	160°	LDF4 Jumpers (3)	AVA5-50FX	Type N	Supply new antenna and install on new tower; Remove existing from old tower and salvage to Coast Guard.
3	CCG	SD214-SF2P2SNM(D00)	76.8 m (252 ft)	76.8 m (252 ft)	160°	LDF5-50A (1)	AVA5-50FX	Type N	See Antenna 2
4	CCG	SD214-SF2P2SNM(D00)	54 m (210 ft)	64.6 m (212 ft)	160°	LDF5-50A (1)	AVA5-50FX	Type N	See Antenna 2
5	CCG	SD214-SF2P2SNM(D00)	-	56.4 m (185 ft)	160°	-	AVA5-50FX	-	Include in design for future installation.
6	Hamilton Township	SD212-SF2P2SNM(D00)	47.9 m (157 ft)	47.9 m (157 ft)	10°	AVA5-50FX	AVA5-50FX	Type N Male and Type N Female	Antenna, cabling, connectors and grounding kits to be supplied and delivered by others; Contractor to install on new tower; Remove and dispose of existing from old tower.
7	Hamilton Township	PBE-M5-400	-	25 m (82 ft)	219.3°	-	Shielded Ethernet Cable	TBD	Include in design for future installation.
8	Hamilton Township	PBE-M5-400	-	30 m (98.4 ft)	166°	-	Shielded Ethernet Cable	TBD	Include in design for future installation.
A	CCG	Flashing Beacon	91.5 m (300 ft)	91.5 m (300 ft)	N/A	TECK 90	TECK 90	-	Supply new and install on new tower; Remove existing from old tower and salvage to Coast Guard.
B	CCG	Dual Obstruction Lights (2)	45.6 m (150 ft)	45.6 m (150 ft)	N/A	TECK 90	TECK 90	-	See Flashing Beacon

APPENDIX E: DRAWINGS & DATA SHEETS

CAD PRODUCED DRAWING / PRODUIT PAR DAO

REPORT ANY ERRORS OR OMISSIONS TO ILS MANAGER / SIGNALER LES ERREURS OU LES OMISSIONS AU GESTIONNAIRE SLI



Fisheries and Oceans Canada
Pêches et Océans Canada
Canadian Coast Guard
Garde côtière Canadienne

Asset - Actif

COBOURG MCTS
TOWER REPLACEMENT

Drawing - Dessin

PROPOSED TOWER LOCATION

designed - conception: LL
date: 2017-06-13

approved - approuvé
date

CCG ref. no. - no. réf. GCC: EWT 8055-450

scale - échelle: NTS

drawing no. - no. dessin: TBD

sheet-feuille: 01/01

rev: 0

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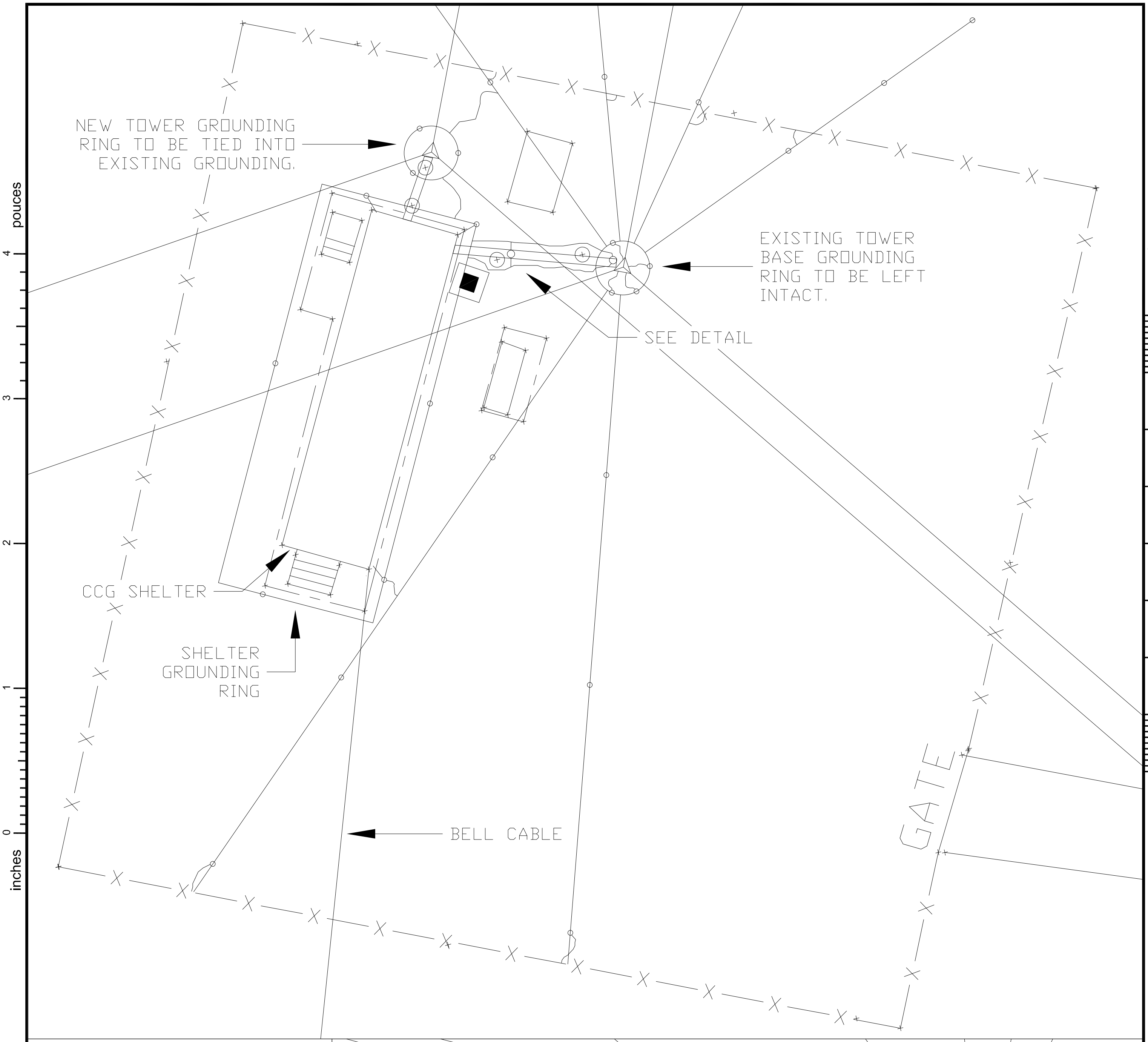

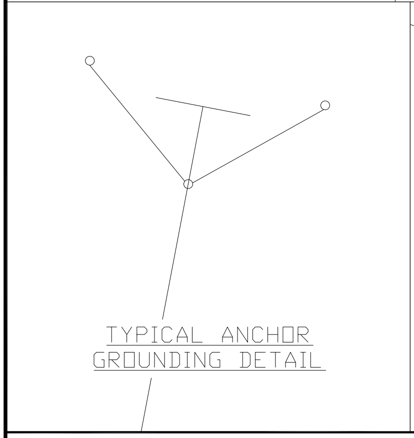

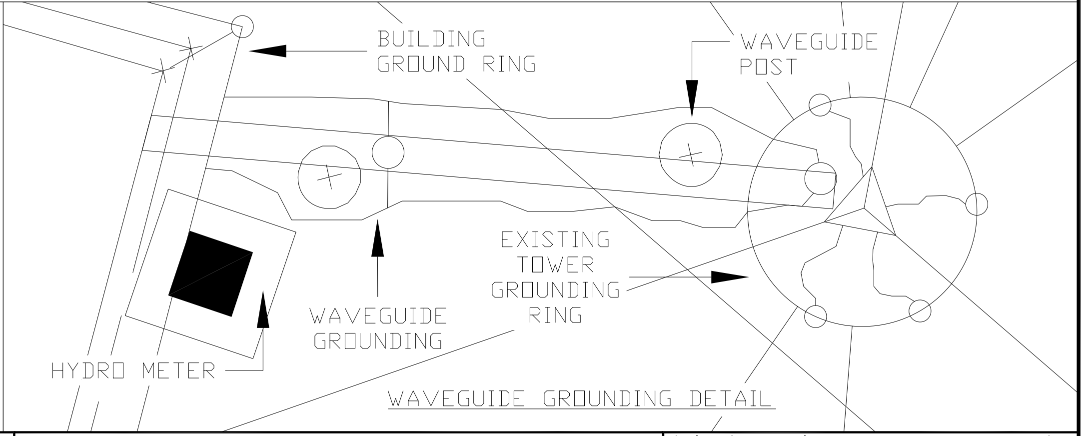

Fisheries and Oceans Canada
Pêches et Océans Canada
Canadian Coast Guard
Garde côtière Canadienne

CCG ref. no. - no. réf. GCC	EWT 8055-450
scale - échelle	NTS
Asset - Actif	COBOURG MCTS TOWER REPLACEMENT
Drawing - Dessin	GROUNDING
designed - conception	LL
date	2017-06-13
approved - approuvé	
date	
drawing no. - no. dessin	TBD
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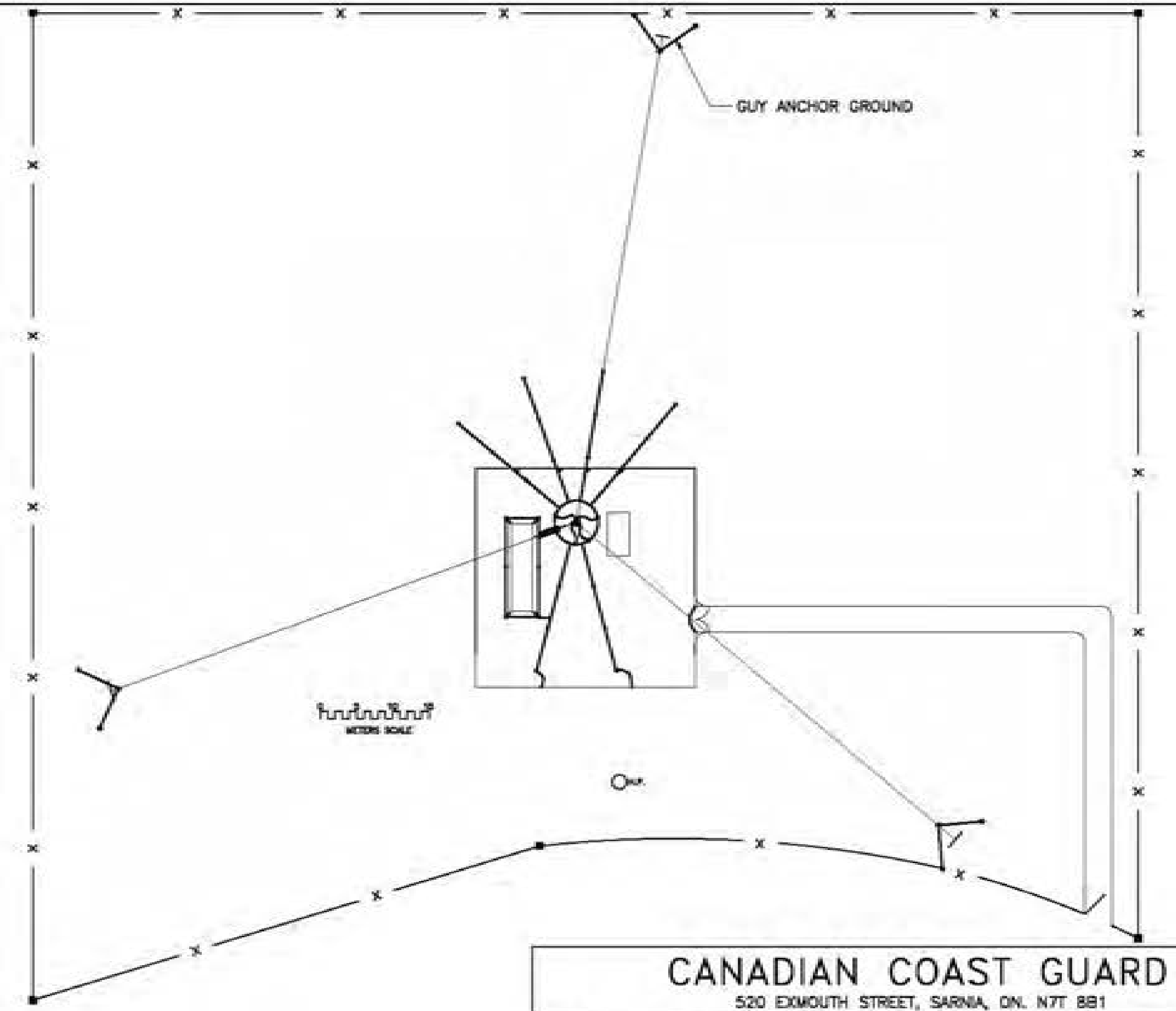


CANADIAN COAST GUARD

520 EXMOUTH STREET, SARNIA, ON. N7T 8B1

FILE NO. EWT
8055-450-1

DWGS MAY NOT BE DUPLICATED OR DISCLOSED WITHOUT WRITTEN CONSENT FROM CANADIAN COAST GUARD

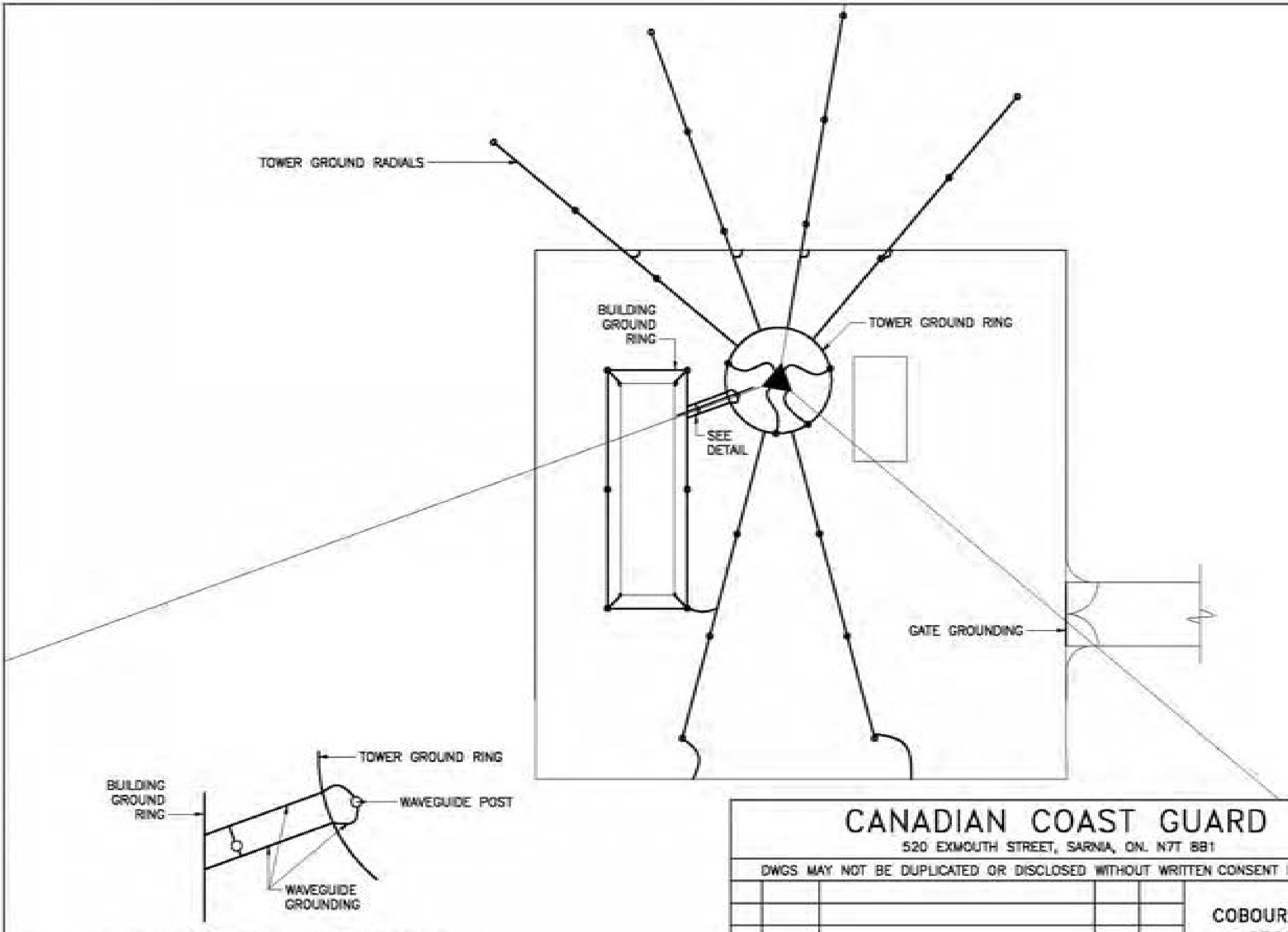
COBOURG MCTS SITE LAYOUT
GROUNDING LAYOUT

ISS.	DATE	DESCRIPTION	DRWN	APP'D
0	02-14-07	DRAWING INITIATED.	R.C.S.	

SCALE N.T.S.

DWG NO. SK-01

ISSUE 1



WAVEGUIDE GROUNDING DETAIL

SCALE N.T.S.

CANADIAN COAST GUARD

520 EXMOUTH STREET, SARNIA, ON. N7T 8B1

FILE NO. EWT
8055-450-2

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COBOURG MCTS COMPOUND GROUNDING LAYOUT

ISS.	DATE	DESCRIPTION	DRWN	APP'D
0	02-14-07	DRAWING INITIATED.	R.C.S.	

SCALE N.T.S.
DWG NO. SK-02
ISSUE 1

SD214-SF2P2SNM(D00) 4 dipole, 8.0 dBd, bi-directional, N-Male, 138-174 MHz

- Covers the entire 138-174 MHz frequency range
- 8.0 dBd gain with bi-directional pattern
- 300 Watts power handling
- Can be top or side mounted (Universal Mount)

Recommend SMK-125-A3 or SMK-125-A7 for Offset Side Mount.
Available from Sinclair separately.

The SD214 series is a rugged 4-bay exposed dipole antenna designed for applications where moderate gain is required. These premium-quality antennas are well suited to public safety applications.

The design of these antennas provides for coverage between 118 to 225 MHz in 3 sub bands, 118-138 MHz for civil aviation applications, 138-174 MHz for private mobile networks, public safety, and 220-225 MHz for transportation networks.

The standard connector offered is an N-type male.

Electrical Specifications

Frequency Range	MHz	138 to 174
Connector		N-Male
Gain (nominal)	dBd (dBi)	8 (10.1)
Input VSWR (max)		1.5:1
Polarization		vertical
Impedance	Ω	50
Pattern		Bi-directional
Vertical beamwidth (typ)	degrees	17
Average Power Input (max)	W	300
Lightning protection		DC ground
Electrical tilt (available)		0,2,4,6, or 8 degrees

Mechanical Specifications

Depth	in (mm)	4 (102)	
Length/ Height	in (mm)	240 (6096)	
Width	in (mm)	42.5 (1080)	
Base pipe diameter	in (mm)	2.38 (60)	
Radiating element material		aluminum	
Base pipe material		aluminum	
Weight	lbs (kg)	54 (24.52)	
Mounting Hardware (Optional)		Clamp005, Clamp015, or Clamp130	*1
Actual Shipping weight	lbs (kg)	93 (42.22)	
Shipping dimensions	in (mm)	247x48x6 (6274x1219x152)	
Mounting configurations		Universal Mount	
Recommended For Offset Side Mount:		SMK-125-A3 or SMK-125-A7	

Environmental Specifications

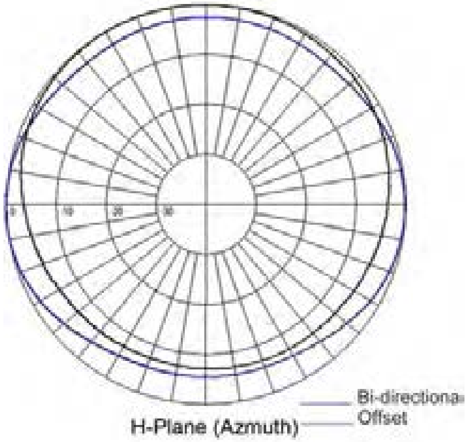
Temperature range	°F (°C)	-40 to +140 (-40 to +60)
Wind Loading Area (Flat Plate Equivalent)	ft² (m²)	3.86 (0.36)
Wind Loading Area (1/2" ice)	ft² (m²)	6.52 (0.61)
Rated wind velocity (no ice)	mph (km/h)	130 (209)
Rated wind velocity (1/2" radial ice)	mph (km/h)	90 (145)
Lateral thrust (100 mph No Ice)	lbs (N)	141 (627.2)
Torsional moment (100 mph No Ice)	ft-lbs (Nm)	172 (232.2)
Bending moment (100 mph No Ice)	ft-lbs (Nm)	811 (1094.9)

Notes

*1 : Qty 2

Ordering Information

Clamps must be ordered separately.



AVA5-50FX

AVA5-50FX, HELIAX® Andrew Virtual Air™ Coaxial Cable, corrugated copper, 7/8 in, black PE jacket

Construction Materials

Jacket Material	PE
Outer Conductor Material	Corrugated copper
Dielectric Material	Foam PE
Flexibility	Standard
Inner Conductor Material	Copper
Jacket Color	Black

Dimensions

Nominal Size	7/8 in
Cable Weight	0.29 lb/ft | 0.43 kg/m
Diameter Over Dielectric	24.130 mm | 0.950 in
Diameter Over Jacket	27.991 mm | 1.102 in
Inner Conductor OD	9.4488 mm | 0.3720 in
Outer Conductor OD	25.400 mm | 1.000 in

Electrical Specifications

Cable Impedance	50 ohm ±1 ohm
Capacitance	22.0 pF/ft | 73.0 pF/m
dc Resistance, Inner Conductor	0.825 ohms/kft | 2.888 ohms/km
dc Resistance, Outer Conductor	0.400 ohms/kft | 1.313 ohms/km
dc Test Voltage	6000 V
Inductance	0.184 µH/m | 0.056 µH/ft
Insulation Resistance	100000 Mohms•km
Jacket Spark Test Voltage (rms)	8000 V
Operating Frequency Band	1 – 5000 MHz
Peak Power	91.0 kW
Velocity	90%

Environmental Specifications

Installation Temperature	-40 °C to +60 °C (-40 °F to +140 °F)
Operating Temperature	-55 °C to +70 °C (-67 °F to +158 °F)
Storage Temperature	-70 °C to +70 °C (-94 °F to +158 °F)

General Specifications

Brand	HELIAX®
Ordering Note	CommScope® non-standard product | Not available in the United States or Canada

Mechanical Specifications

Bending Moment	27.1 N-m | 20.0 ft lb
Flat Plate Crush Strength	75.0 lb/in
Minimum Bend Radius, Multiple Bends	254.00 mm | 10.00 in
Minimum Bend Radius, Single Bend	127.00 mm | 5.00 in
Number of Bends, minimum	15
Number of Bends, typical	30
Tensile Strength	159 kg | 350 lb

Note

Performance Note	Values typical, unless otherwise stated

Standard Conditions

Attenuation, Ambient Temperature	20 °C | 68 °F
Average Power, Ambient Temperature	40 °C | 104 °F
Average Power, Inner Conductor Temperature	100 °C | 212 °F

Return Loss/VSWR

Frequency Band	VSWR	Return Loss (dB)
680–800 MHz	1.13	24.30
800–960 MHz	1.13	24.30
1700–2200 MHz	1.13	24.30

Attenuation

Frequency (MHz)	Attenuation (dB/100 m)	Attenuation (dB/100 ft)	Average Power (kW)
0.5	0.08	0.024	91.00
1	0.113	0.034	74.43
1.5	0.138	0.042	60.73
2	0.16	0.049	52.56
10	0.359	0.11	23.37
20	0.51	0.156	16.46
30	0.627	0.191	13.39
50	0.814	0.248	10.32
85	1.068	0.326	7.86
88	1.088	0.332	7.72
100	1.162	0.354	7.23
108	1.209	0.368	6.95
150	1.433	0.437	5.86
174	1.548	0.472	5.43
200	1.665	0.507	5.05
204	1.682	0.513	4.99
300	2.059	0.628	4.08
400	2.398	0.731	3.50
450	2.553	0.778	3.29
500	2.7	0.823	3.11
512	2.735	0.834	3.07
600	2.977	0.907	2.82
700	3.235	0.986	2.60
800	3.478	1.06	2.42
824	3.534	1.077	2.38
894	3.694	1.126	2.27
960	3.841	1.171	2.19
1000	3.927	1.197	2.14
1218	4.377	1.334	1.92
1250	4.44	1.353	1.89
1500	4.912	1.497	1.71
1700	5.268	1.606	1.59
1800	5.439	1.658	1.54
2000	5.771	1.759	1.46
2100	5.933	1.808	1.42
2200	6.091	1.856	1.38
2300	6.247	1.904	1.34
2500	6.551	1.996	1.28
2700	6.845	2.086	1.23
3000	7.273	2.217	1.15
3400	7.819	2.383	1.07
3700	8.213	2.503	1.02
4000	8.596	2.62	0.98
5000	9.807	2.989	0.86

** Values typical, guaranteed within 5%*

Regulatory Compliance/Certifications

Agency	Classification
ISO 9001:2008	Designed, manufactured and/or distributed under this quality management system

FORWARD

SCOPE

This manual contains information on the AA1301FW antenna array. The information includes: a general description of the equipment, installation instructions, operating procedures, trouble shooting and maintenance procedures.

PROPRIETARY DATA

Information contained in this document is property of Cubic Communications, Inc. This information may not be disclosed to a third party, either wholly or in part, without the written consent of Cubic Communications, Inc.

CORRECTION NOTICE

Information contained in this document is believed to be correct as of the publication date. If a variation is noted between the information in this manual and the equipment in your possession, contact the factory for clarification. Future issues will be updated if necessary.

RIGHTS RESERVED

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LIST OF ABBREVIATIONS AND NON-STANDARD NOMENCLATURE

ADF	Automatic Direction Finding
DF	Direction Finding
E	East
N	North
S	South
RF	Radio Frequency
rms	Root Mean Squared
UHF	Ultra High Frequency
VHF	Very High Frequency
W	West

NOTE: Standard abbreviations follow ANSI and IEEE guidelines and are used to describe system electronics.

FORWARD

SCOPE

This manual contains information on the AA1301FW antenna array. The information includes: a general description of the equipment, installation instructions, operating procedures, trouble shooting and maintenance procedures.

PROPRIETARY DATA

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W	West

NOTE: Standard abbreviations follow ANSI and IEEE guidelines and are used to describe system electronics.

1.0 GENERAL INFORMATION

1-1 INTRODUCTION

This section contains operator level description, theory and specifications for the AA1301FW antenna array manufactured by Cubic Communications, Inc., OAR Products Group of San Diego, California.

Paragraph 1-2 gives a general description of the antenna; paragraph 1-3 describes principles of operation, and primary modes of operation for the AA1301FW antenna. Paragraph 1-4 provides specifications for operation.

1-2 DESCRIPTION

The AA1301FW antenna (Figure 1-1) is a dipole adcock, fixed site VHF array which provides 360 degree monitoring and is designed to supply inputs to a Direction Finding (DF) System. The AA1301FW receives vertically polarized ground waves, or low angle sky waves across the frequency range of 108 to 250 MHz. The antenna is designed to be mounted on a cement pad or on top of a tower either at a strategic location in the city or at remote mountain top sites and is weatherized to withstand extreme conditions.

The antenna is composed of two main sections, the VHF array and the antenna control box. The VHF array is composed of 8 dipole elements. The hub assembly is attached to the mast section, which supports the entire antenna. The control box, located at the bottom of the mast section, contains the VHF combiner and supplies the connection between the system equipment and the antenna.

The antenna has internal RF pre-amplifiers and signal processing which combine received signals for output to the receiver. All power and control signals to the antenna are provided through one 8-conductor control cable via the DF processor. The received signal with bearing information encoded, is routed to the receiver through a RF coaxial cable. From the control box, the RF and control cables are routed to the area housing other control and processing elements of the Direction Finding System.

1-3 THEORY OF OPERATION

The AA1301FW antenna array is designed to determine the direction of received signals. The frequencies that can be optimally received and processed by the antenna are 118 to 200 MHz. The antenna receives power and two modulating tones from the DF processor via the antenna power cable. The antenna provides a composite direction signal to the DF receiver via the coaxial RF cable.

The automatic direction finding system employs a modified three channel system (Watson-Watt) technique, which derives directional information from the amplitude response pattern of two direction antenna inputs, resolving the 180 degree ambiguity with a third sense channel. The antenna electronics derives the three channels of information from the antenna elements as follows:

Axial Channel: Difference of N-S elements

Transverse Channel: Difference of E-W elements

Sense Channel: Sum of all elements

Direction information is contained in the relative magnitude of information on the transverse and axial channels. The bearing processor connected to the antenna supplies audio tones to modulate axial and transverse channel signals.

The two processed signals are combined with sense channel information to provide a single RF input to the receiver via the RF coax cable.

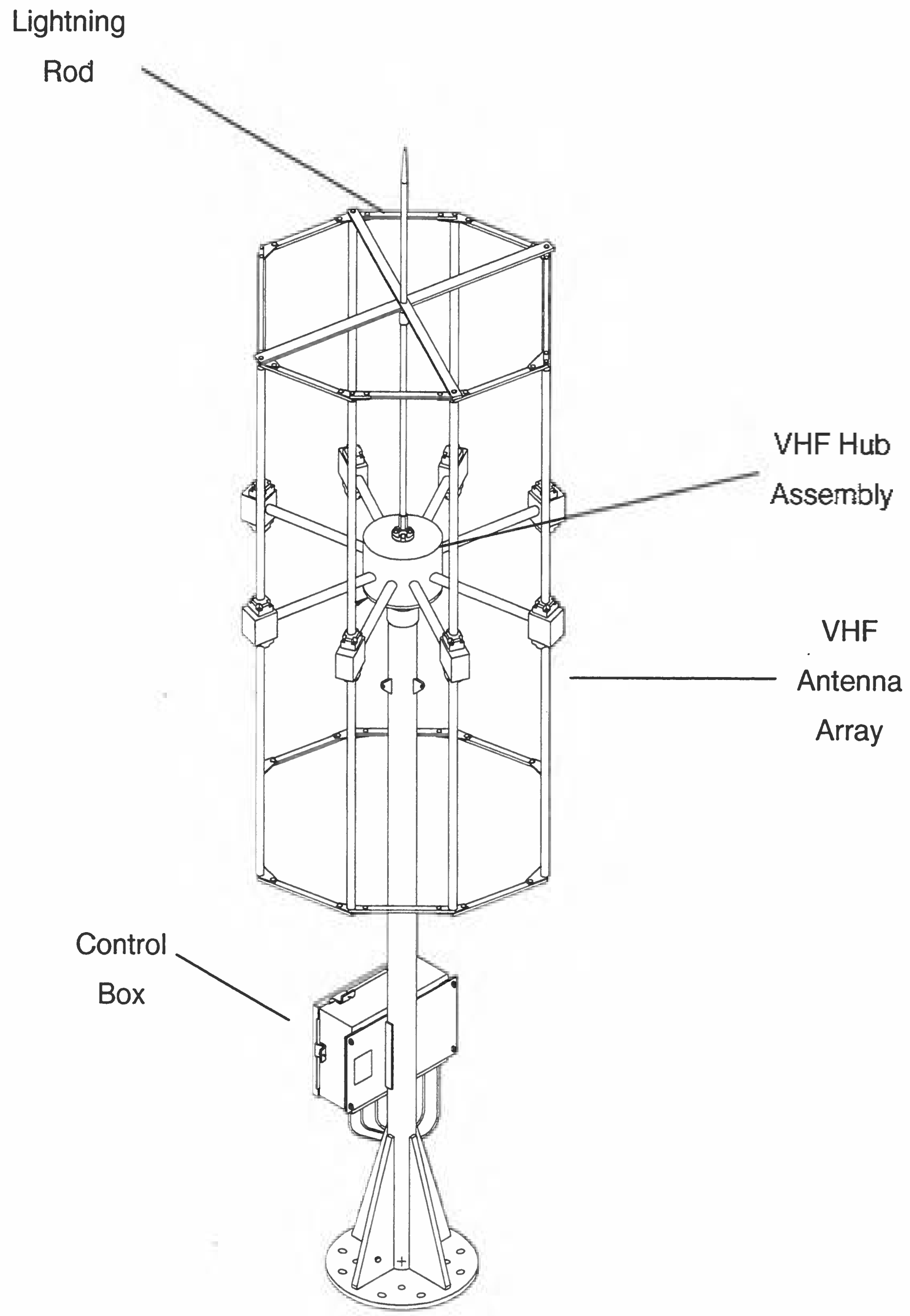


Figure 1-1. AA1301FW Antenna

1-4 SPECIFICATIONS

Table 1-1 lists specifications for the AA1301FW antenna.

Table 1-1. AA1301FW Antenna Specifications

Item	Specification	
VHF Array	8 element dipole adcock array	
Frequency	108 to 250 MHz (118 to 200 MHz optimum)	
VHF DF Sensitivity	121.5 MHz	1.0 uV/m
(See Note 1)	160.0 MHz	1.0 uV/m
Input Voltage	11.5 to 20 Vdc	
Power Consumption	250 ma	
Polarization	Vertical	
Horizontal Coverage	360°	
Output Impedance	50 ohms	
Bearing Accuracy (See Note 2)	2.0° rms typical (3° rms maximum)	
Mechanical		
Height	80" (202.9 cm)	
Diameter (Maximum)	30" (76.2 cm)	
Weight	77 lbs. (35.0 kg)	
Environmental		
Operating	-40°C to +60°C	
Storage	-40°C to +70°C	

Note 1: System Sensitivity for an incident field strength which results in 6° rms bearing jitter at the DF output with 200 ms integration time and 15 kHz bandwidth.
Note 2: DF bearing accuracy is measured at an ideal site over 360° azimuth and 118 to 200 MHz frequency range of the equipment with vertical polarization at zero degrees elevation.

CHAPTER 2
INSTALLATION

2-1 INTRODUCTION.

This section describes installation procedures for the AA1301FW antenna. Paragraph 2-2 describes the site selection process. Paragraph 2-3 details unpacking and handling of the antenna. Paragraphs 2-4, 2-5, and 2-6 describe cable requirements. Paragraphs 2-7 and 2-8 discuss installation and alignment procedures. Paragraph 2-9 describes preparation for movement, and storage.

2-2 SITE SELECTION.

For optimal performance, locate the AA1301FW antenna in a fairly open area, as far away as possible from sources of signal refraction, reflection, re-radiation or blocking. Obstructions such as hills or mountains should be at a distance. Proximity to metal objects such as power lines, metal buildings, or railroad tracks should be avoided. Location should be a distance from high radiation equipment, or sources of interference.

The antenna is designed for mounting on the antenna mast, which extends the height of the antenna and allows free reception in all directions. Position the antenna away from, or well above, structures, which might distort or obstruct reception.

2-3 UNPACKING AND HANDLING.

The AA1301FW is shipped in three sections: the mast with the control box mounted on it, the VHF array, and the lightning rod. Unpack the antenna from the shipping crates and inspect for damage during shipment. If any evidence of shipping damage is observed before or during antenna unpacking, notify the carrier. Save shipping containers for antenna storage, shipping, or any claim settlement.

Unpack the antenna as follows:

a. Remove the lid of the shipping container.

b. When removing the VHF array, be extremely cautious not to place pressure or weight on the VHF dipole elements.

CAUTION

Do not lift the array by the VHF dipole elements. This will damage them.

c. Remove the antenna array by grasping the hub and one of the arms welded to the central hub.

d. Place the array on the ground being certain to support the hub assembly to protect the VHF elements.

e. Remove the mast and lightning rod from their containers.

2-3.1 Antenna Components.

The AA1301FW antenna is supplied with the items listed in Table 2-1.

Table 2-1. AA1301FW Antenna Components

Item	Part No.
AA1301FW VHF Antenna	0253405-3
Operator Manual	0250-1020-5
Antenna/Receiver RF Cable (optional)	Configuration dependent on receiver input connector; may be supplied unassembled with RF connectors and coaxial cable.

Table 2-1. AA1301FW Antenna Components, continued

Antenna/Processor Control Cable (optional)	Usually supplied unassembled with mating connectors and raw cable.
Aluminum Point (lightning rod)	139-001
Collar (lightning rod), qty. 1	196-023
O Ring, qty. 1	263-684
Grease Cup	455-336-2
Socket Head Screw, ¼ -20 x 5/8, qty. 8	720-015
Flat Washer, ¼", (small pattern) qty. 8	768-103
Split Washer, ¼", qty. 8	767-047
AquaSeal© Weatherproofing Sealant (optional)	779-067
Hex Key, 5/32"	224-006

2-4 RF CABLE RECOMMENDATIONS.

The AA1301FW antenna is designed with cable drive amplifiers with sufficient gain to allow cable losses of 6 dB. Since cable loss is function of frequency, the maximum length cable run is also a function of the frequency range of the antenna. Table 2-2 lists several coaxial cable types and their respective RF connectors available through Cubic Communications Inc. The maximum cable length listed is based on the cable loss at 175 MHz. An N type plug is required to mate with the antenna output. The system's receiver antenna input connector dictates the mating connector type required.

Table 2-2. Coaxial Cable Selection Guide

Cable Type	Cubic Part #	Weight/ft.	Maximum Cable Length	TNC Plug	N Plug	BNC Plug
RG-214/U	671-616	0.13 lbs. (.059 kg)	187 ft. (57 m)	321-169	321-130	-
RG-8/U	671-621	0.10 lbs. (.045 kg)	187 ft. (57 m)	-	321-118	321-077
LMR400	671-630	0.068 lbs. (.03 kg)	375 ft. (114 m)	321-163	321-133	321-173
LMR400DB (watertight)	671-646	0.068 lbs. (.03 kg)	375 ft. (114 m)	321-163	321-133	321-173
LMR600DB (watertight)	671-645	0.13 lbs. (.059 kg)	575 ft. (175 m)	321-176	321-175	-

2-5 CONTROL CABLE REQUIREMENTS.

The control cable supplies power to the antenna as well as the DF modulation tones, but the DC voltage drop in the cable is the limiting factor in control cable length. The maximum control cable DC resistance is 5 ohms one way. Table 2-3 lists maximum cable lengths for the antenna control cable. Table 2-4 gives the pinout for the antenna control cable assembly.

Table 2-3. Control Cable Recommendations

(8 conductor with outer shield)

Cable Size	Cubic Part #	Manufacturer's Part #	Maximum Length
#24 AWG	671-619	Alpha XTRA-Guard 3 #35118 (direct burial)	214 ft. (65 m)
#20 AWG	671-643	Alpha XTRA-Guard 3 #35468 (direct burial)	480 ft. (146 m)
#20 AWG	671-611	Alpha XTRA-Guard 1 #5158C	480 ft. (146 m)
#24 AWG	671-614	Alpha XTRA-Guard 1 #5118C	214 ft. (65 m)

Table 2-4. Control Cable Pinout

Antenna Mating Connector: Bayonet style, 320-116, Amphenol Bendix # PT06W-16-8S

DF Processor Mating Connector: Bayonet style, 320-091, Amphenol Bendix # PT06W-12-8P

Antenna BITE Generator Mating Connector: Bayonet style, 320-115, Amphenol Bendix #PT06W-16-8P

PIN	SIGNAL
A	V+
B	GND
C	Horizontal Tone
D	Vertical Tone
E	Data
F	Clock
G	Strobe
H	Cascade

Pg. 9-25

Note

Pins E, F, G, and H are unused in the AA1301FW

2-6 LIGHTNING ROD CABLE RECOMMENDATION.

The recommended specification for the lightning rod cable is as follows:

- 37 strands of 13 gauge aluminum wire
- 9/16" diameter, smooth concentric twist
- 192,000 circular mils
- Net weight – 190 lbs. per 1000 feet

Note

Aluminum cables should never be used under ground. If a ground rod is used, the conversion between aluminum and copper should be made not less than 1 ½ feet above grade by the use of bimetal clamps.

2-7 ASSEMBLY AND INSTALLATION.

Installation of the AA1301FW antenna involves mounting antenna to a suitable fixed site location. For proper site selection refer to paragraph 2-2. If mounting the antenna on the ground, then it is assumed that a premade, prealigned antenna mounting pad has been installed at the antenna site, as per the alignment procedure in paragraph 2-8. This must be done prior to antenna assembly. The alignment procedure should also be used to mount the antenna on a tower. Antenna assembly requires the assistance of two or more people, and a qualified rigger.

CAUTION

The antenna must be oriented so that bearing readings can be properly interpreted. This orientation provides a zero degree reference for the bearing readout on the DF Processor. Normally, for land based installations, the antenna is aligned such that the North indicator (N) marked on the antenna points towards true north. True north bearings may then be read directly from the DF Processor bearing display or plotted on a map. The antenna can be calibrated to true north using a compass (see paragraph 2-8 for alignment procedure).

To assemble the antenna, proceed as follows:

a. Refer to the AA1301FW final assembly drawing and the interconnect diagram at the back of this manual. The parts list is given in Table 6.1.

b. Verify that antenna mounting pad bolts will mate properly with holes in the mast (item #15) base plate.

c. Lower the mast onto mounting pad, while aligning the holes in the baseplate with the mounting pad bolts.

Note

The mast baseplate is symmetrical and can be oriented with the control box in any direction, if necessary for convenience in cable routing.

d. Secure mast to pad.

e. Apply lubricant (supplied in Grease Cup) to the O-ring (item #41) and install O-ring in groove at the top of the mast.

f. Run the eight coax cables (W1 - W8) from the VHF hub assembly (item #12) down through the mast and bring out at large open slot below control box (item #17).

g. Mark the North indication, on the hub assembly, with red tape. Align VHF antenna assembly to the mast so that the "N" (North) on the hub assembly is aligned with the North position on the baseplate, as determined in paragraph 2-8.

Note

When determining the alignment of the baseplate, keep in mind that the dipole arm indicated “North” may align with any outer diameter mounting hole in the baseplate.

h. Assemble bottom mast to hub assembly using eight (8) 1/4-20x5/8 socket head screws, flat washers, and split washers (items #28, #38 and 36). Tighten securely using threadlocker, if necessary.

i. Observing cable markings, attach the eight direction coax cables to the corresponding connectors on the antenna control box ("N" to "N", "S" to "S", etc.). Refer to Figure 2-1.

j. Wrap all connections with weatherproof tape.

k. Loosen the nuts on the lightning rod base at the top of the hub assembly. Clamp the lightning rod cable into the aluminum base, and tighten the nuts on the base. Run the cable to the ground connection on the mast base plate.

l. Feed the lightning rod (item #24) down through the rod supports at the top of the VHF array. Slide the collar (item #25) onto the rod and thread the lightning rod onto the base (item #23) at the top of the hub assembly. Slide the collar up against the rod supports and use the 5/32” hex key to tighten the collar. A pictorial of the lightning rod base is given in Figure 2-2.

m. Fasten a ground strap to the threaded hole on the mast support (triangular plate at bottom of mast), using the 3/8-16x7/8 hex head screw, split washer, and flat washer (items 31, 34, and 37).

n. Run antenna control cable and antenna RF cable from the receiver and DF Processor to antenna site.

o. Attach connectors of antenna control and antenna RF cables to connectors marked ANT CONTROL and RF OUT on the antenna control box.

p. If there is a stake in the ground marking true north, a person can stand at the stake and sight along the N-S element pair of the VHF array. If necessary, the base mounting bolts can be loosened slightly and the antenna can be turned to align precisely with true north. Be sure to re-tighten the mounting bolts.

Installation of the antenna is now complete.

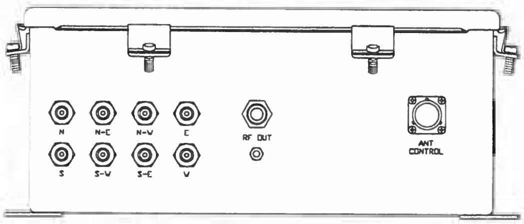


Figure 2-1. AA1301FW Control Box

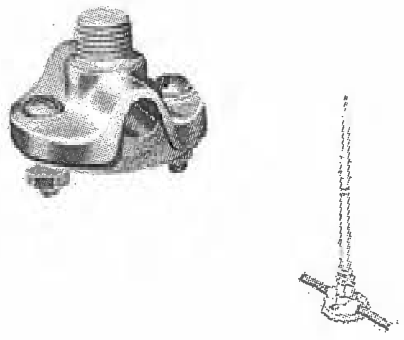


Figure 2-2. Lightning Rod Base

2-8 ALIGNMENT PROCEDURE.

The following procedures are used to align the AA1301FW antenna with true north, and to calibrate the DF Processor for a more accurate bearing reading. The alignment procedure must be completed prior to antenna installation.

To perform antenna alignment, follow the procedure listed below:

a. Stand at antenna location with a sighted magnetic compass, drive a six foot stake into the ground where the antenna axis is to be located, and send a second man to pace out 100 feet from that point in a northerly direction.

b. Sighting along the magnetic compass, position the man right or left as necessary to align with magnetic north. Drive a six-foot stake into the ground at that point.

c. Determine local magnetic variation and using compass, position the man to the left or right of magnetic north to coincide with the variation. For example, if the variation is 10°, position the man to the right by 10°. Drive a second stake into the ground at this point. Verify position one more time, then, remove the stake at magnetic north (from the measurement taken in step b).

d. Align antenna to true north by aligning the position the base pad is laid, so that two opposing mounting bolts are precisely aligned with the north and south reference line. Mark the north mounting bolt at 0 degrees with the letter “N” or color it red.

e. If possible, leave the true north stake in the ground for use by installation crew.

2-9 PREPARATION FOR MOVEMENT AND STORAGE.

The following information describes how to repack the antenna system and prepare it for relocation, storage, or shipping.

Store antenna in dry area free from possible damage while transporting.

2-9.1 Disassembly.

Disassemble the antenna to the extent required for storage or preparation for shipment as follows:

a. To disassemble antenna assembly, remove antenna mast from its mount by unscrewing the nuts, and removing flat washers, and split washers.

b. Disconnect the RF Out cable from the antenna control box.

c. Disconnect the antenna power/control cable from the control box.

CAUTION

Never use the dipole arrays to support the antenna in lifting or storing the array. The hub assembly arms are the strongest part of the array for lifting or securing the array.

d. Lift antenna assembly up off its mount and lay carefully on it's side.

2-9.2 Storage.

Store the antenna system as follows:

a. Remove the antenna system from its installed location (paragraph 2-9.1).

b. Carefully place antenna in a suitable storage container. Secure antenna in container making sure that the antenna elements will not be damaged during shipping.

c. Place copy of shipping documents inside shipping containers(s).

CAUTION

Open storage is not recommended, but can be endured for short periods of time if shipping container(s) is fully covered with a tarp or sheet of plastic.

d. Close shipping container(s) and attach required documents to exterior of shipping container(s).

2-9.3 Preparation for Shipment.

Prepare the antenna or separate pieces for shipment as follows:

a. Ensure the antenna is properly stored (refer to paragraph 2-9.2). It should not move in any direction. Add additional packing material if necessary.

CAUTION

It may be necessary to paint over existing address marking on shipping container(s). Do not obscure information (nomenclature, part no., etc.) markings on shipping container exterior.

b. Stencil destination on top, one side, and one end of shipping container(s).

c. Make sure shipping container is properly closed. Apply banding material around shipping container, if required.

CHAPTER 3
OPERATING PROCEDURES

3-1 INTRODUCTION.

This section describes operating procedures for the AA1301FW antenna. Paragraph 3-2 describes control and indicators, paragraph 3-3 calibration, and paragraph 3-4 describes normal operating procedures.

3-2 CONTROLS AND INDICATORS.

The AA1301FW antenna has no controls or indicators as it is controlled and operated by the DF processor. Connection with the DF processor is made at the antenna control box via control cable.

3-3 CALIBRATION.

Primary calibration will be completed at installation. Recalibration should only be attempted if components of the DF system have been replaced or modified. Be sure to note offset, if installed.

3-4 NORMAL OPERATION.

Refer to DF processor operator's manual associated with the antenna for normal operating procedures.

Additionally, any nearby equipment known to transmit at the antenna's present target frequencies should be shielded to prevent/minimize the DF processor from producing false bearings.

3-5 OPERATION UNDER EXTREME CLIMATIC CONDITIONS.

There are a few situations in which the AA1301FW antenna would be effected by extreme climatic conditions. For example, an extremely heavy rain might limit the sensitivity of the antenna. Ice loading on the VHF elements will inhibit it's capabilities as well as cause bearing errors due to water melting and dripping off the antenna.

A lightning strike near or directly to the antenna, may limit the capability of the antenna, and it is strongly recommended that the antenna be taken down and not operated if there is prior knowledge of a powerful storm. The same precautions are recommended in the event of heavy winds.

An ample grounding cable should be installed.

CHAPTER 4
TROUBLESHOOTING

4-1 INTRODUCTION.

This section describes troubleshooting for the AA1301FW antenna.

4-2 TROUBLESHOOTING.

Troubleshooting of the AA1301FW antenna is limited to verifying proper power and cable connections at the operators level. If the antenna is not working properly, send antenna assembly back to the manufacturer for repair and/or replacement. For shipping procedures, refer to paragraph 2-9.3.

CHAPTER 5
MAINTENANCE

5-1 INTRODUCTION.

This section describes maintenance procedures for the AA1301FW antenna.

5-2 PREVENTIVE MAINTENANCE.

Because the AA1301FW antenna is a fully waterproofed and weatherized piece of equipment, there is no preventive maintenance required other than taking down the antenna in the event of a powerful storm and periodically inspecting the antenna for serious corrosion.

5-3 OPERATOR REPAIR.

There is no repair required of the AA1301FW antenna system at the operators level. If a problem has been isolated to the antenna, package antenna assembly and return to the manufacturer for repair or replacement. For shipping procedures refer to paragraph 2-9.3.

CHAPTER 6
PARTS LISTS

6-1 INTRODUCTION.

This section contains the parts lists for items required to install the AA1301FW antenna.

6-2 PARTS LISTINGS.

Table 6-1 lists the parts for the AA1301FW antenna. These are the parts required to install the mast on the VHF section and mount the lightning rod. Appendix I includes an assembly drawing and interconnect diagram for the antenna.

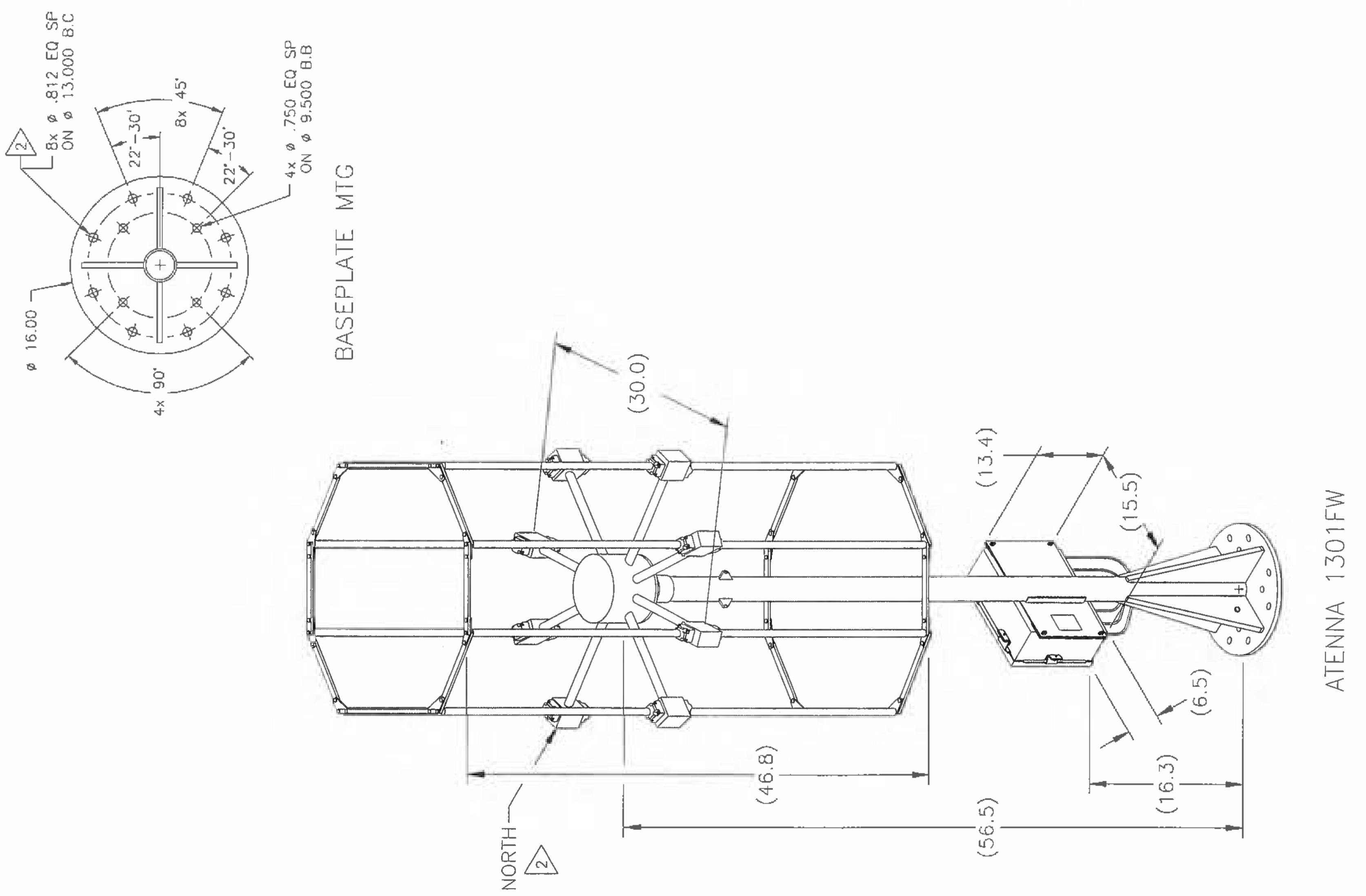
Table 6-1 Aa1301fw Final Assembly

(0253405-3)

Item #	Part Number	Description	Qty
12	0253409-1	Hub Antenna Assembly	1
15	0253048-1	Bottom Mast	1
17	0255409-1	Control Box Assembly	1
23	139-000	Aluminum Base	1
24	139-001	Aluminum Point	1
25	196-023	Collar	1
28	720-015	Socket Cap Screw, ¼-20x5/8	8
31	721-010	Hex Head Screw, 3/8-16x7/8	1
33	768-095	Flat Washer, ¼”	14
34	768-099	Flat Washer, 3/8”	1
36	767-047	Split Washer, ¼”	14
37	767-072	Split Washer, 3/8”	1
39	761-083	Hex Nut, ¼-20	4
40	224-006	Hex Key Tool	1
41	263-684	O Ring	1
42	779-050	Lubricant	A/R
44	779-049	Threadlocker	A/R

APPENDIX I

AA1301FW ANTENNA DRAWINGS

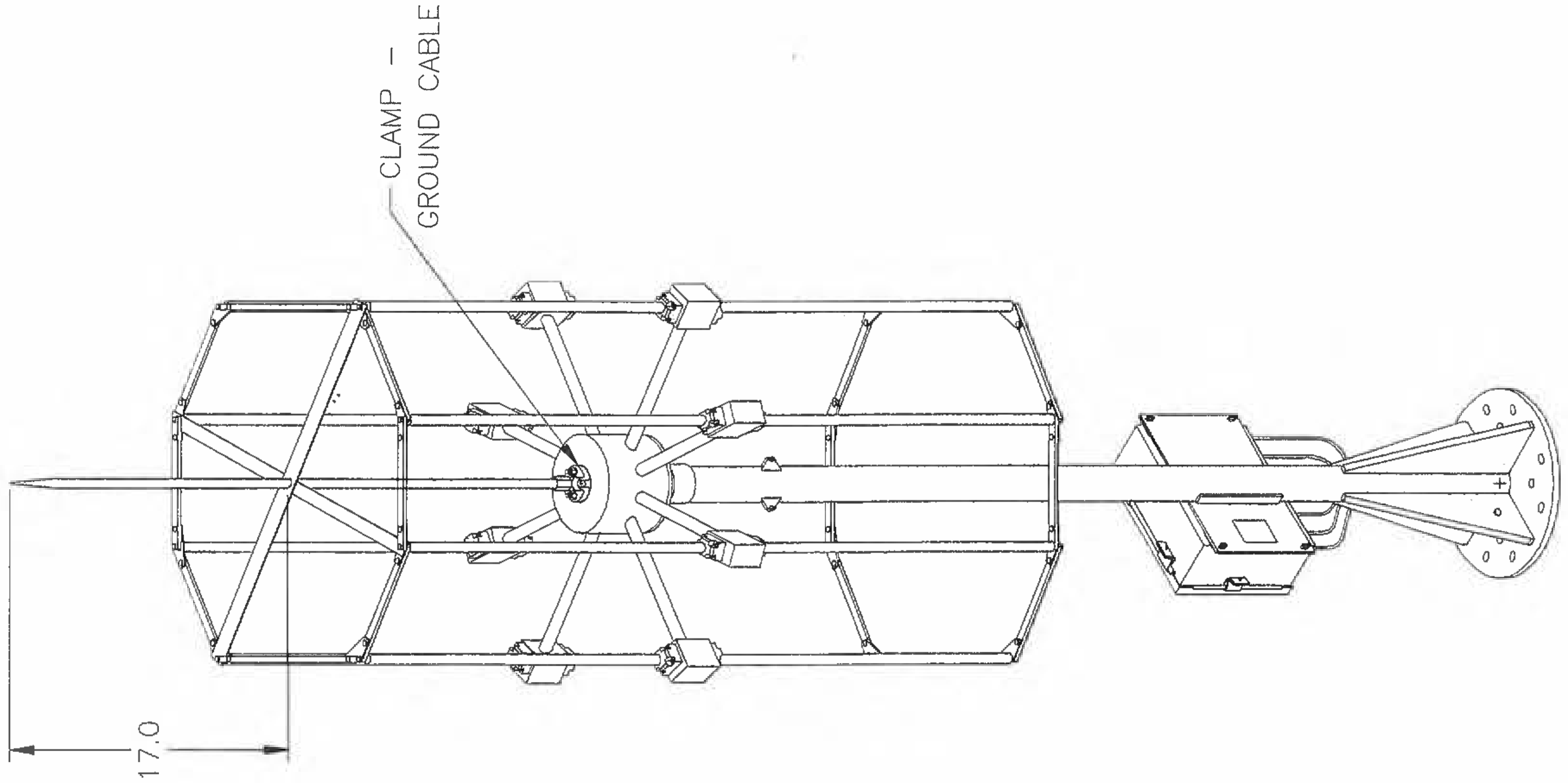


2 DIPOLE ARM INDICATED "NORTH" MAY ALIGN WITH ANY OUTER DIA MTG HOLE IN BASE PLATE.

1. INTERPRET DWG PER DOD-STD-100.

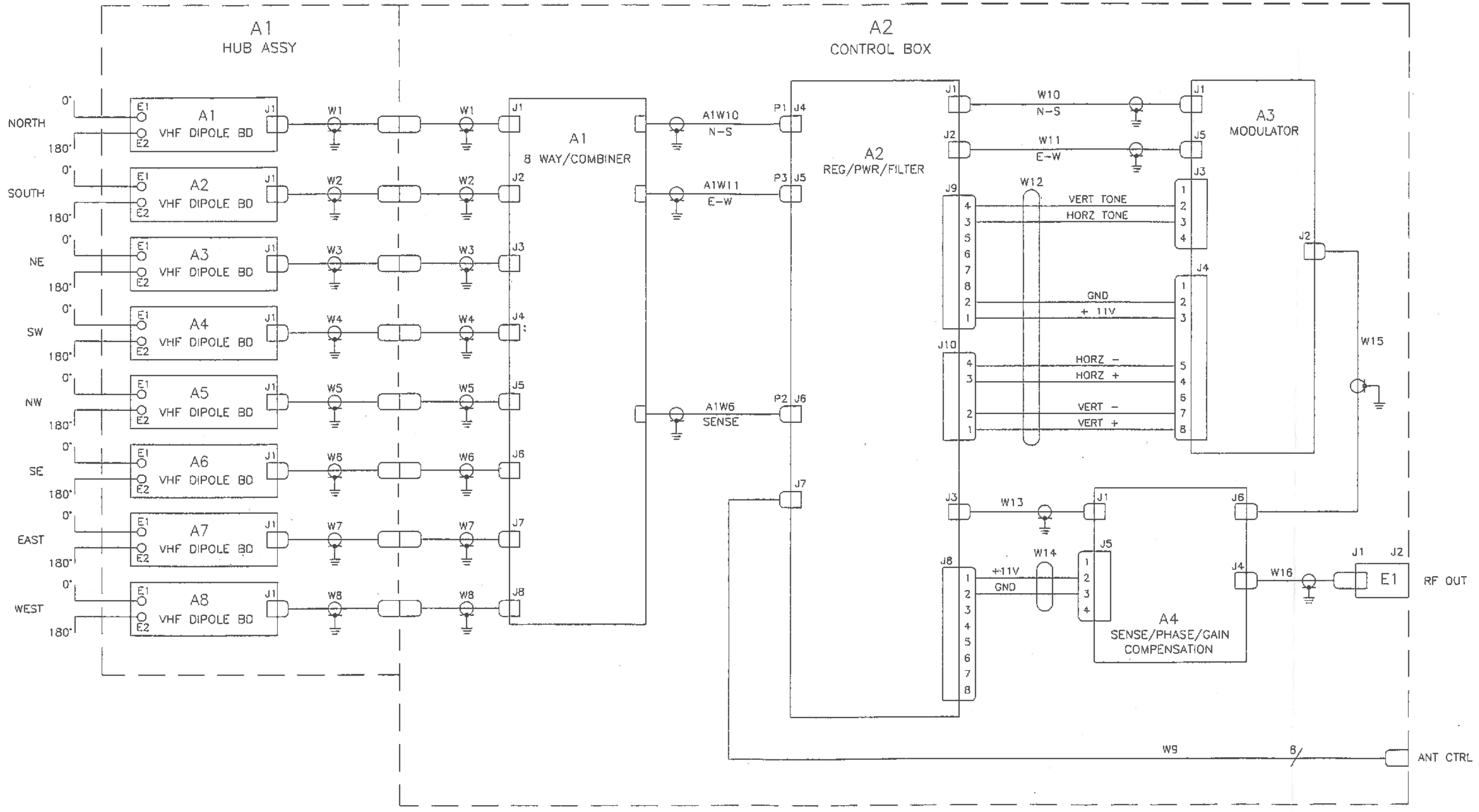
NOTES: UNLESS OTHERWISE SPECIFIED

FO-1. Outline and Mounting Drawing
Sheet 1 of 2

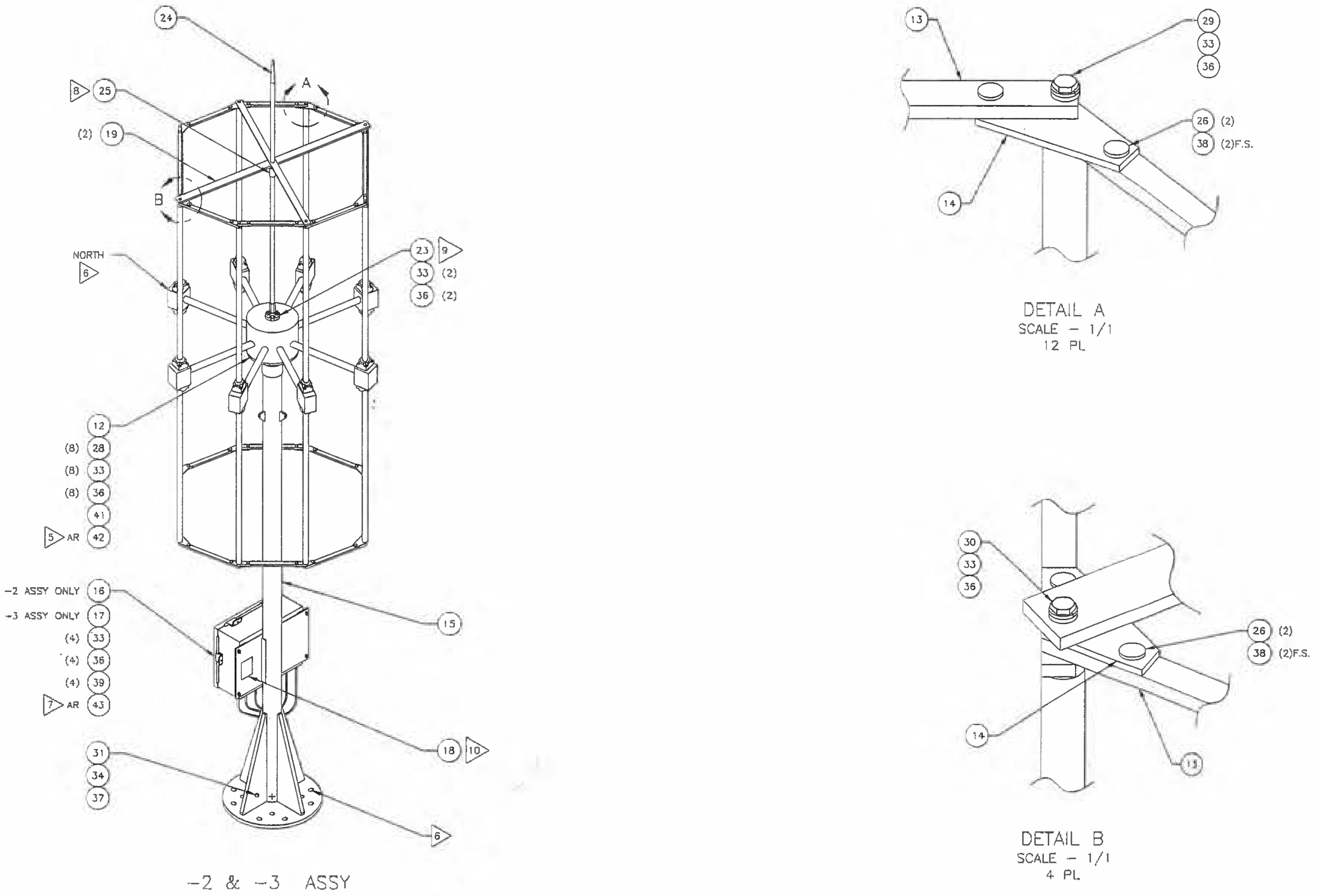


AA1301FW Lightning Protection

FO-1. Outline and Mounting Drawing
Sheet 2 of 2



FO-2. Interconnect Diagram



-2 & -3 ASSY

DETAIL A
SCALE - 1/1
12 PL

DETAIL B
SCALE - 1/1
4 PL

FO-3. AA1301FW Antenna Parts Locator Diagram

SD212-SF2P2SNM(D00) 2 dipole, 5.0 dBd, bi-directional, 138-174 MHz

Also referred as: SRL210C2NM*2-2

- Covers the entire 138-174 MHz frequency range
- 5.0 dBd gain with bi-directional pattern
- 300 Watt power handling
- Can be top or side mounted (Universal mount)

Recommend SMK-125-A3 or SMK-125-A7 for Offset Side Mount.
Available from Sinclair separately.

The SD212 series is a 2-bay exposed dipole antenna designed for applications where moderate gain is required. These premium-quality antennas are well suited to public safety applications.

The design of these antennas provides for coverage from 118 to 225 MHz in 3 sub bands, 118-138 MHz for civil aviation applications, 138-174 MHz for private mobile networks, and public safety, and 220-225 MHz for transportation networks.

The standard connector offered is N male which is terminated on a 1 foot cable.

Application Notes

- The SD212 is available with a bi-directional pattern (P2) providing 5.0 dBd gain or with a offset pattern (P4) providing a 5.5 dBd gain (gain varies slightly with frequency).

- Sub bands:
  118-138 MHz (F1)
  138-174 MHz (F2)
  190-225 MHz (F3)

Electrical Specifications

Frequency Range	MHz	138 to 174
Bandwidth	MHz	36
Connector		N-Male
Gain (nominal)	dBd (dBi)	5 (7.1)
Input VSWR (max)		1.5:1
Polarization		vertical
Impedance	Ω	50
Pattern		Bi- directional
Vertical beamwidth (typ)	degrees	34
Average Power Input (max)	W	300
Lightning protection		DC ground
Electrical tilt (available)		0,2,4,6,8, or 10 degrees

Mechanical Specifications

Width	in (mm)	40 (1016)	
Depth	in (mm)	3 (76)	
Length/ Height	in (mm)	120 (3048)	
Base pipe diameter	in (mm)	1.9 (48)	
Base pipe mounting length	in (mm)	36 (914)	
Radiating element material		aluminum	
Base pipe material		aluminum	
Weight	lbs (kg)	22.5 (10.22)	
Weight iced (1/2" ice)	lbs (kg)	55 (24.97)	
Mounting Hardware (Optional)		Clamp005, Clamp015, or Clamp130	*1
Actual Shipping weight	lbs (kg)	45 (20.43)	
Shipping dimensions	in (mm)	124x48x6 (3150x1219x152)	
Mounting configurations		Universal Mount	
Recommended For Offset Side Mount:		SMK-125-A3 or SMK-125-A7	

Environmental Specifications

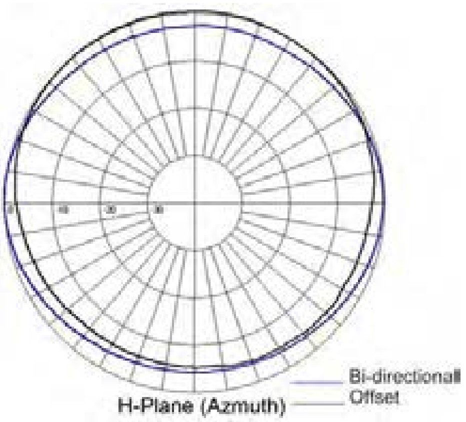
Temperature range	°F (°C)	-40 to +140 (-40 to +60)
Wind Loading Area (Flat Plate Equivalent)	ft² (m²)	2.14 (0.2)
Wind Loading Area (1/2" ice)	ft² (m²)	3.71 (0.34)
Rated wind velocity (no ice)	mph (km/h)	140 (225)
Rated wind velocity (1/2" radial ice)	mph (km/h)	105 (169)
Lateral thrust (100 mph No Ice)	lbs (N)	77 (342.5)
Torsional moment (100 mph No Ice)	ft-lbs (Nm)	83 (112.1)
Bending moment (100 mph No Ice)	ft-lbs (Nm)	247 (333.5)
Tip deflection (100 mph No Ice)	degrees	1.02

Notes

*1 : Qty 2 required

Ordering Information

Clamps must be ordered separately.



DATASHEET

PowerBeam®

High-Performance airMAX® Bridge

Models: PBE-M5-620, PBE-M5-400, PBE-M5-300, PBE-M2-400

Uniform Beamwidth Maximizes Noise Immunity

Innovative Mechanical Design

High-Speed Processor for Superior Performance

UBIQUITI®
NETWORKS

Overview

Starting with the first-generation NanoBridge®, Ubiquiti Networks pioneered the all-in-one design for an airMAX® product functioning as a CPE (Customer Premises Equipment). Now Ubiquiti Networks launches the latest generation of CPE, the PowerBeam®.

Improved Noise Immunity

The PowerBeam directs RF energy in a tighter beamwidth. With the focus in one direction, the PowerBeam blocks or spatially filters out noise, so noise immunity is improved. This feature is especially important in an area crowded with other RF signals of the same or similar frequency.

Integrated Design

Ubiquiti's InnerFeed® technology integrates the radio into the feedhorn of an antenna, so there is no need for a cable. This improves performance because it eliminates cable losses.

Providing high performance and innovative mechanical design at a low cost, the PowerBeam is extremely versatile and cost-effective to deploy.

airMAX Technology Included

Unlike standard Wi-Fi protocol, Ubiquiti's Time Division Multiple Access (TDMA) airMAX protocol allows each client to send and receive data using pre-designated time slots scheduled by an intelligent AP controller.

This time slot method eliminates hidden node collisions and maximizes airtime efficiency. It provides significant performance improvements in latency, throughput, and scalability compared to all other outdoor systems in its class.

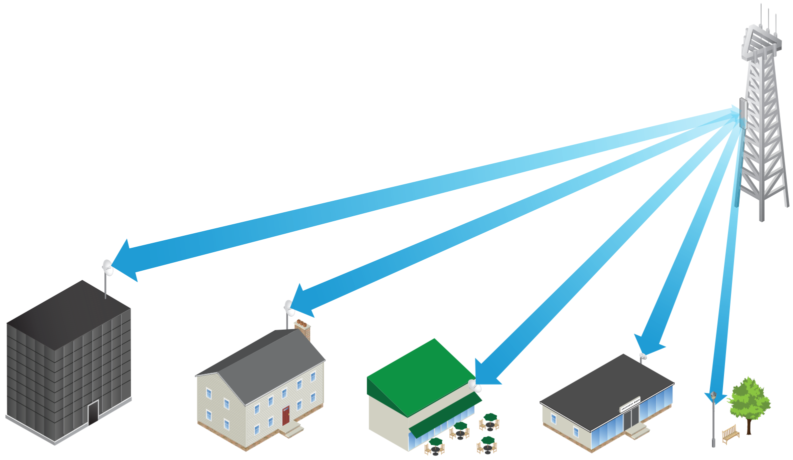
Intelligent QoS Priority is given to voice/video for seamless streaming.

Scalability High capacity and scalability.

Long Distance Capable of high-speed, carrier-class links.

Application Examples

PtMP Client Links

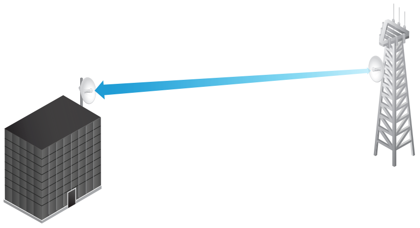


The PowerBeam used as a CPE device for each client in an airMAX PtMP network.

Wireless Client

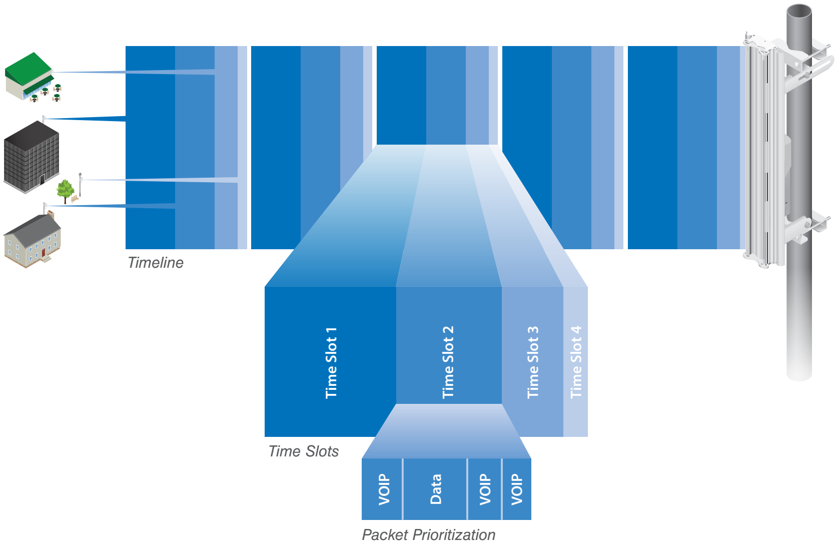
The PowerBeam as a powerful wireless client.

PtP Link



Use a PowerBeam on each side of a PtP link.

airMAX TDMA Technology



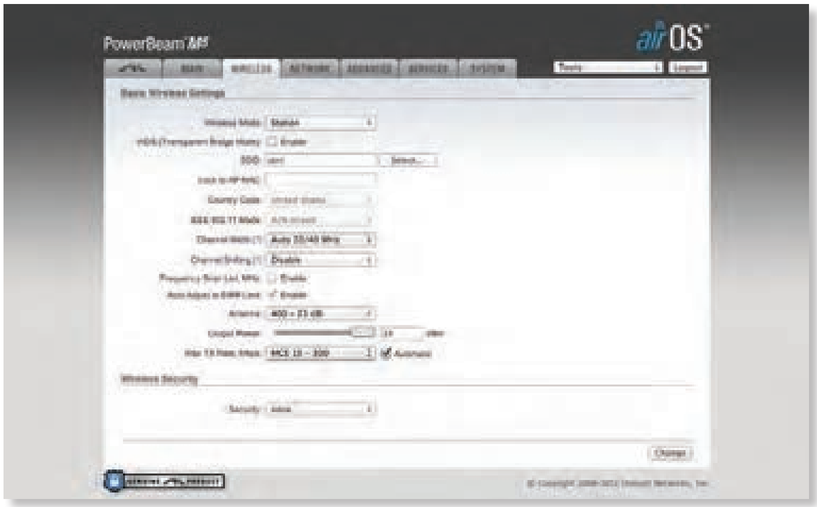
Up to 100 airMAX stations can be connected to an airMAX Sector; four airMAX stations are shown to illustrate the general concept.

Software

airOS®

airOS® is an intuitive, versatile, highly developed Ubiquiti firmware technology. It is exceptionally intuitive and was designed to require no training to operate. Behind the user interface is a powerful firmware architecture, which enables high-performance, outdoor multi-point networking.

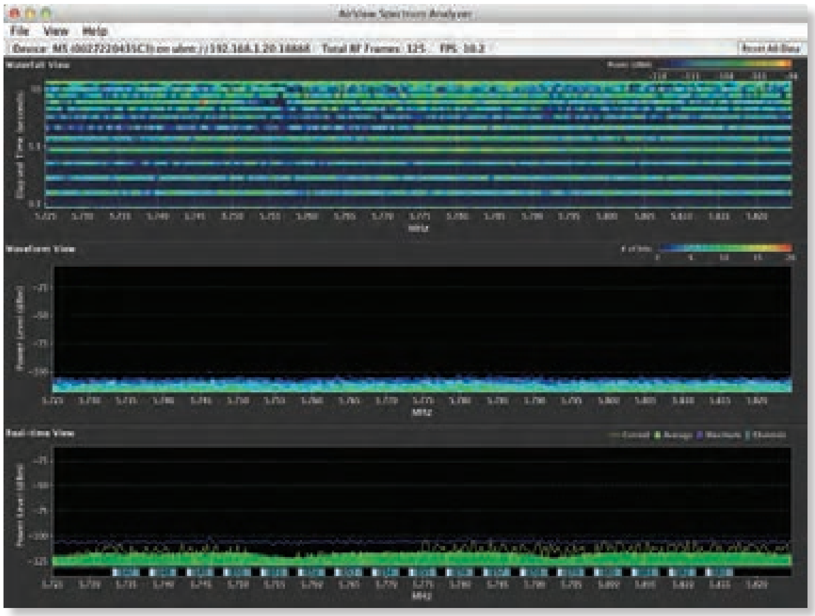
- Protocol Support
- Ubiquiti Channelization
- Spectral Width Adjustment
- ACK Auto-Timing
- AAP Technology
- Multi-Language Support



airView®

Integrated on all Ubiquiti M products, airView® provides advanced spectrum analyzer functionality: waterfall, waveform, and real-time spectral views allow operators to identify noise signatures and plan their networks to minimize noise interference.

- **Waterfall** Aggregate energy over time for each frequency.
- **Waveform** Aggregate energy collected.
- **Real-time** Energy is shown in real time as a function of frequency.
- **Recording** Automate airView to record and report results.



airControl®

airControl® is a powerful and intuitive, web-based server network management application, which allows operators to centrally manage entire networks of Ubiquiti devices.

- Network Map
- Monitor Device Status
- Mass Firmware Upgrade
- Web UI Access
- Manage Groups of Devices
- Task Scheduling

Hardware Overview

Innovative Mechanical Design

- **Built-in mechanical tilt** The mounting bracket conveniently offers 20° of uptilt and up to 20° of downtilt.
- **Quick assembly** The number of fasteners was reduced to simplify assembly. Tools are required only when the technician mounts the PowerBeam on the pole.
- **Easy removal** The antenna feed can be detached with the push of a button.

Corrosion Resistance

- **Fasteners** GEOMET-coated for improved corrosion resistance when compared with zinc-plated fasteners.
- **Dish and brackets** Made of galvanized steel that is powder-coated for superior corrosion resistance.

  The redesigned pole bracket for the 400 mm dish and fender washers for the 300 mm dish prevent paint from being removed from the metal brackets for improved corrosion resistance.

Model Comparison

	PBE-M5-620	PBE-M5-400	PBE-M5-300	PBE-M2-400
Frequency Band	5 GHz	5 GHz	5 GHz	2.4 GHz
Antenna Gain	29 dBi	25 dBi	22 dBi	18 dBi
Dish Reflector	620 mm	400 mm	300 mm	400 mm
Throughput	150+ Mbps	150+ Mbps	150+ Mbps	150+ Mbps
Network Interface	10/100/1000	10/100/1000	10/100	10/100

PowerBeam® M
400 mm Radome

Model	PBE-M2-400	PBE-M5-400	PBE-M5-300
PBE-RAD-400	✓	✓	N/A

A protective radome is available as an optional accessory for the PBE-M2-400 and PBE-M5-400.

PowerBeam® Accessories

IsoBeam™

Model: ISO-BEAM-620

The IsoBeam™ is an isolator radome that is available as an optional accessory for the PBE-M5-620 and other models:

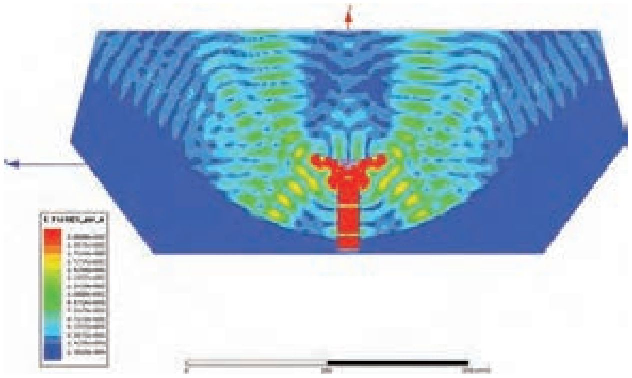
- airFiber® AF-5G30-S45
- PowerBeam PBE-5AC-620
- RocketDish™ RD-5G30-LW

The innovative RF-choke perimeter of the IsoBeam delivers superior noise immunity in co-location deployments; its perimeter corrugation provides enhanced RF shielding. Compare the two near-field plots below, and note the breakthrough isolation performance of the IsoBeam.

Both near-field plots are displayed in watts and use a linear scale. The strength of the electromagnetic field is color-coded:

- Red: Highest strength
- Green: Medium strength
- Indigo: Lowest strength

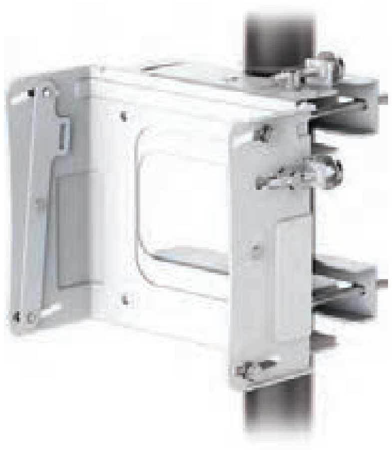
Without IsoBeam



With IsoBeam

Precision Alignment Kit

Model: PAK-620



The Precision Alignment Kit is available as an optional accessory for the PBE-M5-620. It features 15° of azimuth adjustment and 15° of elevation adjustment to enable extremely accurate aiming for optimal PtP link performance.

The Precision Alignment Kit is also compatible with other dish antennas:

- airFiber AF-5G30-S45
- PowerBeam PBE-5AC-620
- RocketDish RD-5G30-LW

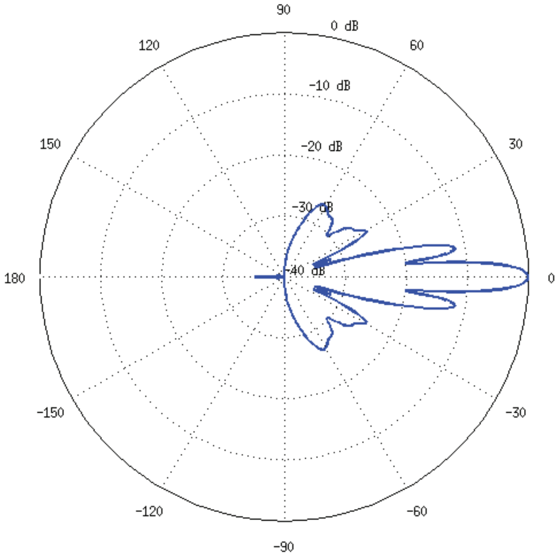
Specifications

<table>
<tr><th colspan="6">PBE-M5-620</th></tr>
<tr><td>Dimensions</td><td colspan="5">620 x 620 x 386 mm (24.41 x 24.41 x 15.2")</td></tr>
<tr><td>Weight</td><td colspan="5">6.4 kg (14.11 lb)</td></tr>
<tr><td>Power Supply</td><td colspan="5">24V, 0.5A Gigabit PoE</td></tr>
<tr><td>Max. Power Consumption</td><td colspan="5">8.5W</td></tr>
<tr><td rowspan="2">Operating Frequency</td><td>Worldwide</td><td>USA: U-NII-1</td><td>USA: U-NII-2A</td><td>USA: U-NII-2C</td><td>USA: U-NII-3</td></tr>
<tr><td>5150 - 5875 MHz</td><td>5150 - 5250 MHz*</td><td>5250 - 5350 MHz*</td><td>5470 - 5725 MHz*</td><td>5725 - 5850 MHz*</td></tr>
<tr><td>Gain</td><td colspan="5">29 dBi</td></tr>
<tr><td>Networking Interface</td><td colspan="5">(1) 10/100/1000 Ethernet Port</td></tr>
<tr><td>Processor Specs</td><td colspan="5">Atheros MIPS 74Kc, 560 MHz</td></tr>
<tr><td>Memory</td><td colspan="5">64 MB DDR2, 8 MB Flash</td></tr>
<tr><td>LEDs</td><td colspan="5">(1) Power, (1) LAN, (4) WLAN</td></tr>
<tr><td>Signal Strength LEDs</td><td colspan="5">Software-Adjustable to Correspond to Custom RSSI Levels</td></tr>
<tr><td>Max. VSWR</td><td colspan="5">1.6:1</td></tr>
<tr><td>Channel Sizes</td><td colspan="5">5/8/10/20/30/40 MHz</td></tr>
<tr><td>Polarization</td><td colspan="5">Dual Linear</td></tr>
<tr><td>Enclosure</td><td colspan="5">Outdoor UV Stabilized Plastic</td></tr>
<tr><td>Mounting</td><td colspan="5">Pole-Mount (Kit Included)</td></tr>
<tr><td>Wind Loading</td><td colspan="5">1510 N @200 km/h (340 lbf @125 mph)</td></tr>
<tr><td>Wind Survivability</td><td colspan="5">200 km/h (125 mph)</td></tr>
<tr><td>ESD/EMP Protection</td><td colspan="5">Air: ± 24 kV, Contact: ± 24 kV</td></tr>
<tr><td>Operating Temperature</td><td colspan="5">-40 to 70° C (-40 to 158° F)</td></tr>
<tr><td>Operating Humidity</td><td colspan="5">5 to 95% Noncondensing</td></tr>
<tr><td>Wireless Approvals</td><td colspan="5">FCC, IC, CE</td></tr>
<tr><td>RoHS Compliance</td><td colspan="5">Yes</td></tr>
<tr><td>Salt Fog Test</td><td colspan="5">IEC 68-2-11 (ASTM B117), Equivalent: MIL-STD-810 G Method 509.5</td></tr>
<tr><td>Vibration Test</td><td colspan="5">IEC 68-2-6</td></tr>
<tr><td>Temperature Shock Test</td><td colspan="5">IEC 68-2-14</td></tr>
<tr><td>UV Test</td><td colspan="5">IEC 68-2-5 at 40° C (104° F), Equivalent: ETS 300 019-1-4</td></tr>
<tr><td>Wind-Driven Rain Test</td><td colspan="5">ETS 300 019-1-4, Equivalent: MIL-STD-810 G Method 506.5</td></tr>
</table>

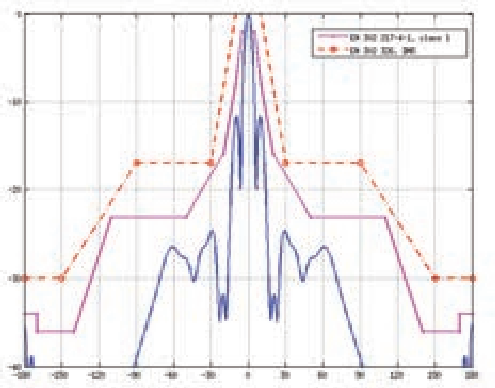
<table>
<tr><th colspan="8">PBE-M5-620 Output Power: 24 dBm</th></tr>
<tr><th colspan="4">TX Power Specifications</th><th colspan="4">RX Power Specifications</th></tr>
<tr><th>Modulation</th><th>Data Rate</th><th>Avg. TX</th><th>Tolerance</th><th>Modulation</th><th>Data Rate</th><th>Sensitivity</th><th>Tolerance</th></tr>
<tr><td rowspan="4">802.11a</td><td>6 - 24 Mbps</td><td>24 dBm</td><td>± 2 dB</td><td rowspan="4">802.11a</td><td>6 - 24 Mbps</td><td>-94 dBm Min.</td><td>± 2 dB</td></tr>
<tr><td>36 Mbps</td><td>24 dBm</td><td>± 2 dB</td><td>36 Mbps</td><td>-80 dBm</td><td>± 2 dB</td></tr>
<tr><td>48 Mbps</td><td>23 dBm</td><td>± 2 dB</td><td>48 Mbps</td><td>-77 dBm</td><td>± 2 dB</td></tr>
<tr><td>54 Mbps</td><td>22 dBm</td><td>± 2 dB</td><td>54 Mbps</td><td>-75 dBm</td><td>± 2 dB</td></tr>
<tr><td rowspan="16">802.11n/airMAX</td><td>MCS0</td><td>24 dBm</td><td>± 2 dB</td><td rowspan="16">802.11n/airMAX</td><td>MCS0</td><td>-96 dBm</td><td>± 2 dB</td></tr>
<tr><td>MCS1</td><td>24 dBm</td><td>± 2 dB</td><td>MCS1</td><td>-95 dBm</td><td>± 2 dB</td></tr>
<tr><td>MCS2</td><td>23 dBm</td><td>± 2 dB</td><td>MCS2</td><td>-92 dBm</td><td>± 2 dB</td></tr>
<tr><td>MCS3</td><td>23 dBm</td><td>± 2 dB</td><td>MCS3</td><td>-90 dBm</td><td>± 2 dB</td></tr>
<tr><td>MCS4</td><td>22 dBm</td><td>± 2 dB</td><td>MCS4</td><td>-86 dBm</td><td>± 2 dB</td></tr>
<tr><td>MCS5</td><td>21 dBm</td><td>± 2 dB</td><td>MCS5</td><td>-83 dBm</td><td>± 2 dB</td></tr>
<tr><td>MCS6</td><td>20 dBm</td><td>± 2 dB</td><td>MCS6</td><td>-77 dBm</td><td>± 2 dB</td></tr>
<tr><td>MCS7</td><td>20 dBm</td><td>± 2 dB</td><td>MCS7</td><td>-74 dBm</td><td>± 2 dB</td></tr>
<tr><td>MCS8</td><td>24 dBm</td><td>± 2 dB</td><td>MCS8</td><td>-96 dBm</td><td>± 2 dB</td></tr>
<tr><td>MCS9</td><td>24 dBm</td><td>± 2 dB</td><td>MCS9</td><td>-95 dBm</td><td>± 2 dB</td></tr>
<tr><td>MCS10</td><td>23 dBm</td><td>± 2 dB</td><td>MCS10</td><td>-92 dBm</td><td>± 2 dB</td></tr>
<tr><td>MCS11</td><td>23 dBm</td><td>± 2 dB</td><td>MCS11</td><td>-90 dBm</td><td>± 2 dB</td></tr>
<tr><td>MCS12</td><td>22 dBm</td><td>± 2 dB</td><td>MCS12</td><td>-86 dBm</td><td>± 2 dB</td></tr>
<tr><td>MCS13</td><td>21 dBm</td><td>± 2 dB</td><td>MCS13</td><td>-83 dBm</td><td>± 2 dB</td></tr>
<tr><td>MCS14</td><td>20 dBm</td><td>± 2 dB</td><td>MCS14</td><td>-77 dBm</td><td>± 2 dB</td></tr>
<tr><td>MCS15</td><td>20 dBm</td><td>± 2 dB</td><td>MCS15</td><td>-74 dBm</td><td>± 2 dB</td></tr>
</table>

* Some frequencies may require activation; visit: **https://www.ubnt.com/fcclabelrequest**

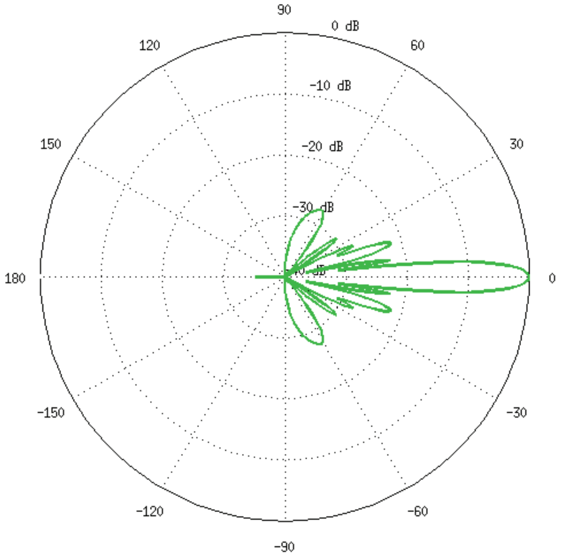
E-Plane



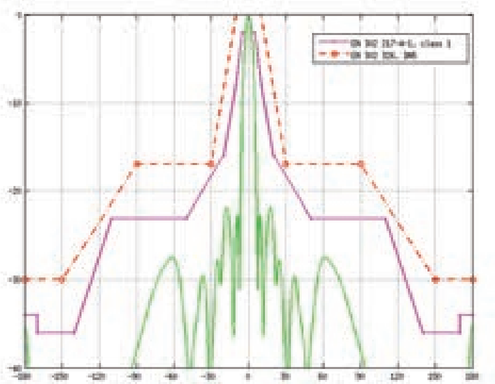
E-Plane Specs



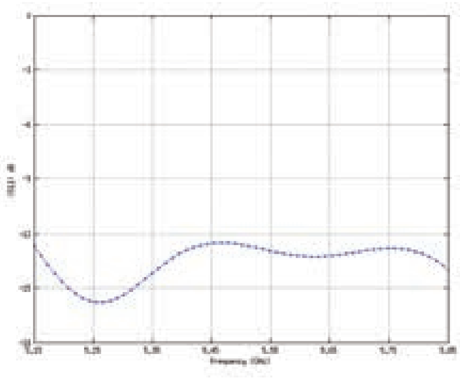
H-Plane



H-Plane Specs



Return Loss



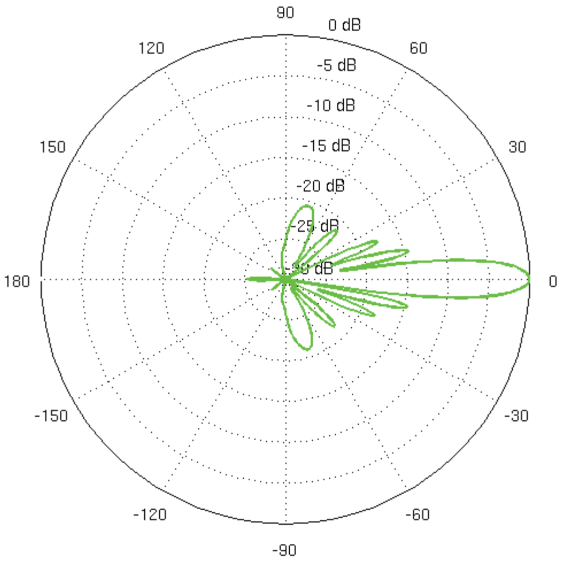
Specifications

<table>
<tr><th colspan="6">PBE-M5-400</th></tr>
<tr><td>Dimensions</td><td colspan="5">420 x 420 x 275 mm (16.54 x 16.54 x 10.83")</td></tr>
<tr><td>Weight</td><td colspan="5">1.753 kg (3.87 lb)</td></tr>
<tr><td>Power Supply</td><td colspan="5">24V, 0.5A Gigabit PoE</td></tr>
<tr><td>Max. Power Consumption</td><td colspan="5">8W</td></tr>
<tr><td rowspan="2">Operating Frequency</td><td>Worldwide</td><td>USA: U-NII-1</td><td>USA: U-NII-2A</td><td>USA: U-NII-2C</td><td>USA: U-NII-3</td></tr>
<tr><td>5150 - 5875 MHz</td><td>5150 - 5250 MHz*</td><td>5250 - 5350 MHz*</td><td>5470 - 5725 MHz*</td><td>5725 - 5850 MHz*</td></tr>
<tr><td>Gain</td><td colspan="5">25 dBi</td></tr>
<tr><td>Networking Interface</td><td colspan="5">(1) 10/100/1000 Ethernet Port</td></tr>
<tr><td>Processor Specs</td><td colspan="5">Atheros MIPS 74Kc, 560 MHz</td></tr>
<tr><td>Memory</td><td colspan="5">64 MB DDR2, 8 MB Flash</td></tr>
<tr><td>LEDs</td><td colspan="5">(1) Power, (1) LAN, (4) WLAN</td></tr>
<tr><td>Signal Strength LEDs</td><td colspan="5">Software-Adjustable to Correspond to Custom RSSI Levels</td></tr>
<tr><td>Max. VSWR</td><td colspan="5">1.5:1</td></tr>
<tr><td>Channel Sizes</td><td colspan="5">5/8/10/20/30/40 MHz</td></tr>
<tr><td>Polarization</td><td colspan="5">Dual Linear</td></tr>
<tr><td>Enclosure</td><td colspan="5">Outdoor UV Stabilized Plastic</td></tr>
<tr><td>Mounting</td><td colspan="5">Pole-Mount (Kit Included)</td></tr>
<tr><td>Wind Loading</td><td colspan="5">278.4 N @ 120 km/h (63 lbf @ 75 mph)</td></tr>
<tr><td>Wind Survivability</td><td colspan="5">120 km/h (75 mph)</td></tr>
<tr><td>ESD/EMP Protection</td><td colspan="5">Air: ± 24 kV, Contact: ± 24 kV</td></tr>
<tr><td>Operating Temperature</td><td colspan="5">-40 to 70° C (-40 to 158° F)</td></tr>
<tr><td>Operating Humidity</td><td colspan="5">5 to 95% Noncondensing</td></tr>
<tr><td>Wireless Approvals</td><td colspan="5">FCC, IC, CE</td></tr>
<tr><td>RoHS Compliance</td><td colspan="5">Yes</td></tr>
<tr><td>Salt Fog Test</td><td colspan="5">IEC 68-2-11 (ASTM B117), Equivalent: MIL-STD-810 G Method 509.5</td></tr>
<tr><td>Vibration Test</td><td colspan="5">IEC 68-2-6</td></tr>
<tr><td>Temperature Shock Test</td><td colspan="5">IEC 68-2-14</td></tr>
<tr><td>UV Test</td><td colspan="5">IEC 68-2-5 at 40° C (104° F), Equivalent: ETS 300 019-1-4</td></tr>
<tr><td>Wind-Driven Rain Test</td><td colspan="5">ETS 300 019-1-4, Equivalent: MIL-STD-810 G Method 506.5</td></tr>
</table>

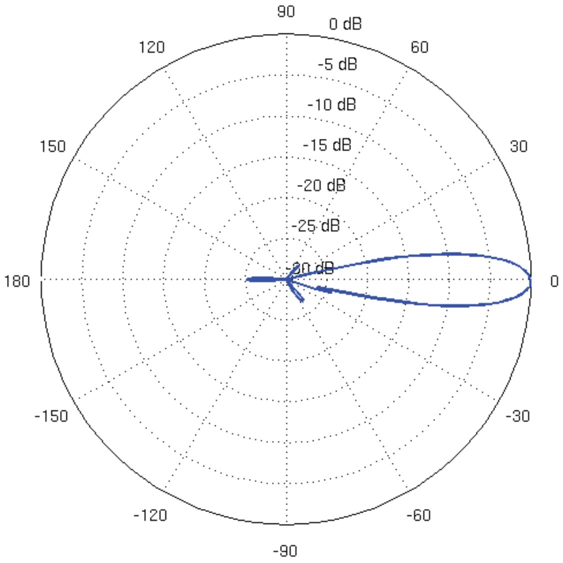
PBE-M5-400 Output Power: 26 dBm							
TX Power Specifications				RX Power Specifications			
Modulation	Data Rate	Avg. TX	Tolerance	Modulation	Data Rate	Sensitivity	Tolerance
802.11a	6 - 24 Mbps	26 dBm	± 2 dB	**802.11a**	6 - 24 Mbps	-94 dBm Min.	± 2 dB
	36 Mbps	25 dBm	± 2 dB		36 Mbps	-80 dBm	± 2 dB
	48 Mbps	24 dBm	± 2 dB		48 Mbps	-77 dBm	± 2 dB
	54 Mbps	23 dBm	± 2 dB		54 Mbps	-75 dBm	± 2 dB
802.11n/airMAX	MCS0	26 dBm	± 2 dB	**802.11n/airMAX**	MCS0	-96 dBm	± 2 dB
	MCS1	25 dBm	± 2 dB		MCS1	-95 dBm	± 2 dB
	MCS2	25 dBm	± 2 dB		MCS2	-92 dBm	± 2 dB
	MCS3	25 dBm	± 2 dB		MCS3	-90 dBm	± 2 dB
	MCS4	24 dBm	± 2 dB		MCS4	-86 dBm	± 2 dB
	MCS5	23 dBm	± 2 dB		MCS5	-83 dBm	± 2 dB
	MCS6	23 dBm	± 2 dB		MCS6	-77 dBm	± 2 dB
	MCS7	23 dBm	± 2 dB		MCS7	-74 dBm	± 2 dB
	MCS8	26 dBm	± 2 dB		MCS8	-95 dBm	± 2 dB
	MCS9	25 dBm	± 2 dB		MCS9	-93 dBm	± 2 dB
	MCS10	25 dBm	± 2 dB		MCS10	-90 dBm	± 2 dB
	MCS11	25 dBm	± 2 dB		MCS11	-87 dBm	± 2 dB
	MCS12	24 dBm	± 2 dB		MCS12	-84 dBm	± 2 dB
	MCS13	23 dBm	± 2 dB		MCS13	-79 dBm	± 2 dB
	MCS14	23 dBm	± 2 dB		MCS14	-78 dBm	± 2 dB
	MCS15	23 dBm	± 2 dB		MCS15	-75 dBm	± 2 dB

* Some frequencies may require activation; visit: **https://www.ubnt.com/fcclabelrequest**

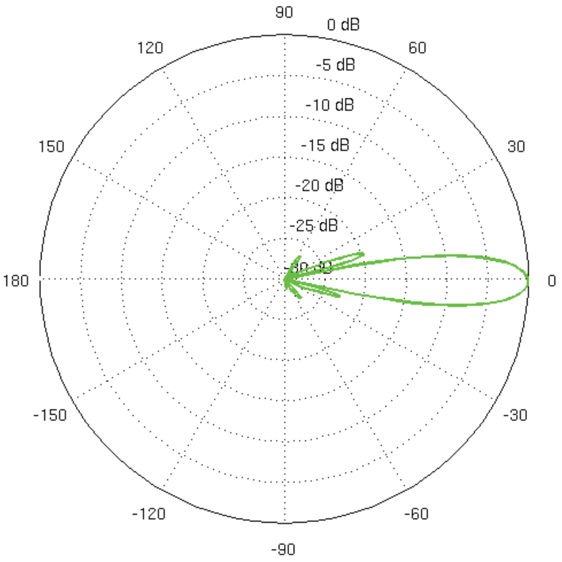
Vertical Azimuth



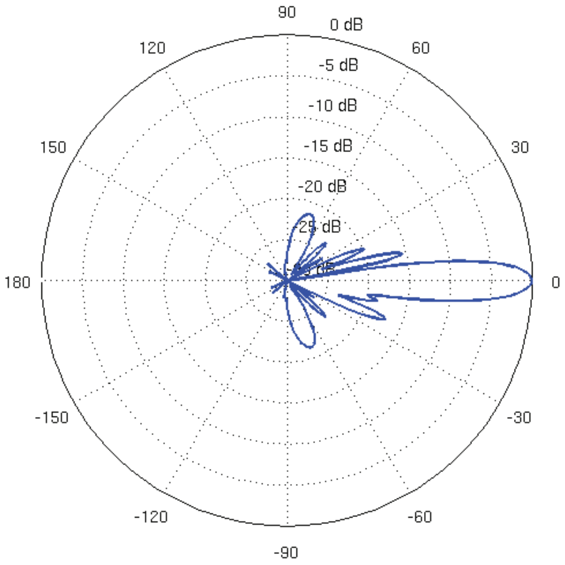
Vertical Elevation



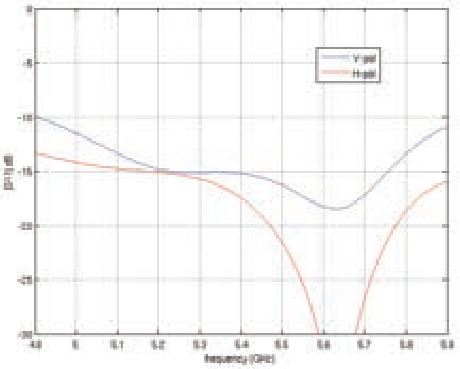
Horizontal Azimuth



Horizontal Elevation



Return Loss



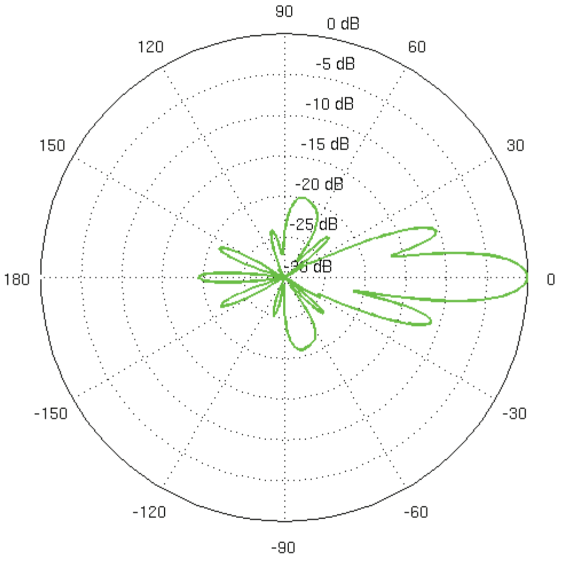
Specifications

PBE-M5-300					
Dimensions	325 x 325 x 256 mm (12.80 x 12.80 x 10.08")				
Weight	1.203 kg (2.65 lb)				
Power Supply	24V, 0.5A PoE				
Max. Power Consumption	6W				
Operating Frequency	Worldwide	USA: U-NII-1	USA: U-NII-2A	USA: U-NII-2C	USA: U-NII-3
	5150 - 5875 MHz	5150 - 5250 MHz*	5250 - 5350 MHz*	5470 - 5725 MHz*	5725 - 5850 MHz*
Gain	22 dBi				
Networking Interface	(1) 10/100 Ethernet Port				
Processor Specs	Atheros MIPS 74Kc, 560 MHz				
Memory	64 MB DDR2, 8 MB Flash				
LEDs	(1) Power, (1) LAN, (4) WLAN				
Signal Strength LEDs	Software-Adjustable to Correspond to Custom RSSI Levels				
Max. VSWR	1.5:1				
Channel Sizes	5/8/10/20/30/40 MHz				
Polarization	Dual Linear				
Enclosure	Outdoor UV Stabilized Plastic				
Mounting	Pole-Mount (Kit Included)				
Wind Loading	145.2 N @ 120 km/h (33 lbf @ 75 mph)				
Wind Survivability	120 km/h (75 mph)				
ESD/EMP Protection	Air: ± 24 kV, Contact: ± 24 kV				
Operating Temperature	-40 to 70° C (-40 to 158° F)				
Operating Humidity	5 to 95% Noncondensing				
Wireless Approvals	FCC, IC, CE				
RoHS Compliance	Yes				
Salt Fog Test	IEC 68-2-11 (ASTM B117), Equivalent: MIL-STD-810 G Method 509.5				
Vibration Test	IEC 68-2-6				
Temperature Shock Test	IEC 68-2-14				
UV Test	IEC 68-2-5 at 40° C (104° F), Equivalent: ETS 300 019-1-4				
Wind-Driven Rain Test	ETS 300 019-1-4, Equivalent: MIL-STD-810 G Method 506.5				

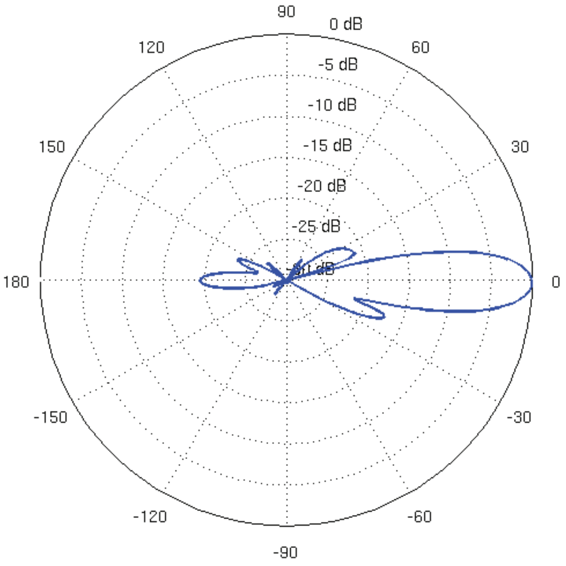
PBE-M5-300 Output Power: 26 dBm							
TX Power Specifications				RX Power Specifications			
Modulation	Data Rate	Avg. TX	Tolerance	Modulation	Data Rate	Sensitivity	Tolerance
802.11a	6 - 24 Mbps	26 dBm	± 2 dB	802.11a	6 - 24 Mbps	-94 dBm Min.	± 2 dB
	36 Mbps	25 dBm	± 2 dB		36 Mbps	-80 dBm	± 2 dB
	48 Mbps	24 dBm	± 2 dB		48 Mbps	-77 dBm	± 2 dB
	54 Mbps	23 dBm	± 2 dB		54 Mbps	-75 dBm	± 2 dB
802.11n/airMAX	MCS0	26 dBm	± 2 dB	802.11n/airMAX	MCS0	-96 dBm	± 2 dB
	MCS1	25 dBm	± 2 dB		MCS1	-95 dBm	± 2 dB
	MCS2	25 dBm	± 2 dB		MCS2	-92 dBm	± 2 dB
	MCS3	25 dBm	± 2 dB		MCS3	-90 dBm	± 2 dB
	MCS4	24 dBm	± 2 dB		MCS4	-86 dBm	± 2 dB
	MCS5	23 dBm	± 2 dB		MCS5	-83 dBm	± 2 dB
	MCS6	23 dBm	± 2 dB		MCS6	-77 dBm	± 2 dB
	MCS7	23 dBm	± 2 dB		MCS7	-74 dBm	± 2 dB
	MCS8	26 dBm	± 2 dB		MCS8	-95 dBm	± 2 dB
	MCS9	25 dBm	± 2 dB		MCS9	-93 dBm	± 2 dB
	MCS10	25 dBm	± 2 dB		MCS10	-90 dBm	± 2 dB
	MCS11	25 dBm	± 2 dB		MCS11	-87 dBm	± 2 dB
	MCS12	24 dBm	± 2 dB		MCS12	-84 dBm	± 2 dB
	MCS13	23 dBm	± 2 dB		MCS13	-79 dBm	± 2 dB
	MCS14	23 dBm	± 2 dB		MCS14	-78 dBm	± 2 dB
	MCS15	23 dBm	± 2 dB		MCS15	-75 dBm	± 2 dB

* Some frequencies may require activation; visit: **https://www.ubnt.com/fcclabelrequest**

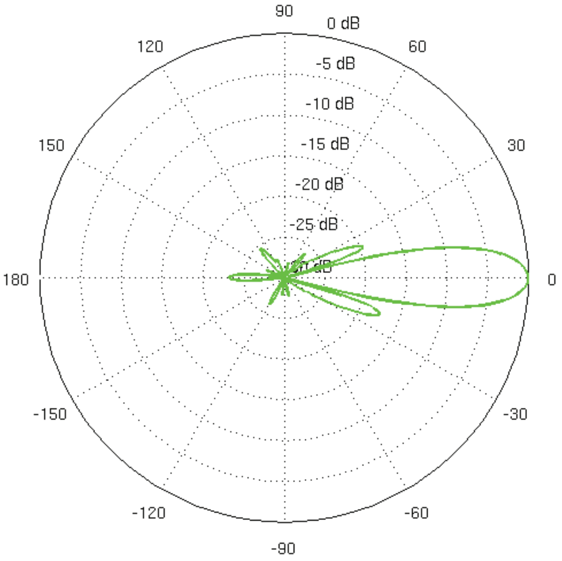
Vertical Azimuth



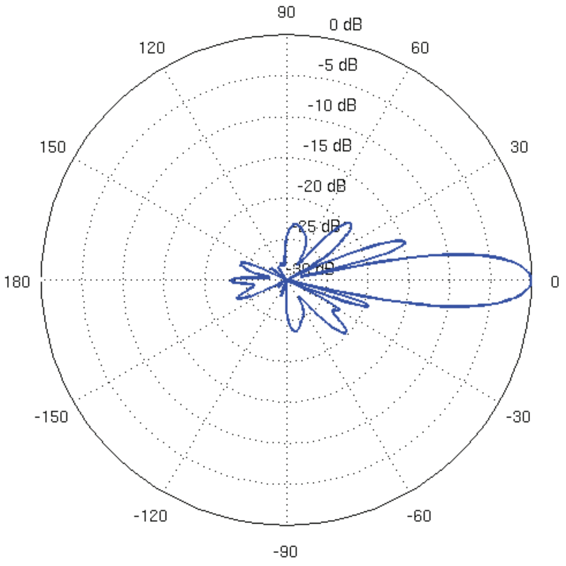
Vertical Elevation



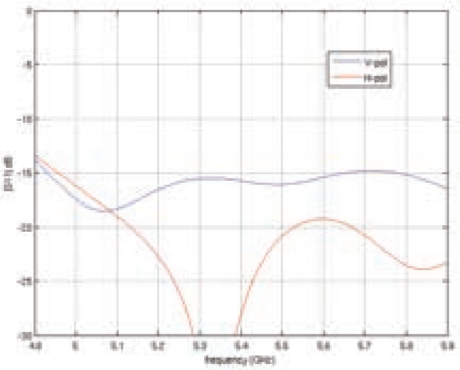
Horizontal Azimuth



Horizontal Elevation



Return Loss



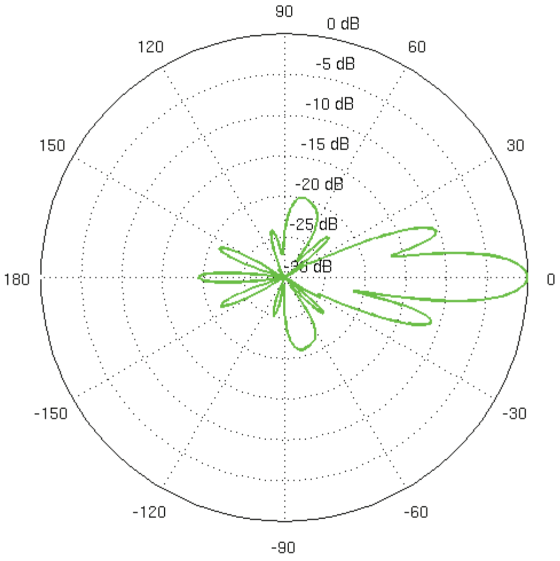
Specifications

PBE-M2-400	
Dimensions	420 x 420 x 289 mm (16.54 x 16.54 x 11.38")
Weight	1.795 kg (3.96 lb)
Power Supply	24V, 0.5A PoE
Max. Power Consumption	6W
Operating Frequency	2405-2475 MHz
Gain	18 dBi
Networking Interface	(1) 10/100 Ethernet Port
Processor Specs	Atheros MIPS 74Kc, 560 MHz
Memory	64 MB DDR2, 8 MB Flash
LEDs	(1) Power, (1) LAN, (4) WLAN
Signal Strength LEDs	Software-Adjustable to Correspond to Custom RSSI Levels
Max. VSWR	1.5:1
Channel Sizes	5/8/10/20/30/40 MHz
Polarization	Dual Linear
Enclosure	Outdoor UV Stabilized Plastic
Mounting	Pole-Mount (Kit Included)
Wind Loading	278.4 N @ 120 km/h (63 lbf @ 75 mph)
Wind Survivability	120 km/h (75 mph)
ESD/EMP Protection	Air: ± 24 kV, Contact: ± 24 kV
Operating Temperature	-40 to 70° C (-40 to 158° F)
Operating Humidity	5 to 95% Noncondensing
Wireless Approvals	FCC, IC, CE
RoHS Compliance	Yes
Salt Fog Test	IEC 68-2-11 (ASTM B117), Equivalent: MIL-STD-810 G Method 509.5
Vibration Test	IEC 68-2-6
Temperature Shock Test	IEC 68-2-14
UV Test	IEC 68-2-5 at 40° C (104° F), Equivalent: ETS 300 019-1-4
Wind-Driven Rain Test	ETS 300 019-1-4, Equivalent: MIL-STD-810 G Method 506.5

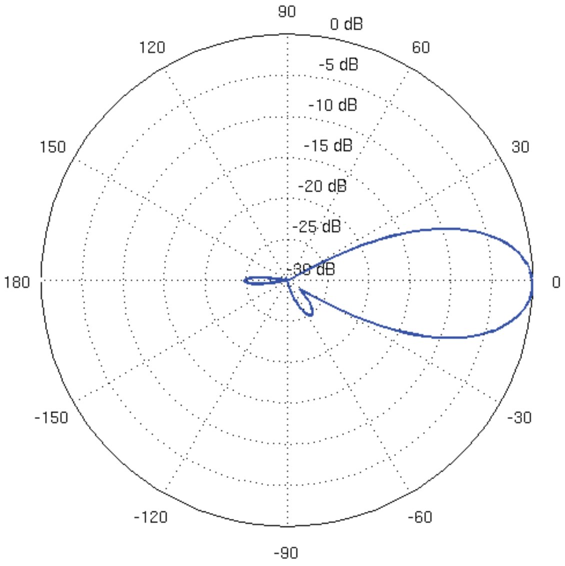
PBE-M2-400 Output Power: 28 dBm

TX Power Specifications				RX Power Specifications			
Modulation	Data Rate	Avg. TX	Tolerance	Modulation	Data Rate	Sensitivity	Tolerance
802.11g	1 - 24 Mbps	28 dBm	± 2 dB	**802.11g**	1 - 24 Mbps	-97 dBm Min.	± 2 dB
	36 Mbps	26 dBm	± 2 dB		36 Mbps	-80 dBm	± 2 dB
	48 Mbps	25 dBm	± 2 dB		48 Mbps	-77 dBm	± 2 dB
	54 Mbps	24 dBm	± 2 dB		54 Mbps	-75 dBm	± 2 dB
802.11n/airMAX	MCS0	28 dBm	± 2 dB	**802.11n/airMAX**	MCS0	-96 dBm	± 2 dB
	MCS1	28 dBm	± 2 dB		MCS1	-95 dBm	± 2 dB
	MCS2	28 dBm	± 2 dB		MCS2	-92 dBm	± 2 dB
	MCS3	28 dBm	± 2 dB		MCS3	-90 dBm	± 2 dB
	MCS4	27 dBm	± 2 dB		MCS4	-86 dBm	± 2 dB
	MCS5	25 dBm	± 2 dB		MCS5	-83 dBm	± 2 dB
	MCS6	23 dBm	± 2 dB		MCS6	-77 dBm	± 2 dB
	MCS7	22 dBm	± 2 dB		MCS7	-74 dBm	± 2 dB
	MCS8	28 dBm	± 2 dB		MCS8	-95 dBm	± 2 dB
	MCS9	28 dBm	± 2 dB		MCS9	-93 dBm	± 2 dB
	MCS10	28 dBm	± 2 dB		MCS10	-90 dBm	± 2 dB
	MCS11	28 dBm	± 2 dB		MCS11	-87 dBm	± 2 dB
	MCS12	27 dBm	± 2 dB		MCS12	-84 dBm	± 2 dB
	MCS13	25 dBm	± 2 dB		MCS13	-79 dBm	± 2 dB
	MCS14	23 dBm	± 2 dB		MCS14	-78 dBm	± 2 dB
	MCS15	22 dBm	± 2 dB		MCS15	-75 dBm	± 2 dB

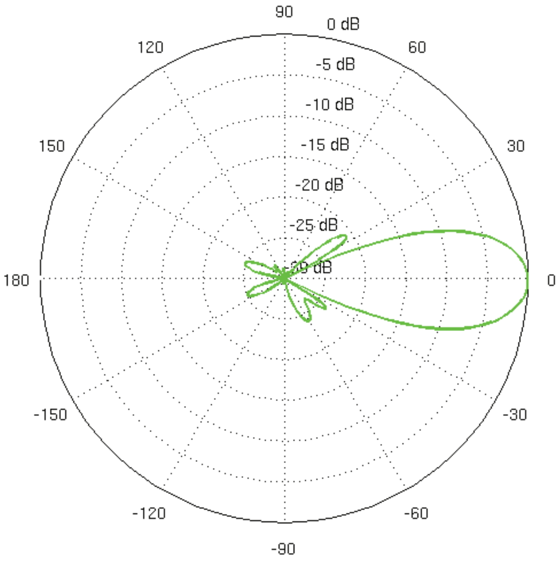
Vertical Azimuth



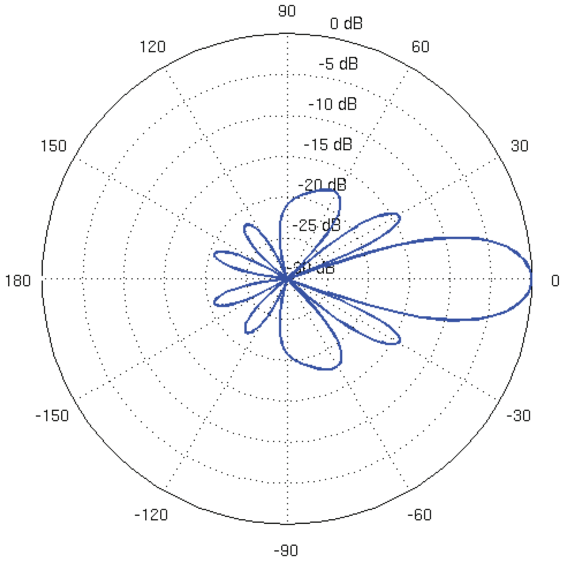
Vertical Elevation



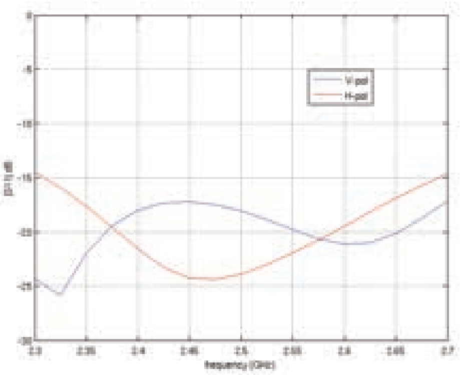
Horizontal Azimuth



Horizontal Elevation



Return Loss



TOUGHCable™

Outdoor Carrier Class Shielded Ethernet Cable

Models: PRO, CARRIER, Connectors

Increase Performance

Extreme Weatherproof

ESD Damage Protection

Extended Cable Support

UBIQUITI® NETWORKS

TOUGHCable™

OUTDOOR CARRIER CLASS SHIELDED

Protect your networks from the most brutal environments with Ubiquiti's industrial-grade shielded Ethernet cable, TOUGHCable™.

Increase Performance
Dramatically improve your Ethernet link states, speeds, and overall performance with Ubiquiti TOUGHCables.

Extreme Weatherproof
TOUGHCables have been built to perform even in the harshest weather and environments.

ESD Damage Protection
Protect your networks from devastating electrostatic discharge (ESD) attacks.

Extended Cable Support
TOUGHCables have been developed to increase power handling performance for extended cable run lengths.

TOUGHCable Connectors

Specifically designed for use with Ubiquiti TOUGHCables and available in 100-pc. bags, TOUGHCable Connectors protect against ESD attacks and Ethernet hardware damage while allowing rapid field deployment without soldering.

Bulletproof your networks

TOUGHCable is currently available in two versions: PRO Shielding Protection and CARRIER Shielding Protection.

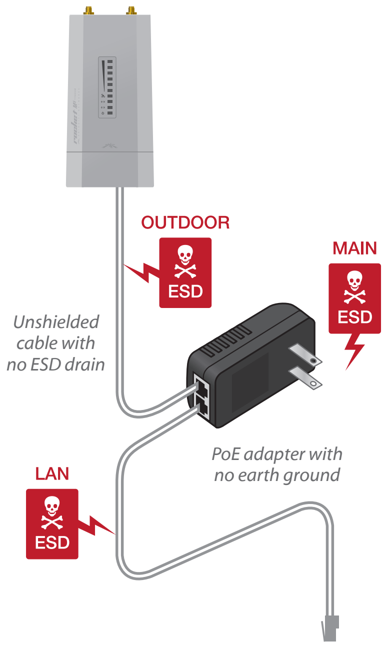
TOUGHCable PRO
A Category 5e, outdoor, carrier-class shielded cable with an integrated ESD drain wire.

TOUGHCable CARRIER
A Category 5e, outdoor, carrier-class shielded cable that features an integrated ESD drain wire, anti-crosstalk divider, and secondary shielding. It is rated to provide optimal performance on Gigabit Ethernet networks.

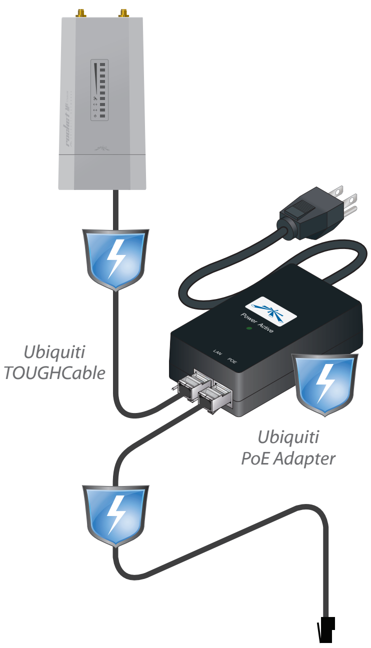
Additional Information:

- 24 AWG copper conductor pairs
- 26 AWG integrated ESD drain wire to prevent ESD attacks and damage
- PE outdoor-rated, weatherproof jacket
- Multi-layered shielding
- Available in lengths of 1000 ft (304.8 m)

ESD attacks are the leading cause for device failures. The diagram below illustrates the areas vulnerable to ESD attacks in a network.



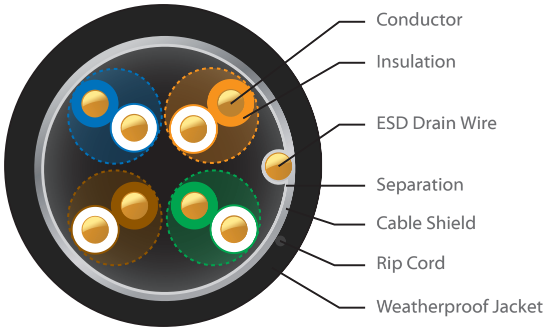
By using a grounded Ubiquiti Power over Ethernet (PoE) Adapter along with Ubiquiti TOUGHCable and TOUGHCable Connectors, you can effectively protect against ESD attacks.



Specifications

TOUGHCable PRO Specifications		
Level 1 Shielding Protection	Cable	CAT5e, Shielded
	Ethernet Support	Up to 1 Gbps
	Conductor Wire Gauge	24 AWG
	Conductor	Solid Bare Copper
	Conductor Diameter	0.500 ± 0.005 mm
	Insulation Type	Solid PE
	Insulation Thickness	AVG: 0.26 mm, MIN: 0.25 mm
	Insulation Diameter	1.04 ± 0.03 mm
	Separation (Polyester Wrapping)	Thick: 0.025 mm, Extent: 20 mm
	Anti-Crosstalk Divider	None
	Cable Shield (Aluminum Foil)	Thick: 0.060 mm, Extent: 18 mm
	ESD Drain Wire	0.4 CCS
	Rip Cord	Yes
	Jacket Material	PE
	Jacket Thickness	AVG: 0.50 mm, MIN: 0.46 mm
	Jacket Outer Diameter	6.0 ± 0.30 mm
	Jacket Color	Black
	Reference Standard	ISO/IEC 11801, TIA/EIA568B.2

PRO Performance					
Frequency (MHz)	RL (dB) min.	Attenuation (dB/100 m)	NEXT/PSNEXT (dB)	ACR (dB)	ELFEXT/PSELFEXT (dB/100 m)
1	17.0	2.03	62.30	60.30	60.75
4	18.8	4.04	53.26	49.20	48.71
8	19.7	5.76	48.75	43.00	42.69
10	20.0	6.46	47.30	40.80	40.75
16	20.0	8.24	44.30	36.10	36.67
20	20.0	9.26	42.78	33.50	34.73
25	19.3	10.41	41.33	30.90	32.79
31.25	18.6	11.72	39.87	28.20	30.86
62.5	16.5	16.99	35.36	18.40	24.83
100	15.1	21.97	32.29	10.30	20.75
150	13.80	23.40	18.60/30.30	8.30	17.60/18.50

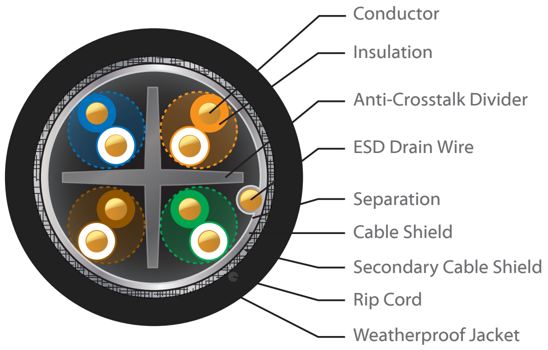


TOUGHCableCARRIER

Specifications

TOUGHCable CARRIER Specifications		
Level 2 Shielding Protection	Cable	CAT5e, Shielded
	Ethernet Support	Up to 1 Gbps
	Conductor Wire Gauge	24 AWG
	Conductor	Solid Bare Copper
	Conductor Diameter	0.500 ± 0.005 mm
	Insulation Type	Solid PE
	Insulation Thickness	AVG: 0.295 mm, MIN: 0.29 mm
	Insulation Diameter	1.16 ± 0.02 mm
	Separation (Polyester Wrapping)	Thick: 0.025 mm, Extent: 20 mm
	Anti-Crosstalk Divider	LDPE: 4.2*0.3 mm
	Cable Shield (Aluminum Foil)	Thick: 0.060 mm, Extent: 20 mm
	ESD Drain Wire	0.4 TC
	Rip Cord	Yes
	Secondary Cable Shield (Braid)	16*8*0.16AA Density: 95%
	Jacket Material	PE
	Jacket Thickness	AVG: 0.52 mm, MIN: 0.46 mm
	Jacket Outer Diameter	6.8 ± 0.30 mm
	Jacket Color	Black
	Reference Standard	ISO/IEC 11801, TIA/EIA568B.2

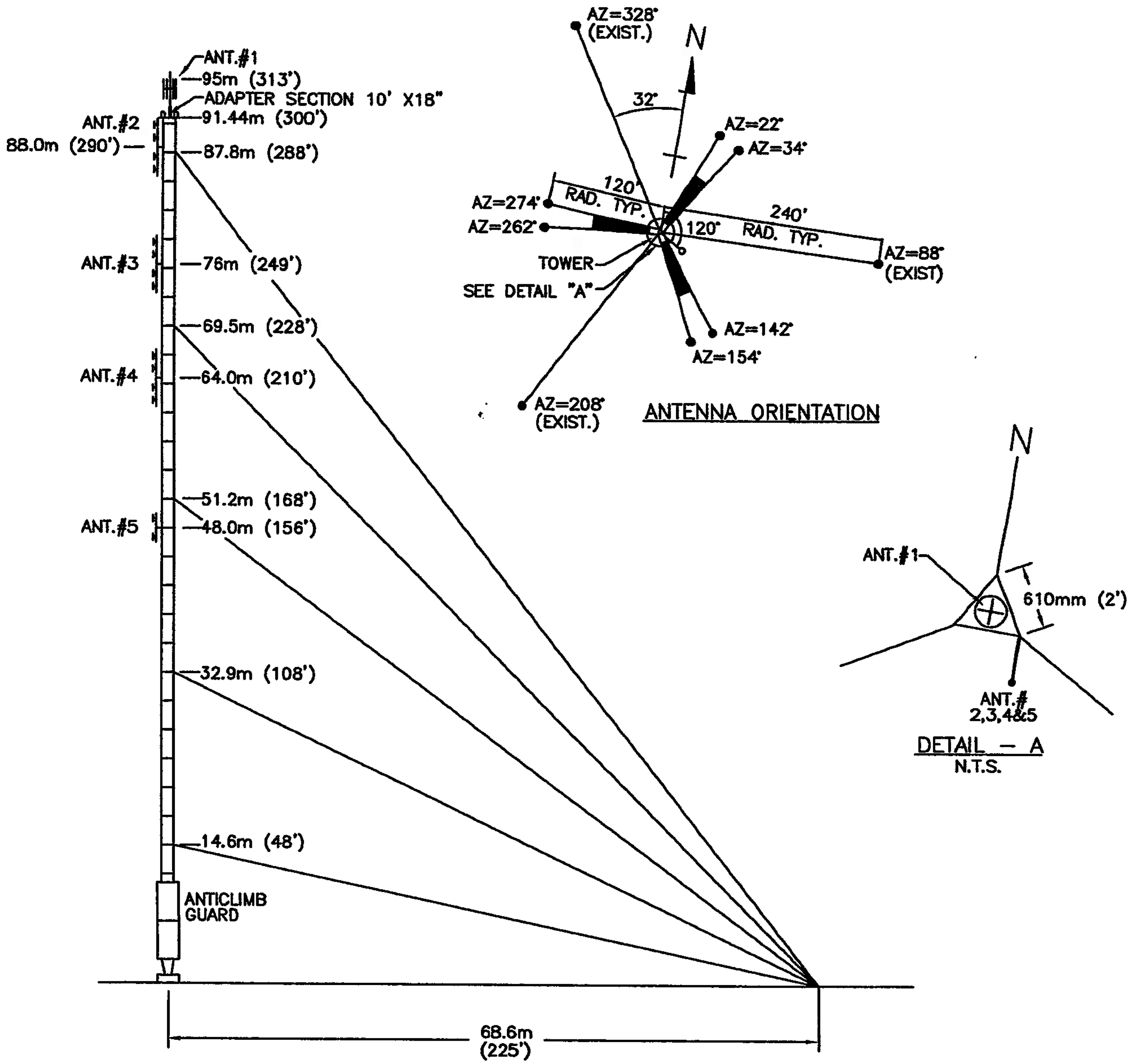
CARRIER Performance					
Frequency (MHz)	RL (dB) min.	Attenuation (dB/100 m)	NEXT/PSNEXT (dB)	ACR (dB)	ELFEXT/PSELFEXT (dB/100 m)
1	18.0	1.93	65.30	60.30	61.00
4	19.9	3.90	56.27	49.20	48.96
8	20.7	5.50	51.75	43.00	42.94
10	21.0	6.30	50.30	40.80	41.00
16	21.0	8.00	47.24	36.10	36.92
20	21.0	9.00	45.78	33.50	34.98
25	20.3	10.20	44.33	30.90	33.04
31.25	19.5	11.50	42.88	28.20	31.10
62.5	19.0	16.70	38.36	18.40	25.08
100	18.3	21.70	35.30	10.30	21.00
200	16.5	32.20	30.78/27.78	7.60	17.78/14.98



APPENDIX F: EXISTING TOWER DRAWINGS

CAD PRODUCED DRAWING
FAIT PAR CAD

REPORT ANY ERRORS OR OMISSIONS TO DRAFTING OFFICE
SIGNALER LES ERREURS OU LES OMISSIONS A BUREAU DE DESSIN



ANTENNA ORIENTATION

DETAIL – A
N.T.S.

Canadian Coast Guard — Garde Côtière Canadienne

LIST OF MATERIALS
LISTE DU MATERIEL

qty quant.	item article	description description	part no. no piece	reference reference

NOTES:

1. LIST OF FREQUENCIES (MHz):

		TRANSMIT	RECEIVE
CANADIAN COAST GUARD	CH16	156.800	156.800
	CH22	157.100	157.100
	CH82	157.175	157.175
	CH21B	161.650	
	CH65A	156.275	156.275
	CH27	161.950	157.350
	CH85	161.875	157.275
HAMILTON TOWNSHIP NORTHUMBERLAND COUNTY		151.235	151.235

2. COBOURG PERIPHERAL IS CONTROLLED BY PRESCOTT CGRS (VBR).
3. TOWER UPGRADED MARCH 1995 BY ADVANCED TOWERS. WORK INCLUDED ADDING A LADDER, FALL ARRESTOR, ANTICLIMB PANELS, FLASHING BEACON LIGHTS AT THE TOP, TLC LIGHTING CONTROLLER AND A STATIC DISSIPATOR L&R PP32.
4. LEC STATIC DISSIPATIVE ARRAY & SPLINE BALL ADDED.
5. MAY 1999 OAR DF SYSTEM & ANTENNA AAT301FW INSTALLED. LEC SPLINE BALL REMOVED.

REFERENCE DWGS:

FOR DRAWINGS OF THE ANTICLIMB & LADDER ASSEMBLIES SEE CM000-041-DE.
SEE SITE DWGS FOR PARTICULARS ON LEC INSTALLATION

no. no	eco no. eco no	revision revision	date date	by par	approved approuve
D		ADDITIONS PER NOTE 4	08-14-96	SF	
F		CHANGES TO NOTE 1	05-21-99	JW	BH
E		CH26 & CH88 TO CH65A & CH85	11-13-98	SW	MJ

TELECOMMUNICATIONS AND ELECTRONICS BRANCH
DIRECTION DES TELECOMMUNICATIONS ET DE L'ELECTRONIQUE

COBOURG
MARINE PERIPHERAL
ANTENNA LAYOUT

date – date	drawn – dessine	checked – verifie		approved approuve
05-04-83	P. PONTICELLI	08-07-83	W.N. MASON	D.P.

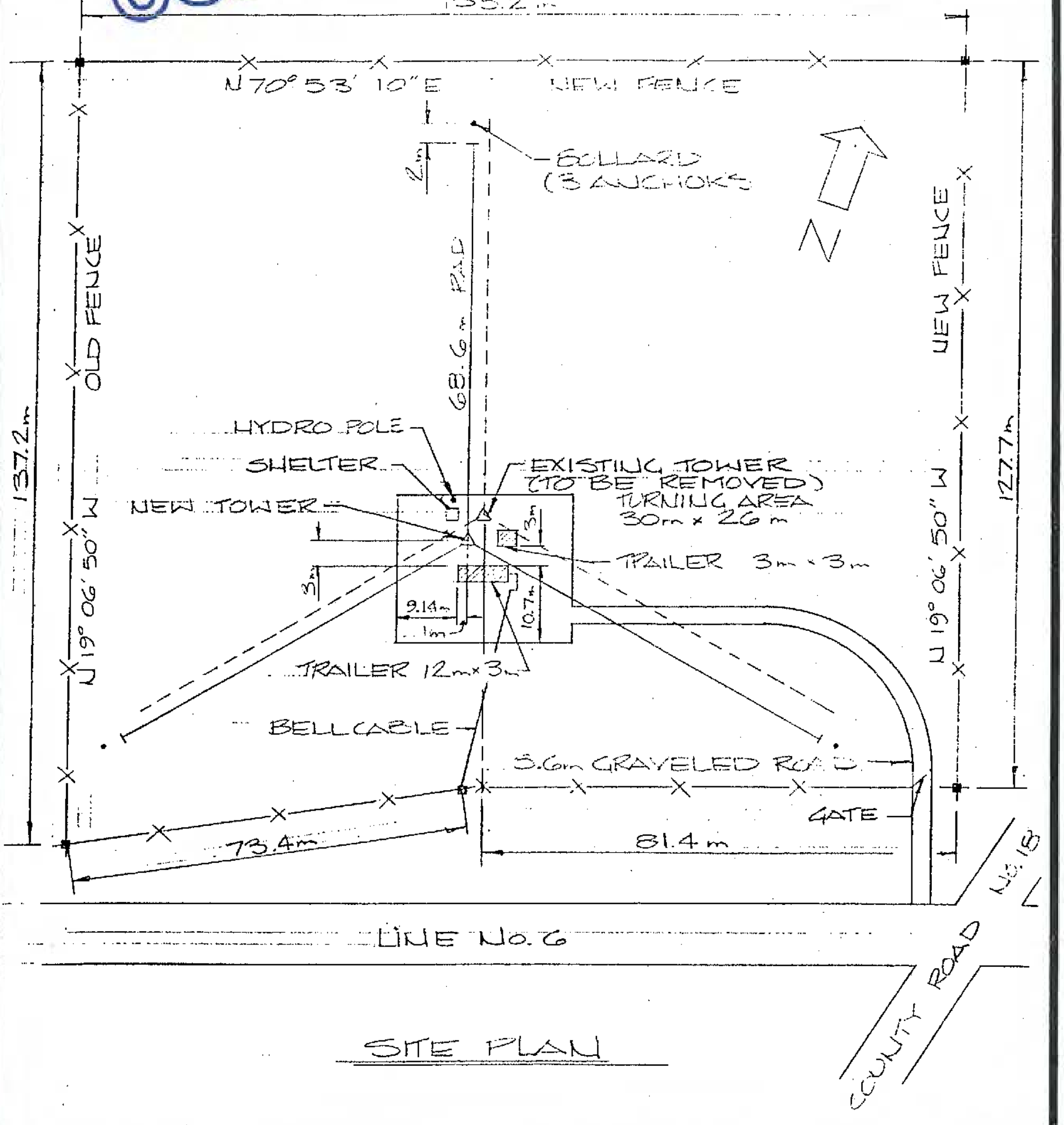
scale – echelle	reference – reference		drawing no. – no du dessin	sheet feuille
3=1000	CM450-001-PP	A2	CM450-001-AL	1/2

Canada

EWT 8032-45D

COPY

FILE NO.
86-0-045



SITE PLAN

LeBLANC & ROYLE TELCOM INC.
514 CHARTWELL ROAD, P.O. BOX 880
OAKVILLE, ONTARIO, CANADA L6J 5C5

CANADIAN COAST GUARD
SITE PLAN
COLD SPRINGS ONT.

0	FEB 25 86	DRAWN DRP	CHECKED RC
REV.	DATE	DESCRIPTION	

SCALE NTS

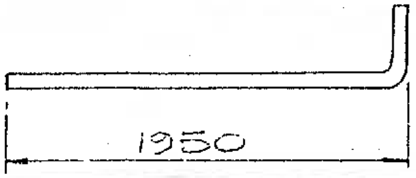
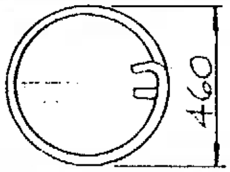
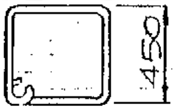
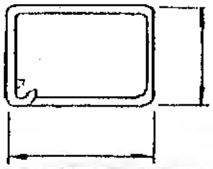
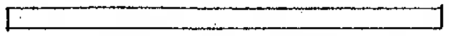
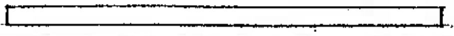
DRAWING NO. 24A1576-S1

ISSUE 0

AVE8107

FILE NO.
86-0-045

BAR LIST FOR REINFORCING STEEL

TAG Nº	BAR SIZE	TYPE	TOTAL LENGTH OF BAR	BENDING DIAGRAM	QTY. REQ'D
BASE	20M	BENT	2250		6
BASE	10 M	TIES	1610	135° HOOKS AT BOTH END 	7
ANCHOR	10 M	STIRRUP	1905	 SQUARE 135° HOOKS AT BOTH ENDS	
		STIRRUP		 135° HOOKS AT BOTH ENDS	
BASE	20 M	STRAIGHTS	1350		12
ANCHOR	20 M	STRAIGHTS	2250		21

SUBSTITUTION OF IMPERIAL FOR METRIC SIZES

METRIC	IMPERIAL	METRIC	IMPERIAL
10M	#4		
15M	#4		
20M	#6		
25M	#8		

GENERAL NOTES:

1.) EMBEDDED STRUCTURAL ANCHOR STEEL SUPPLIED BY LEBLANC & ROYLE. ALL OTHER MATERIAL TO BE SUPPLIED BY FOUNDATION CONTRACTOR.

2.) REINFORCING MATERIAL SHALL BE IN ACCORDANCE WITH C.S.A. STANDARD A

0	FEB 24 86	DRAWN DRP CHECKED RC
REV.	DATE	DESCRIPTION

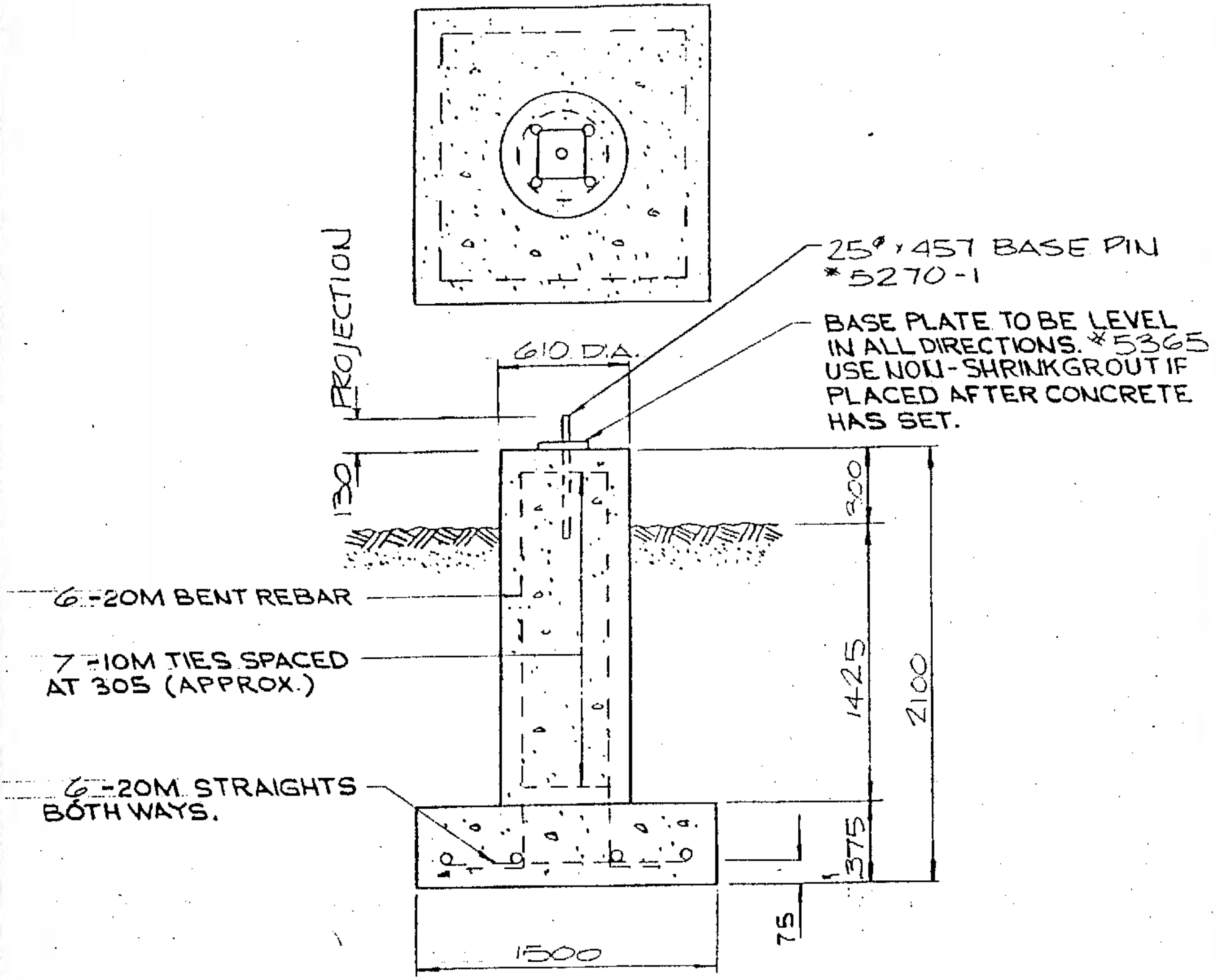
LeBLANC
LeBLANC & ROYLE TEL
514 CHARTWELL ROAD, P.O. BOX 82
OAKVILLE, ONTARIO, CANADA L6J 5C5

CANADIAN COAST GUARD
REBAR LIST
COLD SPRINGS, ONT

SCALE	DRAWING NO.	ISSUE
NTS	24A1576-F3	0

FILE NO.
86-0-045

ESTIMATED VOLUME OF CONCRETE = 1.6 m³



GENERAL NOTES:

1). CONCRETE IS TO HAVE A MINIMUM COMPRESSIVE STRENGTH OF 20 MPa AT 28 DAYS.
2.) REINFORCED CONCRETE CONSTRUCTION AND MATERIAL SHALL BE IN ACCORDANCE WITH C.S.A. STANDARD A23.1.
3.) MINIMUM CONCRETE OVER REBAR IS 75.
4.) POUR CONCRETE PAD ON UNDISTURBED SOIL.
5.) FOUNDATION DESIGNED FOR 192 kPa (4000 P.S.F) ALLOWABLE BEARING CAPACITY.

REV.	DATE	DESCRIPTION	
0	FEB 24 86	DRAWN DRP	CHECKED RC

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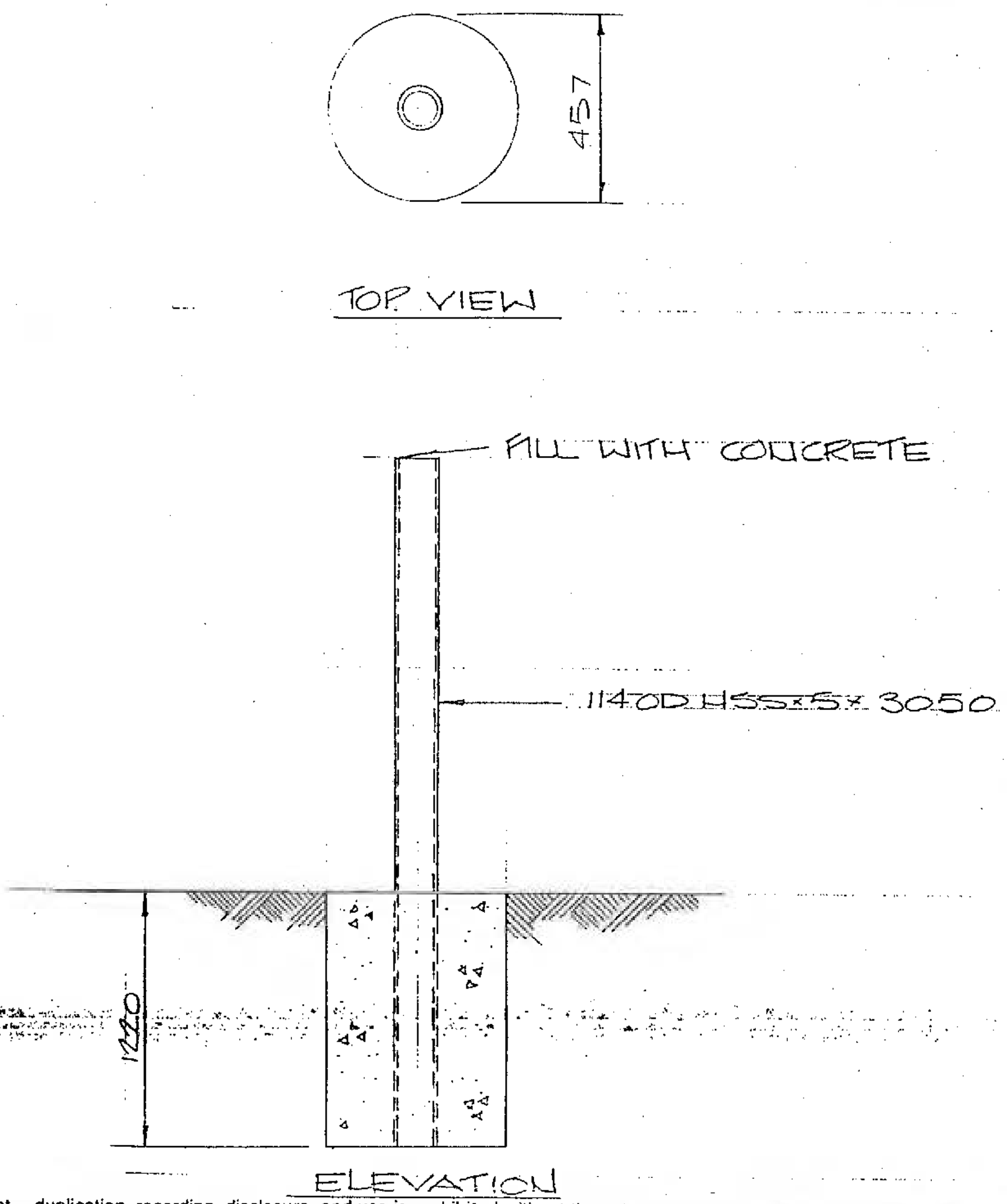
CANADIAN COAST GUARD
BASE FOUNDATION
COLD SPRINGS, ONT

SCALE: NTS.
DRAWING NO.: 24A1576-F1
ISSUE: C

FILE NO.
86-0-045



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NOTE: FOR TOLERANCES SEE DWG. ES.12

0	APR 4 86	DRAWN DRP	CHECKED RL
REV.	DATE	DESCRIPTION	

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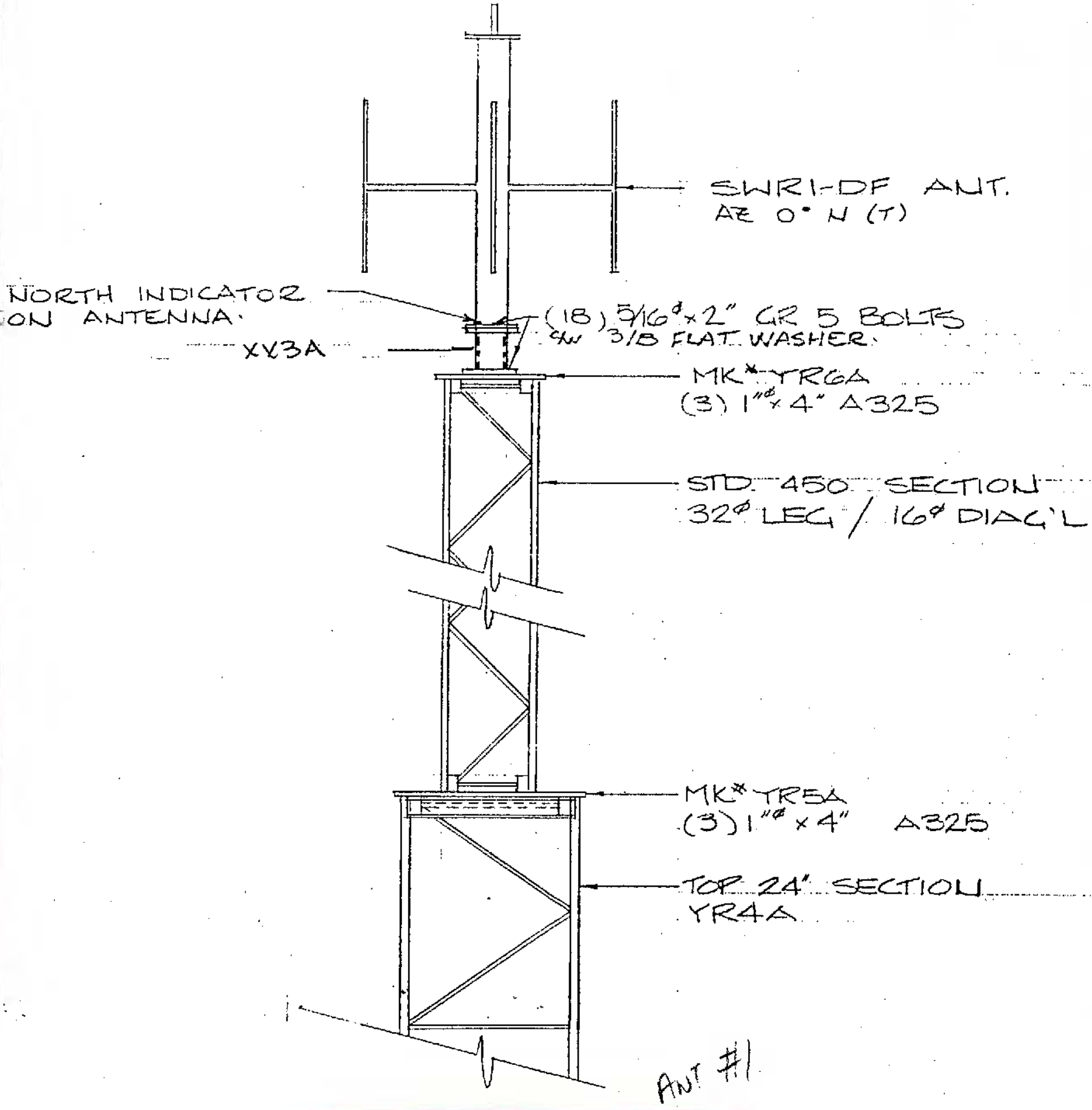
CANADIAN COAST GUARD
BOLLARD ERECTION
COLD SPRINGS, ONT

SCALE	DRAWING NO.	ISSUE
NTS	24A1576-E8	0

AE8512

FILE NO.
86-0-045



SWRI-DF ANT. MTG.

NOTE: FOR TOLERANCES SEE DWG. ES.12

REV.	DATE	DESCRIPTION
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0	MAR 22 86	DRAWN DRK CHECKED RC

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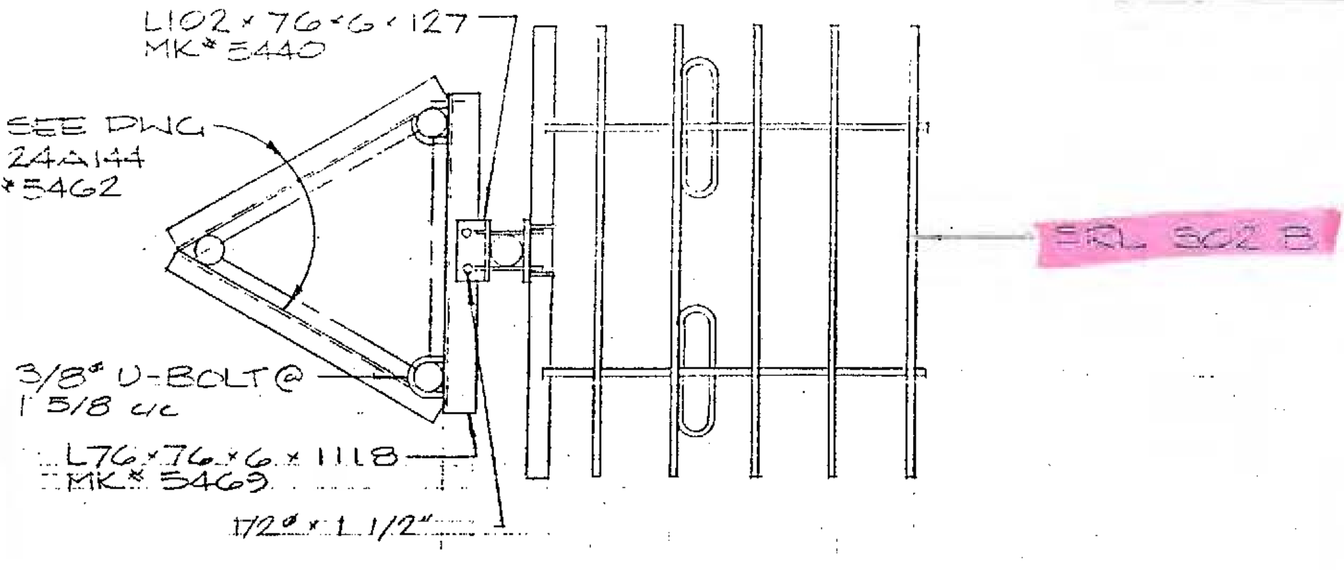
CANADIAN COAST GUARD
SWRI-DF ANT MTG.
COLD SPRINGS. ONT.

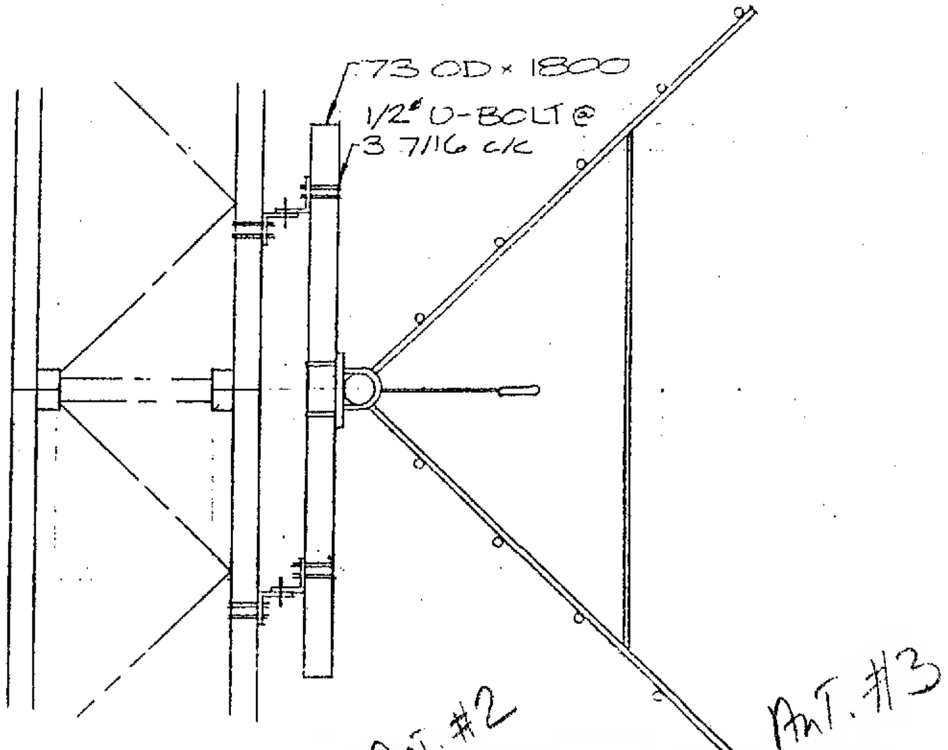
SCALE: NTS
DRAWING NO.: 2AA1576-E7
ISSUE: 1

AIE8512

FILE NO.
86-0-045



PLAN



ELEVATION

SRL 302 B @ ELEV 90m & 76.2m

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LeBLANC & ROYLE TELCOM INC.
514 CHARTWELL ROAD, P.O. BOX 880
OAKVILLE, ONTARIO, CANADA L6J 5C5

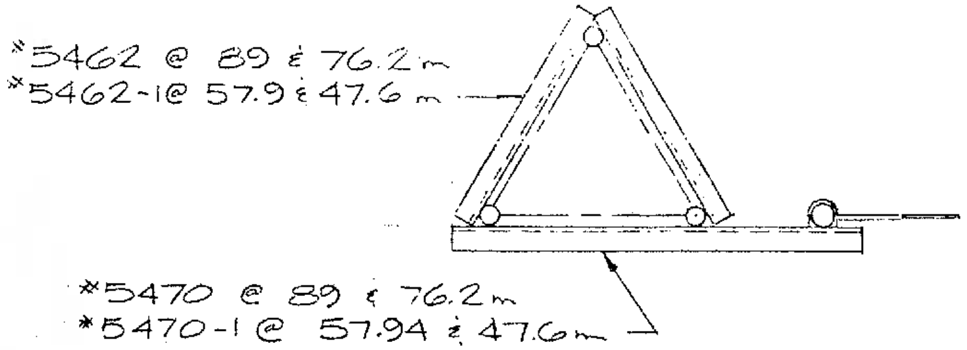
CANADIAN COAST GUARD
ANT. MTG SRL 302 B
COLD SPRINGS, ONT

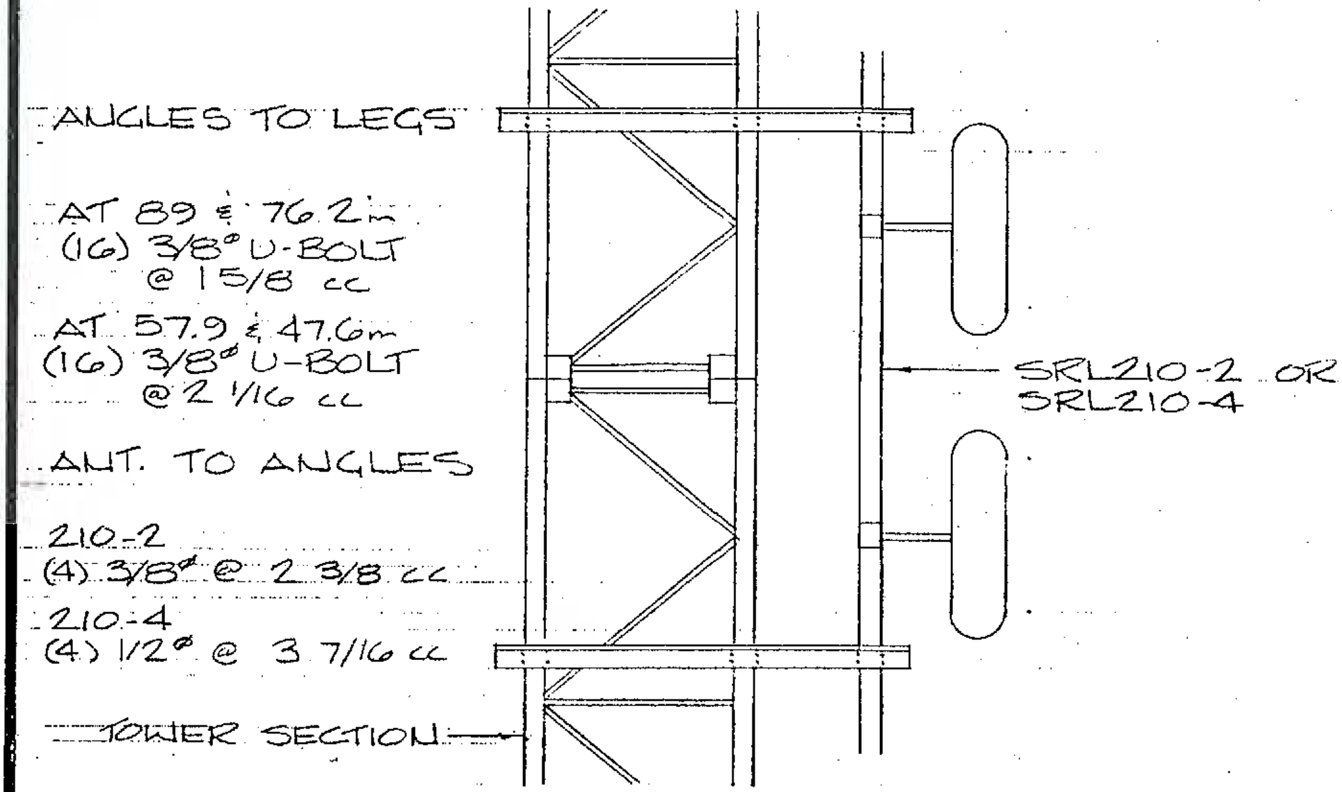
REV.	DATE	DESCRIPTION	
●	FEB 27 86	DRAWN DJP	CHECKED RC

SCALE NTS
DRAWING NO. 24A1576-E6
ISSUE C

AIE8107

FILE NO.
86-0-045





ELEVATION

NOTE: FOR TOLERANCES SEE DWG. ES.12

REV.	DATE	DESCRIPTION	
0	MAR 26 86	DRAWN DRF	CHECKED RC

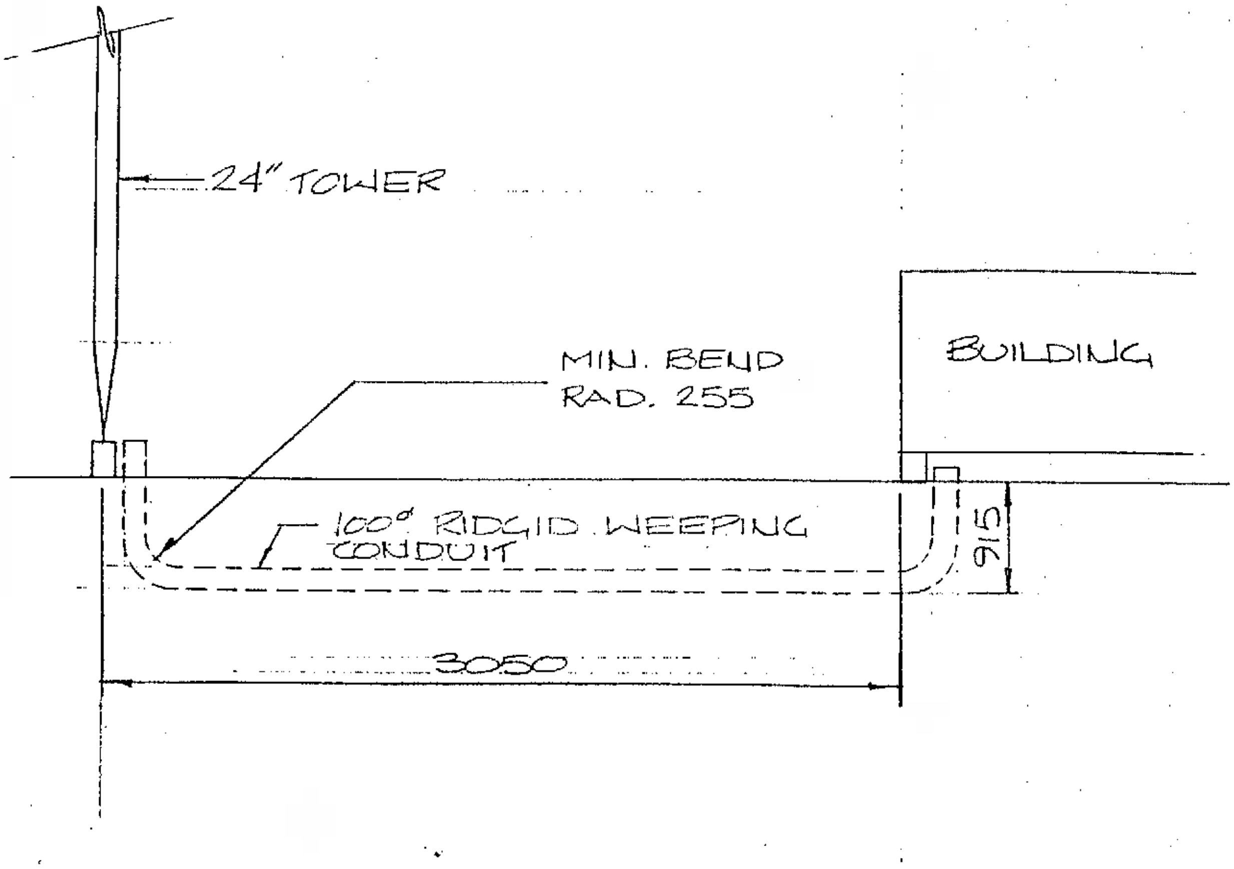
LeBLANC
LeBLANC & ROYLE TELCOM INC.
514 CHARTWELL ROAD, P.O. BOX 880
OAKVILLE, ONTARIO, CANADA L6J 5C5

CANADIAN COAST GUARD
ANT. MTG SRL210-2/210-4
COLD SPRINGS, ONT.

SCALE	DRAWING NO.	ISSUE
NTS	24A1576-E5	0

AIE8512

FILE NO.
86-0-045



NOTE: FOR TOLERANCES SEE DWG. ES.12

REV.	DATE	DESCRIPTION	
0	APR 9 86	DRAWN DRP	CHECKED RL

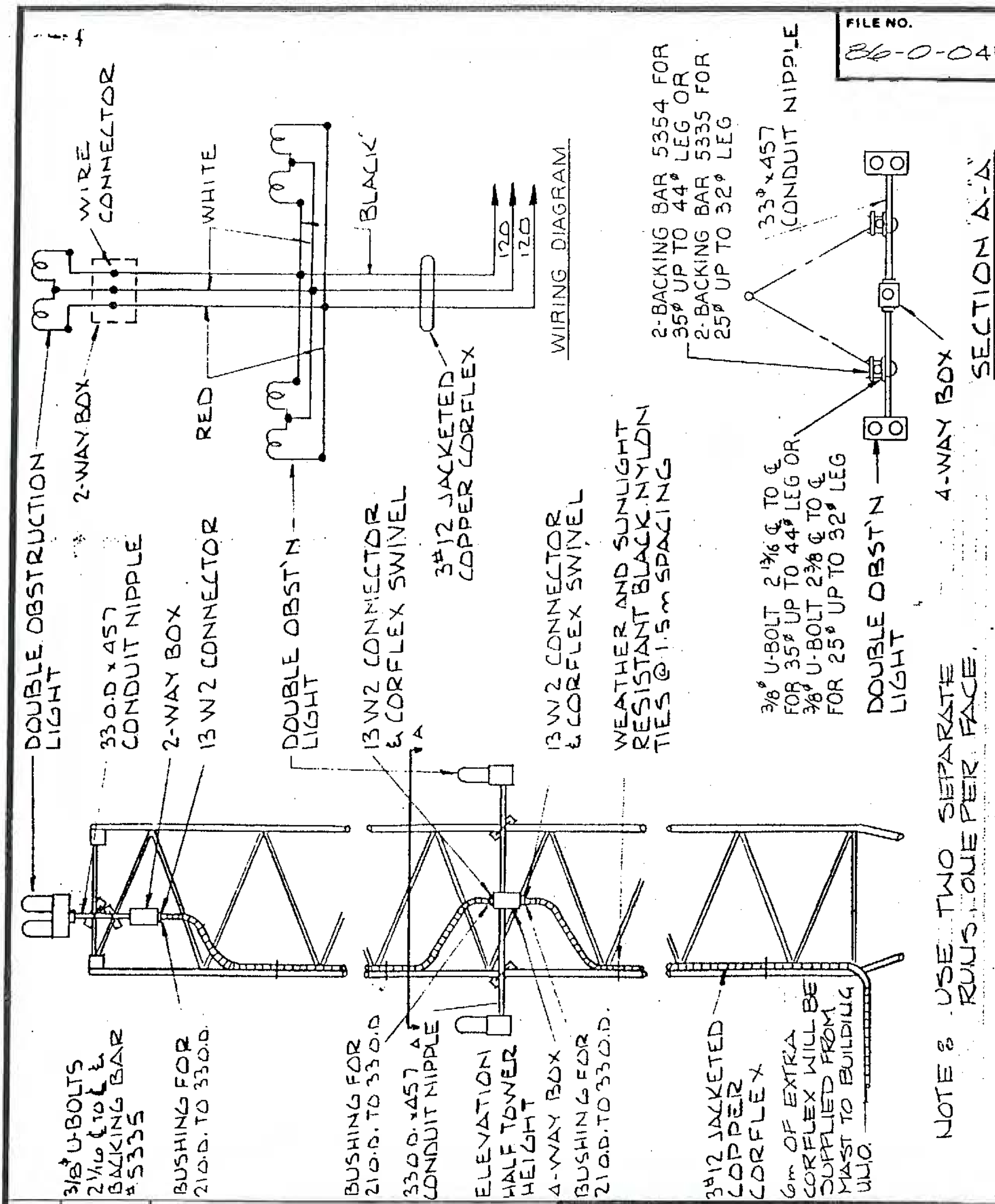
LeBLANC
LeBLANC & ROYLE TELCOM INC.
514 CHARTWELL ROAD, P.O BOX 880
OAKVILLE, ONTARIO, CANADA L6J 5C5

CANADIAN COAST GUARD
WG CONDUIT
COLD SPRINGS, ONT.

SCALE	DRAWING NO.	ISSUE
NTS	24A1576-E4	C

AE8512

FILE NO.
86-0-045



NOTE: USE TWO SEPARATE RUNS, ONE PER FACE.

LeBLANC
LeBLANC & ROYLE TELCOM INC.
514 CHARTWELL ROAD, P.O. BOX 880
OAKVILLE ONTARIO, CANADA L6J 5C5

CANADIAN COAST GUARD
LIGHTING
COLD SPRINGS, ONT.

REV.	DATE	DESCRIPTION			
0	FEB 26 86	DRAWN	DRP	CHECKED	RC

SCALE NTS
DRAWING NO. 24A1576-E3
ISSUE 0

FILE NO.
86-0-045

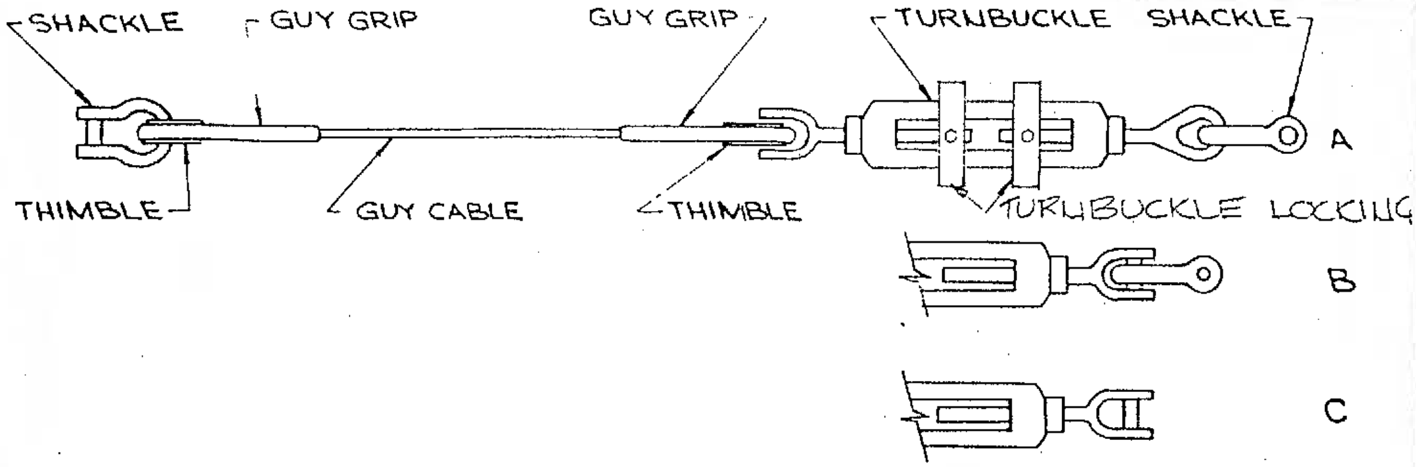


TABLE OF STANDARD GUY ASSEMBLYS

GUY SIZE 1x7GR180	SHACKLE	THIMBLE	GUY GRIP	TURNBUCKLE	SHACKLE ASS'Y A&B
1/4ø	5/16	3/8 STD	1/4	3/8-6 J&E	5/16
5/16ø	1/2	3/8 HVY	5/16	1/2-12 J&E	3/8
3/8ø	1/2	3/8 HVY	3/8	5/8-12 J&E	1/2
7/16ø	5/8	1/2 HVY.	7/16	3/4-18 J&E	5/8
1/2ø	5/8	9/16 HVY.	1/2	3/4-18 J&E	5/8
5/8ø	5/8	3/4 HVY.	5/8	1-18 J&E	5/8

GUY HEIGHT	GUY SIZE	ACTUAL LENGTH	SUPPLIED LENGTH *	INITIAL TENSION AT STD. TEMP.	GUY ASS'Y. TYPE
14.6m	7/16	230'	245'	FOR TENSION SEE PULSE CHART	A
32.9m	7/16	250'	265'		A
51.2m	1/2	281'	296'		A
69.5m	5/8	320'	335'		A
89m	5/8	369'	384'		A

* "SUPPLIED LENGTH" INCLUDES EXTRA GUY CABLE TO ALLOW FOR TURNBUCKLE CONNECTION AND DROP OFF IN GROUND LEVEL.

REV.	DATE	DESCRIPTION	
0	FEB 25 86	DRAWN DRP	CHECKED RC

LeBLANC
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OAKVILLE, ONTARIO, CANADA L6J 5C5

CANADIAN COAST GUARD
GUY CHART
COLD SPRINGS, ONT

SCALE	DRAWING NO.	ISSUE
NTS	24A1576-E1	0

CANADIAN COAST GUARD ON.
COBOURG, ON.
MAST REINFORCING

DESCRIPTION	DWG. NO.	REV.
DRAWING LIST & GENERAL NOTES	1	0
TOWER PROFILE/Tx LINE LAYOUT	2	0
PROFILE SHOWING REINFORCING	3	0
MEMBER DETAILS SHEET 1	4	0

GENERAL NOTES

CONSTRUCTION:

1. Contractor shall field verify all dimensions and details before proceeding with the work.
2. Contractor shall safeguard all existing structures affected by this construction.
3. All workmanship shall be in compliance with the latest issue of CSA Standards.
4. Tolerances for erection of structures shall conform to those specified in CSA-S37-01.
5. Design loading is in accordance with CSA-S37-01 using site specific wind pressure profile.
6. Do not scale dimensions from the drawings.

STEEL:

1. Structural steel fabrication and erection shall conform to the latest issue of CSA standards CAN/CSA-S16.1-94 and CSA S37-01.
2. New structural steel shall be CAN/CSA Grade 40.21 350W or better.
3. All steel, including bolts, shall be 'shop' hot-dip galvanized.
4. Protect paint and galvanizing during shipping and erection.
5. All surface rust shall be removed with a wire brush and the base steel shall be painted with zinc-rich paint.
6. Bolts in all connections shall be high strength bolts conforming to ASTM Standards A325. Bolts shall be in full bearing and threads excluded from the shear planes. Bolts that have been loosened shall be replaced with new A325 bolts.

CODE
CSA-S37-01

TOWER FABRICATOR:

LICENSED PROFESSIONAL ENGINEER
T. M. VARDY
Aug 29/06
PROVINCE OF ONTARIO

ENGINEERING SEAL

VARCON INC.
consulting engineers
237 Mapleview Drive, Unit 1
Barrie, ON L4N OW5
705-734-3868

Pêches et Océans Canada
Fisheries and Oceans Canada
Garde côtière
Coast Guard

JOB
COBOURG
MAST REINFORCING

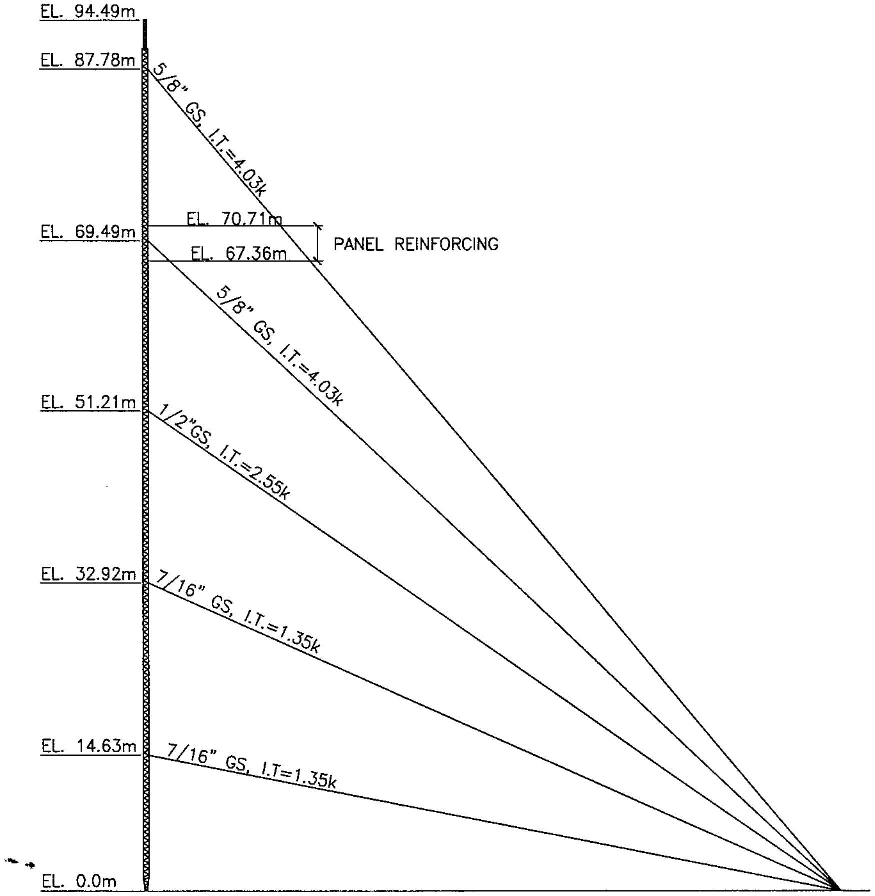
TITLE
DRAWING LIST &
GENERAL NOTES

DRAWN BY	CHECKED BY	APPROVED BY
SCM	SCG	TB

DWG. NO.	PROJECT NO.
1 OF 4	CCG-219-5

DATE	SCALE	REV.
AUG. 2006	NTS	0

TX#	STATUS	ANTENNA	ELEV. (m.)	TX LINE	ORIEN.	LOCATION
1	PROPOSED	COMPROD 872F-70	45.42-49.99	LMR-600	344°	LEG 3
2	PROPOSED	SRL-210C-4	50.90-57.00	7/8" HELIAX	150°	LEG 1
3	EXISTING	SRL-210C-4	60.96-67.06	7/8" HELIAX	150°	LEG 1
4	EXISTING	SRL-210C-4	73.15-79.25	7/8" HELIAX	150°	LEG 1
5	EXISTING	SRL-210C-4	85.34-91.44	7/8" HELIAX	150°	LEG 1
6	EXISTING	VHF-DF	95.40	1/2" HELIAX 7/8" HELIAX 7/16" OD COAXIAL	OMNI	TOP CENTER



TOWER PROFILE

LICENSED PROFESSIONAL ENGINEER
T. M. VARDY
Aug 29/06
PROVINCE OF ONTARIO

ENGINEERING SEAL

VARCON INC.
consulting engineers
237 Mapleview Drive, Unit 1
Barrie, ON L4N 0W5
705-734-3888

Pêches et Océans Canada
Fisheries and Oceans Canada
Garde côtière
Coast Guard

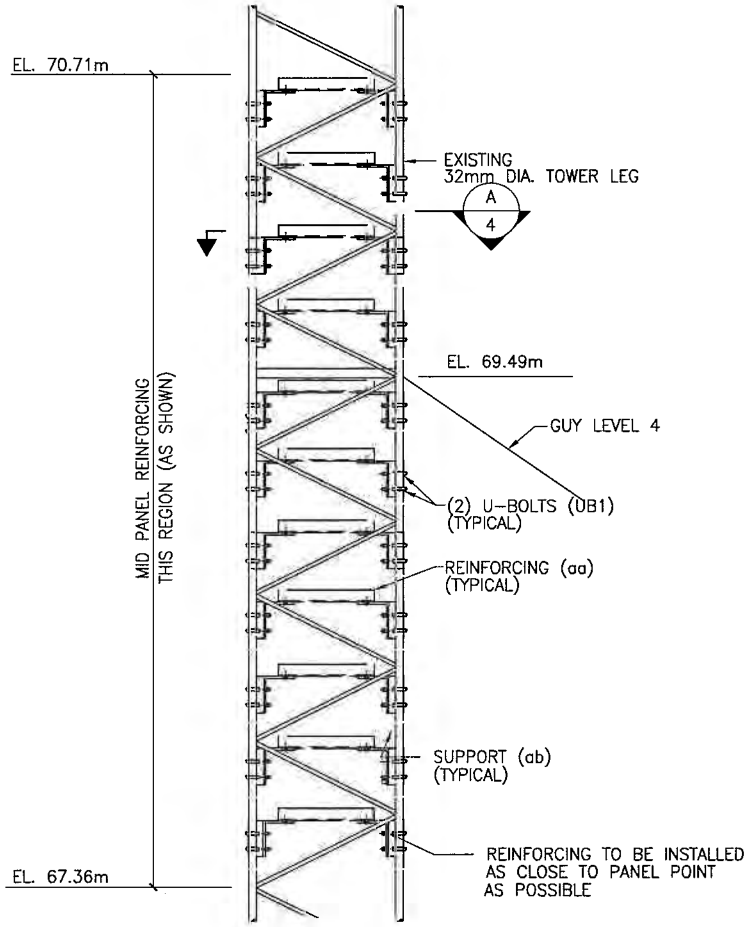
JOB
COBOURG
MAST REINFORCING

TITLE
TOWER PROFILE

DRAWN BY	CHECKED BY	APPROVED BY
SCM	SCG	TB

DWG. NO.	PROJECT NO.
2 OF 4	CCG-219-5

DATE	SCALE	REV.
AUG. 2006	NTS	0



REINFORCING

SCALE 1:20

LICENSED PROFESSIONAL ENGINEER
T. M. VARDY
Aug 29/06
PROVINCE OF ONTARIO

ENGINEERING SEAL

VARCON INC.
consulting engineers

237 Mapleview Drive, Unit 1
Barrie, ON L4N 0W5
705-734-3668

Pêches et Océans Canada	Fisheries and Oceans Canada
Garde côtière	Coast Guard

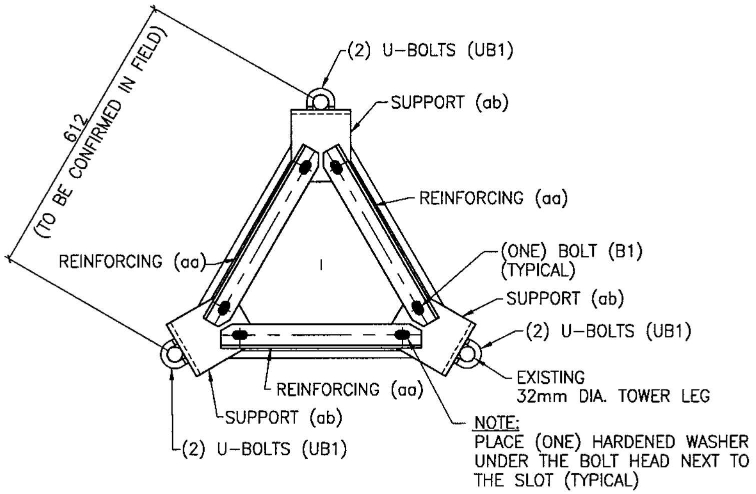
JOB
COBOURG
MAST REINFORCING

TITLE
PROFILE
SHOWING REINFORCING

DRAWN BY	CHECKED BY	APPROVED BY
SCM	SCG	TB

DWG. NO.	PROJECT NO.
3 OF 4	CCG-219-5

DATE	SCALE	REV.
AUG. 2006	NTS	0

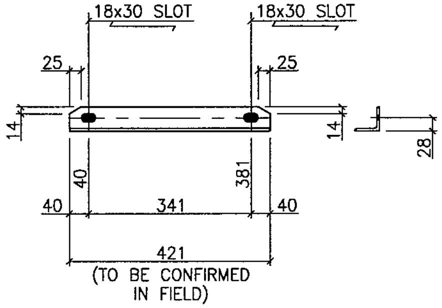


NOTE:
PLACE (ONE) HARDENED WASHER UNDER THE BOLT HEAD NEXT TO THE SLOT (TYPICAL)

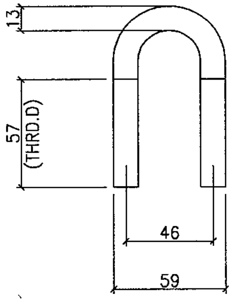
SECTION A 4

SCALE 1:10

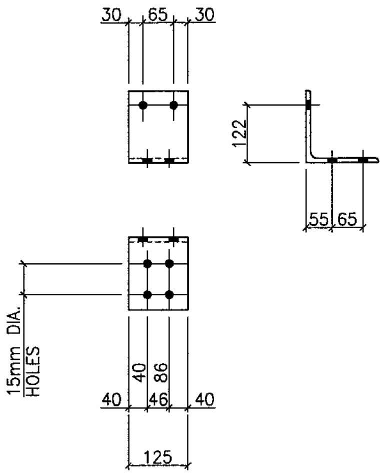
REINFORCING



REINFORCING (aa)
MARK: aa
L51x51x6.4
33 REQUIRED



U-BOLT (UB1)
MARK UB1
13mm U-BOLT
66 REQUIRED
TRYLON PART# 5.963.1001.003



SUPPORT (ab)
MARK: ab
L152x152x9.5
33 REQUIRED

MATERIAL LIST

MARK	QTY.	MATERIAL	LENGTH	WT. (kgs)
aa	33	L51x51x6.4	421	
ab	33	L152x152x9.5	125	

PLAIN MATERIAL

B1	66	M16x50 A325 /w NUT & WASHER	50	–
UB1	69	13mm U-BOLT		–

NOTE:
ALL HOLES 18mm DIA. U.N.O.

LICENSED PROFESSIONAL ENGINEER
T. M. VARDY
PROVINCE OF ONTARIO
Aug 29/06

ENGINEERING SEAL

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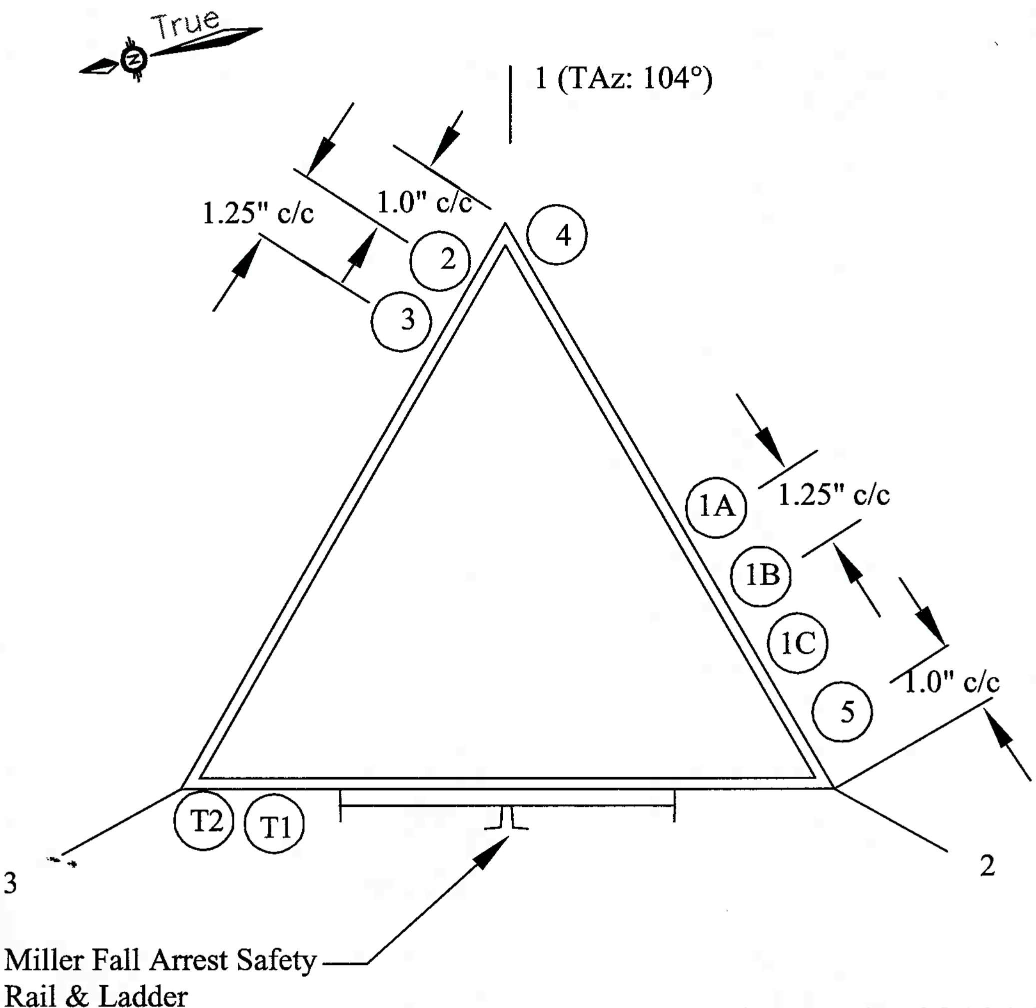
Pêches et Océans Canada
Fisheries and Oceans Canada
Garde côtière
Coast Guard

JOB	COBOURG MAST REINFORCING	
TITLE	MEMBER DETAILS SHEET 1	
DRAWN BY SCM	CHECKED BY SCG	APPROVED BY TB
DWG. NO. 4 OF 4	PROJECT NO. CCG-219-5	
DATE AUG. 2006	SCALE NTS	REV. 0

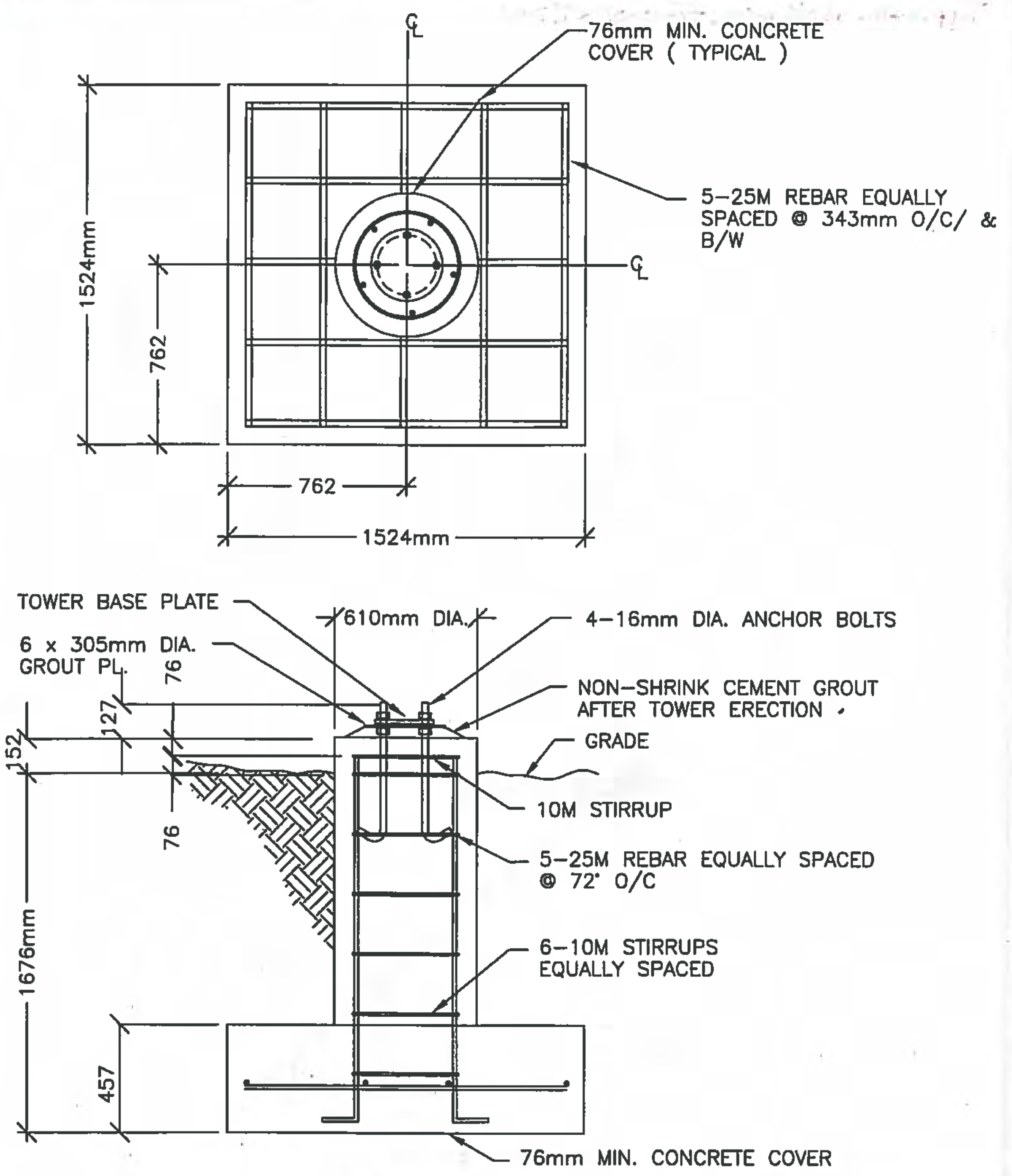


TX #	DIAMETER/ TYPE	ANT. #
1A	1/2" HELIAX	1
1B	7/16" OD COAXIAL	1
1C	7/8" HELIAX	1
2	7/8" HELIAX	2
3	7/8" HELIAX	3
4	7/8" HELIAX	4
5	7/8" HELIAX	5
T1	7/8" OD TECK	DOL
T2	15/16" OD TECK	BEACON

* All transmission ,lines should be spaced 1 " off the leg and have 1-$\frac{1}{4}$" between associated tx lines.

CANADIAN COAST GUARD - COBOURG, ON

TYPICAL TOWER BASE FOUNDATION



TOWER FOUNDATION DESIGNED TO CAN/CSA-S37-01 FOR:

- CONCRETE STRENGTH TO 30 MPa – 28 DAYS.
- 6% ENTRAINED AIR IN BASE.
- COMPACTED BACKFILL TO 95% PDD.

Maxtower COMPANY LIMITED
5 EDMONDSON ST.,P.O.BOX 277
BRANTFORD ONTARIO N3T 5M8
FAX(519)752-4160 TEL(519)752-6601

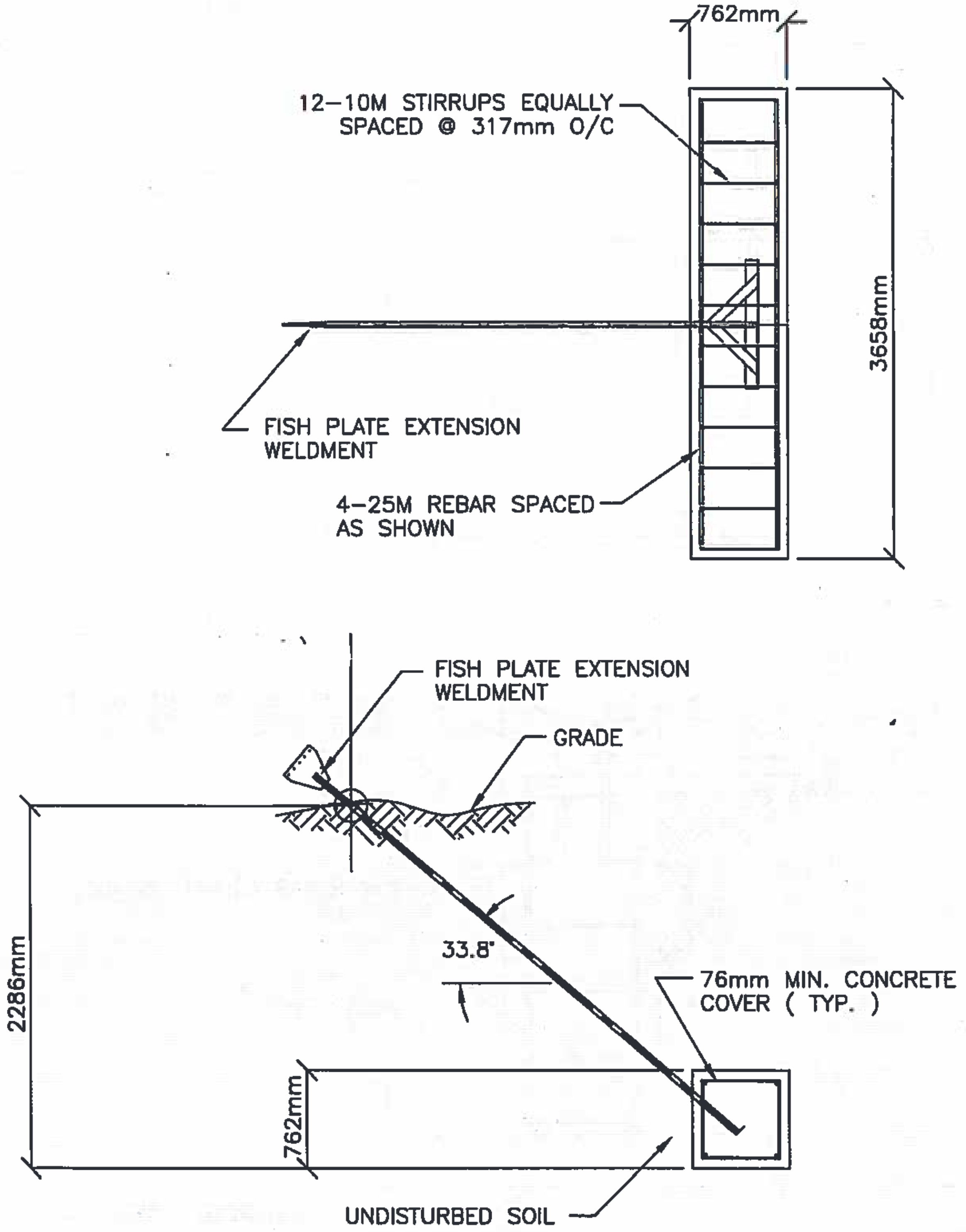
CANADIAN COAST GUARD
[illegible]

BASE FOUNDATION FOR
91.44m MTG241S TOWER

DATE: SEP. 26, 2005
SCALE: NTS
DRAWN BY: D. STARK
CHECKED BY:
APPROVED BY:
REVISION: NOV.2/05 – DS

DRAWING NUMBER: M5106 SHEET 2 OF 4

TYPICAL ANCHOR FOUNDATION



TOWER FOUNDATION DESIGNED TO CAN/CSA-S37-01 FOR:

-
- CONCRETE STRENGTH TO 30 MPa — 28 DAYS.
- 6% ENTRAINED AIR IN BASE.
- COMPACTED BACKFILL TO 95% PDD.

Maxtower COMPANY LIMITED
5 EDMONDSON ST., P.O.BOX 277
BRANTFORD ONTARIO N3T 5M8
FAX(519)752-4160 TEL(519)752-8801

CANADIAN COAST GUARD

ANCHOR FOUNDATION FOR
91.44m MTG241S TOWER

DATE: SEP. 26, 2005
SCALE: NTS
DRAWN BY: D. STARK
CHECKED BY:
APPROVED BY:
REVISION:

DRAWING NUMBER: M5106 SHEET 3 OF 4

APPENDIX G: GEOTECHNICAL INVESTIGATION

GEOTECHNICAL INVESTIGATION REPORT

COBOURG MCTS SITE – TELECOMMUNICATION TOWER REPLACEMENT

COBOURG, ONTARIO

Project No.161-17829-00

Prepared for:
Canadian Coast Guard

March 2017

–
WSP Canada Inc.
294 Rink Street, Suite 103
Peterborough, Ontario K9J 2K2

Phone: +1 705-743-6850
Fax: +1 705-743-6854
www.wspgroup.com

March 1, 2017

Doug Jibb, A.Sc.T
Construction Technologist
Canadian Coast Guard
Central & Arctic Region
Integrated Technician Services
Maritime & Civil Infrastructure
Fisheries and Oceans Canada
520 Exmouth St., Sarnia, ON. N7T 8B1
Government of Canada

Subject: **Geotechnical Investigation Report – Final**
Cobourg MCTS Site – Telecommunication Tower Replacement
Cobourg, Ontario
Project No. 161-17829-00

Dear Mr. Jibb

We are pleased to submit our geotechnical investigation report outlining subsurface findings and recommendations for the proposed construction of a 91 m high guyed telecommunication tower at the Cobourg MCTS Site, located at 8656 McBride Road, Cobourg, ON

This report provides background information on the project and the site, summarizes the methodology and findings of a geotechnical field and laboratory testing program, and provides our geotechnical recommendations for tower foundation construction. Borehole logs, site drawings and laboratory test results from the investigation are appended for reference.

We trust that this report meets your present requirements. Please contact us should you have any questions.

Yours truly,
WSP Canada Inc.

LICENSED PROFESSIONAL ENGINEER
J. S. ASH
PROVINCE OF ONTARIO

J. Stephen Ash, P. Eng., P. Geo.
Director, Environment

WSP Canada Inc.
294 Rink Street, Suite 103
Peterborough , ON K9J 2K2
www.wspgroup.com

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TABLES IN TEXT

FIGURES

APPENDICES

1 INTRODUCTION

WSP Canada Inc. (WSP) was retained by Canadian Coast Guard (Client) to complete a geotechnical investigation for the proposed construction of a 91 m high guyed telecommunication tower at the Cobourg MCTS Site, located at 8656 McBride Road, Cobourg, ON.

The geotechnical investigation was requested to obtain subsurface information for a proposed replacement tower, to be located approximately 3.0 m southeast of the existing tower. This geotechnical report summarizes the investigation procedures and findings, and provides information on the existing subsurface soil and groundwater conditions within the investigated limits. Geotechnical recommendations relevant to tower construction are included.

2 INVESTIGATION PROCEDURES

2.1 FIELD INVESTIGATION

A borehole drilling program for the site was carried out by WSP on January 11, 2017. Borehole locations are shown on Figure 1. The geotechnical investigation included four (4) boreholes advanced at the tower location and at each of the three guy anchor locations, to a depth of 6.6 meters below existing ground level (mBGL).

Boreholes were advanced using a truck-mounted commercial drill rig equipped with 110 mm Outside Diameter (O.D.) solid stem augers and 51 mm O.D. split-spoon samplers. A qualified WSP geotechnical engineering technician supervised the drilling, and logged and sampled the boreholes in accordance with industry standards.

Soil samples were recovered from the boreholes at approximately 0.75 m to 1.5 m intervals using split-spoon samplers, driven generally in accordance with Standard Penetration Test (SPT) procedures (ASTM D1586). The results of the SPT in terms of N-values were used to evaluate consistency of cohesive soils and relative density of non-cohesive materials. Recovered soil samples were inspected and logged in the field using visual and tactile methods, and placed in moisture proof bags for transportation to our laboratory for further classification, review by the Geotechnical Engineer and selected testing. Open boreholes were checked for groundwater and general stability prior to backfilling. Borehole coordinates and elevations were provided by the Client's subcontracted surveyor, and are summarized in Table 2-1 below, and on the borehole logs (Appendix A). The topographic survey is included in the Figures section of the report.

Table 2-1: Borehole Surface Elevation and Termination Depths Summary

Borehole ID	Relative Location	Coordinates (CGVD 28)		Surface Elevation (mASL)	Termination Depth (mBGL)	Termination Elevation (mASL)
		Easting (m)	Northing (m)			
BH16-1	Anchor (Southeast)	723380	4883048	299.4	6.6	292.8
BH16-2	Anchor (Southwest)	723266	4883007	308.6	6.6	302.0

BH16-3	Anchor (North)	723284	4883122	308.1	6.6	301.5
BH16-4	Tower Center	723308	4883060	307.1	6.6	300.5

CGVD – Canadian Geodetic Vertical Datum 1928
mASL = meters above mean sea level

2.2 LABORATORY TESTING PROGRAM

Selected soil samples were submitted to WSP's certified soils laboratory for geotechnical testing and to SGS Environmental for chemical testing, for parameters listed in Table 2-2. Geotechnical laboratory test results are provided on the borehole logs in Appendix A. Copies of the geotechnical laboratory and chemical laboratory test results are provided in Appendix B.

Table 2-2: Laboratory Testing Summary

ANALYSIS	PROCEDURE/METHODOLOGY	NUMBER OF TESTS
Sieve Analysis	LS602	Three (3)
Moisture Content	ASTM D2974	Sixteen (16)
Corrosivity Analysis	ANSI/AWWA and CSA A23.1	One (1)

3 FINDINGS

3.1 SITE DESCRIPTION

The Site is located at 8656 McBride Road, approximately 12 km northwest of the Town of Cobourg, in the Township of Hamilton, County of Northumberland. An existing 91 m (300 ft.) telecommunication tower is in service at the site, along with a CCG trailer and a shelter structure. Select site photographs taken during the geotechnical investigation are included in Appendix C.

The subsurface profile at the site comprises of a layer of topsoil overlying varying fill layers and silty sand to silt and sand. Descriptions of individual soil layers in the profile are summarized below. Borehole logs are included in Appendix A, as previously noted.

3.2 TOPSOIL

A layer topsoil was encountered at all four boreholes. The topsoil was encountered at surface in BH16-1, BH16-2, and BH16-3, and below a surficial fill layer in BH16-4. The topsoil was described as brown silty sand, with trace amounts of organics, and ranged in thickness from 100 mm to 600 mm. At the time of the investigation, the topsoil was frozen to partly frozen.

3.3 SILT AND SAND FILL

A layer of silt and sand fill was encountered in BH16-3 below the topsoil layer, at a depth of 0.3 mBGL. The silt and sand contained trace amounts of gravel and clay, and was wet at the time of the investigation. The fill layer was approximately 0.9 m thick.

Based on SPT N values, the silt and sand has a loose relative density. An SPT 'N' value of greater than 50 blows was noted in BH16-3 during the investigation, however, it is inferred that the split spoon was obstructed by a buried layer of concrete, possibly from an old guy wire foundation.

3.4 GRAVEL AND SAND FILL

A layer of sand and gravel fill was encountered in BH16-3 below the silt and sand layer described above, at a depth of 1.2 mBGL, and also at surface in BH16-4. The sand and gravel contained some silt, and extended to a depth of 1.4 mBGL in BH16-3.

At the time of the investigation, the gravel and sand was moist in BH16-3, and frozen in BH16-4. Based on SPT N values, the gravel and sand fill in BH16-4 has compact relative density.

3.5 SAND

A sand layer with a trace of silt was encountered between silt and sand layers in BH16-2, at a depth of 2.1 mBGL.

At the time of the investigation, the sand was described as moist with a laboratory determined moisture content of approximately 11%. Based on a SPT N value of 30 blows per 305 mm of penetration, the sand is relatively dense.

3.6 SILTY SAND TO SILT AND SAND TILL

All boreholes penetrated layers of silt and sand to silty sand. Silty sand was encountered at a depth of 0.2 mBGL in BH16-2, below the topsoil, and between depths of 0.6 and 2.9 mBGL in the remaining boreholes. The silty sand to silt and sand contained some gravel and clay. All boreholes were terminated in the material at a depth of 6.6 mBGL.

At the time of the investigation, the silty sand to silt and sand was described as moist to wet. Laboratory moisture content test results for the material ranged between 6% and 12%. Based on SPT 'N' values between 2 to greater than 50 blows per 305 mm of penetration, the unit has loose to very dense relative density (generally increasing with depth). In most cases, the silt and sand to silty sand becomes compact (i.e. N>10) at depths between 1.2 and 1.8 mBGL, with the exception of BH16-2.

Three (3) laboratory particle size distribution analyses were completed on samples of the silty sand to silt and sand till unit. The test results are summarized as follows (USCS Classification System):

Table 3-1: Summary of Particle Size Distributions – Silty Sand to Silt and Sand Unit

Borehole ID	Sample No.	Depth (mBGL)	Gravel (> 4.75 mm) (%)	Sand (0.075 mm to 4.75 mm) (%)	Silt and Clay (<0.075 mm) (%)
BH16-1	SS4	2.3 – 2.4	21	36	43
BH16-3	SS6	4.6 – 5.1	8	41	51
BH16-4	SS3	1.2 – 1.7	13	43	44

The material is virtually non-plastic, with clay content (<0.002 mm sieve size) less than 15%.

3.7 GROUNDWATER CONDITIONS

All boreholes were free of groundwater seepage upon completion of drilling. BH16-3 caved to 5.5 mBGL upon completion of drilling.

It should be noted that groundwater levels may vary and are subject to seasonal fluctuations in response to climatic weather events.

3.8 SOIL CORROSIVITY

One (1) soil sample was submitted to CALA certified SGS Laboratories for chemical corrosivity analysis. The samples were analysed for chloride, sulphate, pH, electrical conductivity, resistivity, redox potential, and sulphide concentrations. To determine the potential for corrosion, the laboratory results were compared to the ANSI/AWWA corrosivity rating system (see Appendix B), as shown in Table 3-2 below. A rating of 10 points or less indicates that the soils are non-corrosive to grey or ductile cast iron pipe.

Table 3-2: Summary of Corrosivity Analysis

Borehole/Sample ID		Resistivity (Ω·cm)	pH	Redox Potential	Sulphide (%)	Moisture Content (%)	Total Points
BH16-4/SS3	Test Results	14000	8.68	303	<0.02	8.6	6
	ANSI/AWWA Point Rating	0	3	0	2	1	

Laboratory certificates of analysis for corrosivity testing are included in Appendix B.

4 GEOTECHNICAL RECOMMENDATIONS

The following recommendations for design and construction are based on the borehole information, which we believe fairly represents the actual subsoil conditions at the investigated locations on the site. Recommendations are intended for Designers and should not be construed as instructions to Contractors. Boreholes are not sampled continuously, and descriptions have a degree of subjectivity. If significant differences in the subsurface conditions described above are found during subsequent site work or construction, WSP should be contacted immediately to revise our findings and recommendations, if necessary. Contractors should investigate the site and form their own opinions about subsurface conditions that may affect tendering or construction procedures.

It is understood that the proposed telecommunications tower will be approximately 91 m tall and will be supported by three guy wire cables, connected to ground anchors located approximately 67 m from the tower center. Anticipated dimensions and loading details, typical tower base foundation and anchor foundations were included with the proposal request, and are included in Appendix D. Axial compressive force on the tower footing is given as approximately 349 kN and shear force is 3.1 kN. Settlement tolerance is expected to be no more than 25 mm, and non-consolidating in the long term. The anchor pullout force (resultant) is 207 kN.

Based upon the boreholes results, which are assumed to be representative of subsoil conditions across the site, the following recommendations are provided.

4.1 SITE PREPARATION

The existing site currently has topsoil deposits or soil containing some organics at surface, as noted in the borehole logs. Organic materials encountered within structural footprints, and extending 2 m in any direction beyond, should be removed prior to undertaking construction activities. Any deleterious material, such as buried concrete (i.e. BH16-3), should be removed below any structural footprints. The exposed subgrade should be graded evenly, proof-rolled and inspected by geotechnical engineering personnel prior to placement of granular fills or concrete materials. Any loose/soft or wet areas identified at the time of proof-rolling that cannot be uniformly compacted should be sub-excavated and removed. Alternatively, the use of reinforcing geotextiles or geogrids might be considered to distribute loadings on softer ground.

For construction during winter, exposed foundation subgrade should be insulated and protected from freezing soil temperatures and should be maintained above 5°C to minimize effects of frost hardening, specifically when adequate frost protection is not provided during construction. When subgrade or foundation components will not be adequately protected from frost overnight or longer, measures should be put in place to provide an equivalent of 1.4 m of frost protection at this site (see Section 4.5).

4.2 EXCAVATIONS

Temporary excavations for the construction of the tower and proposed ground anchors must be carried out in accordance with the latest edition of the Occupational Health and Safety Act (OHSA). Based on the soil conditions encountered in the boreholes, the predominant soils at the site may be classified as Type 3 in accordance with OHSA. Thus, temporary excavation side-slopes should not exceed 1:1 (Horizontal: Vertical).

Excavation side slopes should be protected from exposure to precipitation and associated ground surface runoff, and should be inspected regularly for signs of instability. If localized instability is noted during excavation or if wet conditions are encountered, side slopes should be flattened as required to maintain safe working conditions.

4.3 GROUNDWATER CONTROL

The Contractor shall monitor moisture and prevent excessive disturbance and loosening of foundation bearing surfaces, particularly since placement of concrete reinforcing and formwork may take several days. WSP advises that the foundation bearing surface be protected with a 100 mm thick lean concrete mud mat within 24 hours following inspection and approval by the Geotechnical Engineer, provided that subgrade conditions do not change between time of approval and time of placement of the mud mat.

Based on the borehole information and expected construction depths, it is not anticipated that dewatering operations will be required for foundation construction at this site. A Permit to Take Water (PTTW) or EASR submission should not be required. WSP should be contacted to review final designs for confirmation of any dewatering and related permitting requirements.

4.4 MATERIAL REUSE, BACKFILL AND COMPACTION

If consideration is given to the reuse of excavated native soils at the time of construction, it is recommended that all materials designated for reuse be inspected by the Geotechnical Engineer prior to and/or during construction, to confirm that no deleterious matter (e.g. topsoil, organics, concrete, etc.) is present that may affect quality and performance of the fill. Relatively fine-grained silt and sand soils with more than 50% passing the 2.36 mm sieve size may be frost susceptible and sensitive to moisture content changes. Given the laboratory test results, it is recommended that native materials only be used as non-structural fill, or below the frost penetration depth of 1.4 m. It is recommended that OPSS 1010 Granular B be imported for use as free-draining foundation backfill, where required.

Materials used for fill should be placed in 200 mm maximum loose lifts and compacted to 100 percent of the SPMDD (per ASTM D698) below foundations and structural slabs. Compaction to 95 percent may be adequate for general foundation backfill.

4.5 FROST PENETRATION DEPTH

Based on OPS Drawing 3090.101, the maximum frost penetration depth for the site area should be taken as 1.4 mBGL. Therefore, all exterior foundation elements or services should be provided with at least 1.4 m of earth cover for frost protection, or an equivalent thickness of insulation.

4.6 TOWER FOUNDATION

The site conditions are considered suitable to support the proposed tower on a conventional spread footing (gravity base) foundation, situated in the compact silty sand to silt and sand till unit, at a minimal depth of 1.4 mBGL. Relatively loose soils were encountered from surface to 1.6 mBGL in BH16-4. Therefore, it is recommended that the tower foundation be founded on compact silty sand to silt and sand till (2.2 mBGL), or engineered backfill extending to that depth. The foundation should not be constructed on topsoil, loose soil, frozen soil or soil containing organic matter, which should be excavated from the foundation footprint when encountered.

It is assumed a concrete mud mat would be provided to protect and stabilize the foundation subgrade, as previously noted.

Based on the results for borehole BH16-4 at the tower center, assuming a spread footing foundation constructed in the compact silty sand till unit, at a minimal depth of 2.2 m below grade, or on OPSS 1010 Granular A backfill, placed from 2.2 mBGL to 1.4 mBGL and compacted to 100 % SPMDD, a Serviceability Limit State (SLS) bearing resistance of 150 kPa may be assumed for design. Settlement at the SLS loading is expected to be less than 25 mm. An Ultimate Limit State (ULS) geotechnical resistance of 225 kPa is available, including a resistance factor of 0.5 and accounting for the net weight of removed soil.

Foundation backfill (above 1.4 mBGL) should consist of an approved granular material, such as OPSS 1010 Granular B Type 1 or equivalent, placed in 300 mm maximum loose lifts and compacted to 95% of SPMDD, as per ASTM D698 procedures.

4.7 GUY WIRE ANCHORS

It is assumed that mass concrete “deadman” anchors will be used for all three guy wire anchors, to develop the required pullout resistance. Anchor forces are summarized in the proposal documents, included as Appendix D.

Buried deadman anchors develop resistance by virtue of their dead weight and the passive resistance of the ground. The passive resistance force shall be calculated at the angle of the guy wire, and therefore the anchor should be oriented to provide maximum surface area in this direction. Anchors are reportedly installed at 33.8^0 (Appendix D) to the horizontal.

The unit weight of native overburden soil providing anchor pullout resistance should be taken as 18 kN/m^3. For compacted granular backfill, a unit weight of 21 kN/m^3 may be used. No passive resistance from soils within the frost zone (1.4 m depth) should be considered. Therefore, deadman anchors should be buried below the frost depth. The following unfactored passive earth pressure coefficients (K_p) may be used for preliminary anchor design, for soils below the frost depth.

→ Native Sand and Silt Till:	3.0
→ OPSS Granular B Type I (compacted to minimum 95% SPMDD):	3.7

The deadman anchors should have sufficient size and concrete strength/quality to develop adequate pullout bonding for the tendon. Exposed tendon steel shall be protected from corrosion for the life cycle of the facility. Refer to Section 2.6 for soil corrosivity data and Section 4.9 for recommended cement type. WSP should be contacted to review final anchor design, or if other anchor configurations are being considered.

Anchor backfill should consist of granular non-frost susceptible material, such as OPSS 1010 Granular B Type 1, or equivalent. Backfill should be placed in 300 mm maximum lifts and compacted to 95% of SPMDD as per ASTM D698 procedures, to confirm sufficient density.

4.8 INTERPRETED SOIL DESIGN PARAMETERS

Recommended soil design parameters are provided in Table 4-1, below. If unexpected conditions arise during construction WSP should be contacted immediately to reconsider these recommendations.

Table 4-1: Summary of Recommended Soil Design Parameters

Parameter	Compacted (95% SPMDD) Granular B Type I (OPSS 1010)	Upper Silty Sand	Compact to Sense Silty Sand to Silt and Sand Till
Total Unit Weight (kN/m^3)	20	17	19
Angle of Internal Friction	35^o	29^o	33^o
Coefficient of Active Earth Pressure, K_a	0.27	0.35	0.30
Coefficient of Passive Earth Pressure, K_p	3.7	2.9	3.4

4.9 CEMENT TYPE

Sulphate concentrations are well below the 1000 ppm or 0.1% sulphate attack criterion, as per CSA A23.1-04.

Based on these results, no limitations on concrete are necessary in concrete mix design, considering sulphate and chloride attack susceptibility. Normal Portland cement mixes may be used.

4.10 SEISMIC SITE CLASS

Part 4 of the Ontario Building Code (2006) specifies that civil infrastructure should be designed to withstand forces due to earthquakes. For the purpose of earthquake design, the information relevant to the geotechnical conditions is attributed by the “Site Class”. Based on the explored soil properties and in accordance with Table 4.1.8.4.A of the Building Code (2006), which considers average properties in the upper 30 m, it is recommended that the Site Class ‘D’ be considered for tower design. Upgrade to Site Class ‘C’, if required, should be based on shear wave velocities from MASW surveys.

4.11 TESTING AND INSPECTIONS

It is recommended that geotechnical testing and inspections be carried out during construction operations to confirm construction is in accordance with project specifications. Testing and inspections should consider subgrade, granular base and backfill materials, and should include compaction testing, and concrete quality testing.

5 LIMITATIONS

The comments given in this report are intended for the guidance of design engineers. The number of boreholes required to determine the localized underground conditions between boreholes affecting construction costs, techniques, sequencing, equipment, scheduling, etc., may be greater than has been carried out for current purposes. Contractors bidding on or undertaking the work shall, in this light, decide on their own investigations, as well as their own interpretations of the factual borehole results, so that they may draw their own conclusions as to how the subsurface conditions may affect them.

Information in this report shall not be used by third parties without WSP’s permission.

We trust that the information contained in this report is satisfactory. Should you have any questions, please do not hesitate to contact us.

Submitted by,

WSP Canada Inc.

Reviewed by:

VGledhill

Vikki Gledhill, B.E.Sc., E.I.T.
Geotechnical Engineering Intern

J. Stephen Ash, P. Eng., P. Geo.
Director, Environment

Figures

▲	PROPOSED TOWER CENTRE
●	PROPOSED GUY LINES
BH16-2 (308.6)	BOREHOLE ID (ELEVATION in mASL)

Imagery. Google Earth

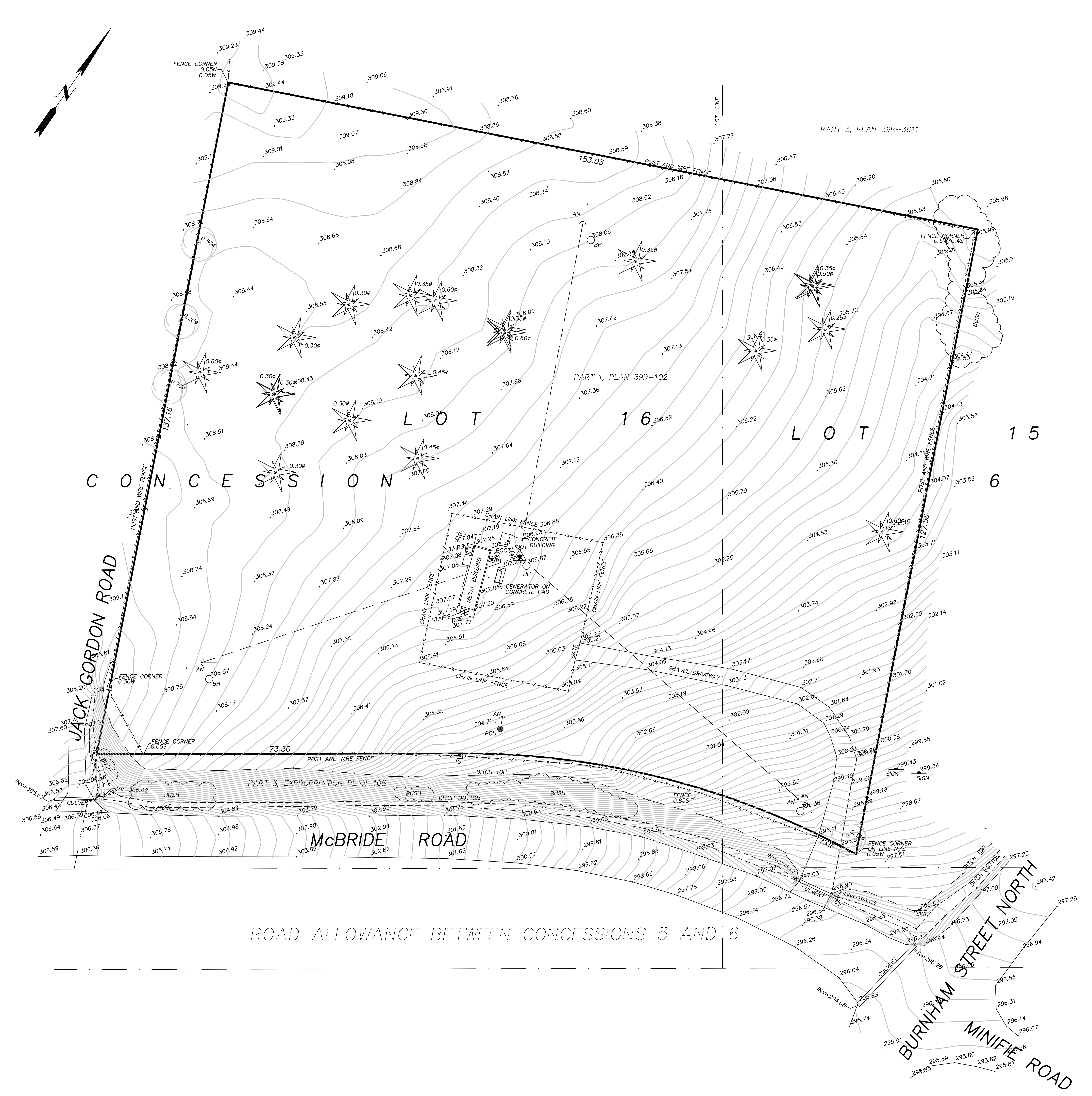
BOREHOLE LOCATION PLAN

COBOURG MCTS TELECOMMUNICATION TOWER
8656 McBride Road
Cobourg, ON
For: Canadian Coast Guard

DATE: FEBRUARY 2017
SCALE: 1:1430
PROJECT: 161-17829-00
FILE. NO.: 161-17829-00 F1

WSP

FIGURE 1



KEY PLAN – NOT TO SCALE

TOPOGRAPHIC DETAIL OF
McBRIDE ROAD & BURNHAM STREET NORTH
TOWNSHIP OF HAMILTON
COUNTY OF NORTHUMBERLAND

SCALE 1 : 500 METRES
0 1 2 3 4 5 10 20
IVAN B. WALLACE O.L.S. LTD.

LEGEND

DSE	denotes Door Sill Elevation
← AN	denotes Anchor Point
◎ POOT	denotes Other Pole
□ TB	denotes Terminal Box
●	denotes Sign
✳ 0.10ø	denotes Coniferous Tree w/Trunk Diameter
○ 0.10ø	denotes Deciduous Tree w/Trunk Diameter
×123.45	denotes Spot Elevation
○ SAPLING	denotes Deciduous Sapling
✹ SAPLING	denotes Coniferous Sapling
○ BH	denotes Borehole Elevation at Ground

CAUTION

This is not a plan of survey and shall not be used except for the purpose indicated in the title block.

CONTOURS

Contours shown hereon are drawn at 0.20 metre intervals.

DISTANCE NOTES – METRIC

Distances are in metres and can be converted to feet by dividing by 0.3048.

ELEVATIONS

Elevations are geodetic and referred to the Canadian Geodetic Vertical Datum (CGVD28) by direct measurement to a Real Time Network.

IBW
SURVEYORS

71 Mearns Court, Bowmanville, Ontario, L1C 4N4 | ibwsurveyors.com | 1.800.667.0696

PARTY CHIEF: RB	DRAWN BY: DGC	CHECKED BY: CC	PLOT DATE: JAN. 31, 2017
FILE NAME: 4-4752_TOPO		copies available at LandSurveyRecords.com	

rev.	Date	Initials	Remarks
1	2017.01.23	DGC	DRAFT TOPO

rev.	Date	Initials	Remarks
1	yyyy.mm.dd	*	*

rev.	Date	Initials	Remarks
1	yyyy.mm.dd	*	*

Appendices

Appendix A

BOREHOLE EXPLANATION FORMS, BOREHOLE LOGS

BOREHOLE LOG EXPLANATION FORM

This explanatory section provides the background to assist in the use of the borehole logs. Each of the headings used on the borehole log, is briefly explained.

DEPTH

This column gives the depth of interpreted geologic contacts in metres below ground surface.

STRATIGRAPHIC DESCRIPTION

This column gives a description of the soil based on a tactile examination of the samples and/or laboratory test results. Each stratum is described according to the following classification and terminology.

Soil Classification*		Terminology	Proportion
Silt & Clay	< 0.075 mm	"trace" (e.g. trace sand)	<10%
Sand	0.075 to 4.75 mm	"some" (e.g. some sand)	10% - 20%
Gravel	4.75 to 75 mm	adjective (e.g. sandy)	20% - 35%
Cobbles	75 to 300 mm	"and" (e.g. and sand)	35% - 50%
Boulders	>300 mm	noun (e.g. sand)	>50%

* Extension of USCS Classification system unless otherwise noted.

The use of the geologic term "till" implies that both disseminated coarser grained (sand, gravel, cobbles or boulders) particles and finer grained (silt and clay) particles may occur within the described matrix.

The compactness of cohesionless soils and the consistency of cohesive soils are defined by the following:

COHESIONLESS SOIL		COHESIVE SOIL	
Compactness	Standard Penetration Resistance "N", Blows / 0.3 m	Consistency	Standard Penetration Resistance "N", Blows / 0.3 m
Very Loose	0 to 4	Very Soft	0 to 2
Loose	4 to 10	Soft	2 to 4
Compact	10 to 30	Firm	4 to 8
Dense	30 to 50	Stiff	8 to 15
Very Dense	Over 50	Very Stiff	15 to 30
		Hard	Over 30

The moisture conditions of cohesionless and cohesive soils are defined as follows.

COHESIONLESS SOILS	COHESIVE SOILS		
Dry	DTPL	-	Drier Than Plastic Limit
Moist	APL	-	About Plastic Limit
Wet	WTPL	-	Wetter Than Plastic Limit
Saturated	MWTPL	-	Much Wetter Than Plastic Limit

STRATIGRAPHY

Symbols may be used to pictorially identify the interpreted stratigraphy of the soil and rock strata.

MONITOR DETAILS

This column shows the position and designation of standpipe and/or piezometer ground water monitors installed in the borehole. Also the water level may be shown for the date indicated.

● Standpipe

▲ Piezometer

☰ Screened Interval

▧ Borehole Seal (Peltonite, Bentonite or Hole Plug)

■ Geotextile Material / Liner

▧ Borehole Seal (Bentonite Grout)

▨ Cement Seal

░ Granular Backfill

▒ Granular (Filter) Pack

□ Native Soil Backfill / Cave / Slough

Where monitors are placed in separate boreholes, these are shown individually in the "Monitor Details" column. Otherwise, monitors are in the same borehole. For further data regarding seals, screens, etc., the reader is referred to the summary of monitor details table.

SAMPLE

These columns describe the sample type and number, the "N" value, the water content, the percentage recovery, and Rock Quality Designation (RQD), of each sample obtained from the borehole where applicable. The information is recorded at the approximate depth at which the sample was obtained. The legend for sample type is explained below.

SS = Split Spoon
ST = Thin Walled Shelby Tube
AS = Auger Flight Sample
CC = Continuous Core
GS = Grab Sample
CS = Channel Sample
WS = Wash Sample
RC = Rock Core

$$\% \text{ Recovery} = \frac{\text{Length of Core Recovered Per Run}}{\text{Total Length of Run}} \times 100$$

Where rock drilling was carried out, the term RQD (Rock Quality Designation) is used. The RQD is an indirect measure of the number of fractures and soundness of the rock mass. It is obtained from the rock cores by summing the length of core recovered, counting only those pieces of sound core that are 100 mm or more in length. The RQD value is expressed as a percentage and is the ratio of the summed core lengths to the total length of core run. The classification based on the RQD value is given below.

RQD Classification	RQD (%)
Very poor quality	< 25
Poor quality	25 - 50
Fair quality	50 - 75
Good quality	75 - 90
Excellent quality	90 - 100

TEST DATA

The central section of the log provides graphs which are used to plot selected field and laboratory test results at the depth at which they were carried out. The plotting scales are shown at the head of the column.

Dynamic Penetration Resistance - The number of blows required to advance a 51 mm diameter, 60º steel cone fitted to the end of 45 mm OD drill rods, 0.3 m into the subsoil. The cone is driven with a 63.5 kg hammer over a fall of 750 mm.

Standard Penetration Resistance - Standard Penetration Test (SPT) "N" Value - The number of blows required to advance a 51 mm diameter standard split-spoon sampler 300 mm into the subsoil, driven by means of a 63.5 kg hammer falling freely a distance of 750 mm. In cases where the split spoon does not penetrate 300 mm, the number of blows over the distance of actual penetration in millimetres is shown as $\frac{xBlows}{mm}$

Water Content - The ratio of the mass of water to the mass of oven-dry solids in the soil expressed as a percentage.

W_P - Plastic Limit of a fine-grained soil expressed as a percentage as determined from the Atterberg Limit Test.

W_L - Liquid Limit of a fine-grained soil expressed as a percentage as determined from the Atterberg Limit Test.

REMARKS

The last column describes pertinent drilling details, field observations and/or provides an indication of other field or laboratory tests that were performed.

BOREHOLE NO. BH16-1

PAGE 1 of 1

PROJECT NAME: COBOURG MCTS TELECOMMUNICATIONS TOWER

PROJECT NO.: 161-17829-00

CLIENT: CANADIAN COAST GUARD

DATE COMPLETED: Jan 11, 2017

BOREHOLE TYPE: SOLID STEM AUGER / 51 mm O.D. SPLIT SPOON

SUPERVISOR: IAA

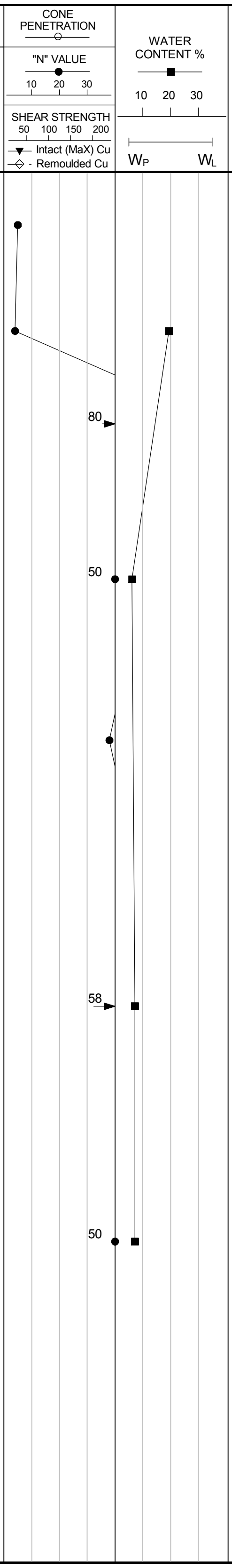
GROUND ELEVATION: 299.4 mASL (CGVD 28)

REVIEWER: VHG

UTM CO-ORDINATES
UTM Zone: 17 NAD: 83
Easting: 723380
Northing: 4883048

DEPTH (m)	ELEV (mASL)	STRATIGRAPHIC DESCRIPTION	STRATIGRAPHY	MONITOR DETAILS	SAMPLE TYPE	N VALUE	% WATER	% RECOVERY	PID/TOV (ppm)	REMARKS
0.0		**TOPSOIL:** Brown silty sand TOPSOIL, trace organics, frozen, loose			SS1	5		33		Anchor (Southeast)
0.6	298.8	**SILTY SAND:** Brown SILTY SAND, trace clay, moist to wet, loose								
1.0		- Light brown, trace gravel			SS2	4	19	75		
1.2	298.2	**SILTY SAND TILL:** Light brown SILTY SAND TILL, some gravel, some clay, moist, very dense to dense			SS3	80		75		
					SS4	50/ 125mm	6	28		GSA SS4 Gravel: 21% Sand: 36% Silt and Clay: 43%
					SS5	38		100		
		- increasing clay content			SS6	58	7			
		- Trace clay, moist to wet			SS7	50/ 125mm	7			
6.6	292.9	Borehole terminated at 6.6 m below ground surface in SILTY SAND TILL.								Borehole open and dry upon completion of drilling.

Depth scale (m): 0.0, 0.6, 1.0, 1.2, 2.0, 3.0, 4.0, 5.0, 6.0, 6.6, 7.0, 8.0



BOREHOLE NO. BH16-2

PAGE 1 of 1

PROJECT NAME: COBOURG MCTS TELECOMMUNICATIONS TOWER
PROJECT NO.: 161-17829-00
CLIENT: CANADIAN COAST GUARD
DATE COMPLETED: Jan 11, 2017
BOREHOLE TYPE: SOLID STEM AUGER / 51 mm O.D. SPLIT SPOON
SUPERVISOR: IAA
GROUND ELEVATION: 308.6 mASL (CGVD 28)
REVIEWER: VHG

UTM CO-ORDINATES
UTM Zone: 17 NAD: 83
Easting: 723266
Northing: 4883007

DEPTH (m)	ELEV (mASL)	STRATIGRAPHIC DESCRIPTION	MONITOR DETAILS	SAMPLE TYPE	N VALUE	% WATER	% RECOVERY	PID/TOV (ppm)	CONE PENETRATION "N" VALUE 10 20 30 / SHEAR STRENGTH 50 100 150 200 Intact (MaX) Cu, Remoulded Cu	WATER CONTENT % 10 20 30 WP WL	REMARKS
0.0		**TOPSOIL:** Brown silty sand TOPSOIL, frozen, loose									Anchor (Southwest)
0.2	308.5	**SILTY SAND:** Light brown SILTY SAND, trace gravel, trace clay, wet, loose		SS1	2		42				
0.6	308.0	**SILT AND SAND:** Light brown SILT AND SAND, some gravel, some clay, moist to wet, loose		SS2	2		75				
				SS3	3		79				
2.1	306.5	**SAND:** Light brown (laminated) SAND, trace silt, moist, dense - Silt seam 75 mm thick		SS4	30	7	72				
2.9	305.7	**SILTY SAND TILL:** Light brown SILTY SAND TILL, some gravel, some clay, moist, compact to very dense		SS5	14		100				
				SS6	36	6	100				
				SS7	66	8	100		66		
6.6	302.1	Borehole terminated at 6.6 m below ground surface in SILTY SAND TILL.									Borehole open and dry upon completion of drilling.

BOREHOLE NO. BH16-3

PAGE 1 of 1

PROJECT NAME: COBOURG MCTS TELECOMMUNICATIONS TOWER

PROJECT NO.: 161-17829-00

CLIENT: CANADIAN COAST GUARD

DATE COMPLETED: Jan 11, 2017

BOREHOLE TYPE: SOLID STEM AUGER / 51 mm O.D. SPLIT SPOON

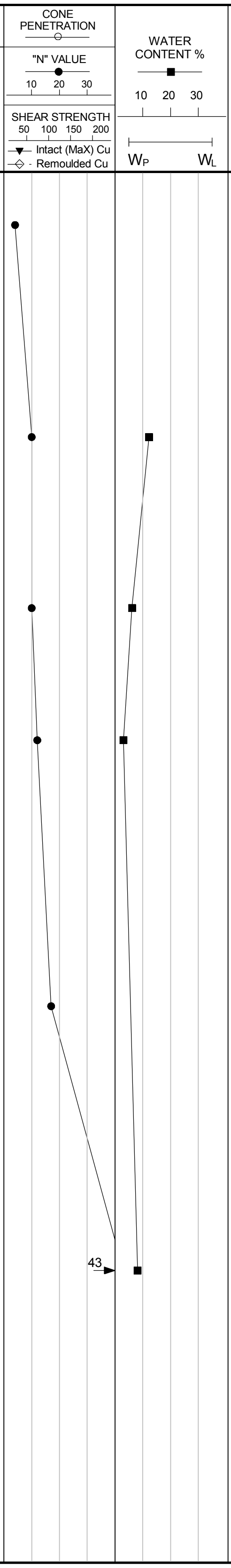
SUPERVISOR: IAA

GROUND ELEVATION: 308.1 mASL (CGVD 28)

REVIEWER: VHG

DEPTH (m)	ELEV (mASL)	STRATIGRAPHIC DESCRIPTION	MONITOR DETAILS	TYPE	N VALUE	% WATER	% RECOVERY	PID/TOV (ppm)	REMARKS
0.0		**TOPSOIL:** Brown silty sand TOPSOIL, trace organics, frozen							Anchor (North)
0.3	307.9	**FILL:** Light brown silt and sand FILL, trace gravel, trace clay, wet, loose		SS1	4		50		
				SS2	>50		100		Borehole penetrated concrete layer (assumed to be old guy wire foundation)
1.2	306.9	**FILL:** Light brown gravel and sand FILL, some silt, moist, compact							
1.4	306.7	**SILT AND SAND TILL:** Light brown SILT AND SAND TILL, some gravel, some clay, wet to moist, compact		SS3	10	12	67		
				SS4	10	6	100		
				SS5	12	3	100		
				SS6	17		100		GSA SS6 Gravel: 8% Sand: 41% Silt and Clay: 51%
		- Grey, moist, dense		SS7	43	8	100		
6.6	301.6	Borehole terminated at 6.6 m below ground surface in SILT AND SAND TILL.							Borehole open and dry upon completion of drilling.

UTM CO-ORDINATES
UTM Zone: 17 NAD: 83
Easting: 723284
Northing: 4883122



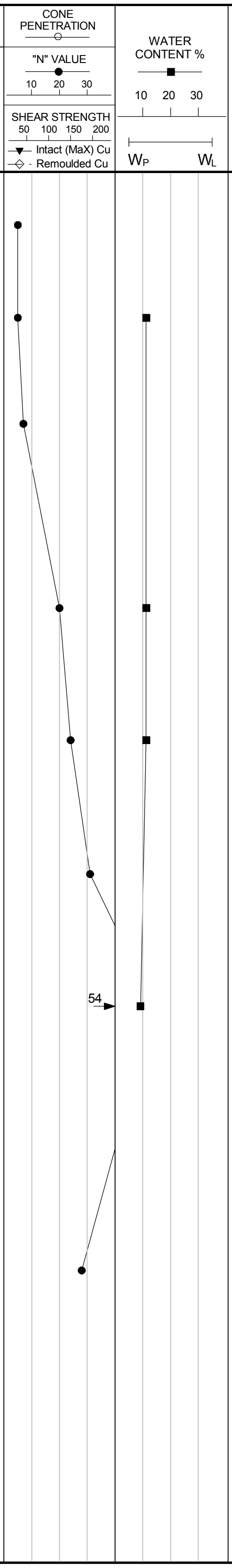
BOREHOLE NO. BH16-4

PAGE 1 of 1

PROJECT NAME: COBOURG MCTS TELECOMMUNICATIONS TOWER
PROJECT NO.: 161-17829-00
CLIENT: CANADIAN COAST GUARD
DATE COMPLETED: Jan 11, 2017
BOREHOLE TYPE: SOLID STEM AUGER / 51 mm O.D. SPLIT SPOON
SUPERVISOR: IAA
GROUND ELEVATION: 307.1 mASL (CGVD 28)
REVIEWER: VHG

UTM CO-ORDINATES
UTM Zone: 17 NAD: 83
Easting: 723308
Northing: 4833060

DEPTH (m)	ELEV (mASL)	STRATIGRAPHIC DESCRIPTION	STRATIGRAPHY	MONITOR DETAILS	SAMPLE TYPE	N VALUE	% WATER	% RECOVERY	PID/TOV (ppm)	REMARKS
0.0										
0.1	307.0	**FILL:** Brown gravelly silty sand TOPSOIL, wet (frozen)								Tower Center
		TOPSOIL: Brown silty sand TOPSOIL, trace gravel, moist			SS1	5		54		
0.6	306.5	**SILTY SAND TILL:** Light brown SILTY SAND TILL, some gravel, some clay, wet, loose, becoming very dense			SS2	5	11	100		
1.0										
					SS3	7		100		GSA SS3 Gravel: 13% Sand: 43% Silt and Clay: 44%
2.0										
		- occasional to no cobbles, moist								
		- compact			SS4	20	11	100		
3.0										
					SS5	24	11	100		
4.0					SS6	31		100		
		- Light grey-brown, occasional cobbles			SS7	54	9	100		
5.0										
										Groundwater at 5.5 m below ground surface upon completion of drilling
		- very dense								
6.0										
		- trace to some clay, moist to wet (wet soon)								
		- compact			SS8	28		100		
6.6	300.6	Borehole terminated at 6.6 m below ground surface in SILTY SAND.								
7.0										
8.0										

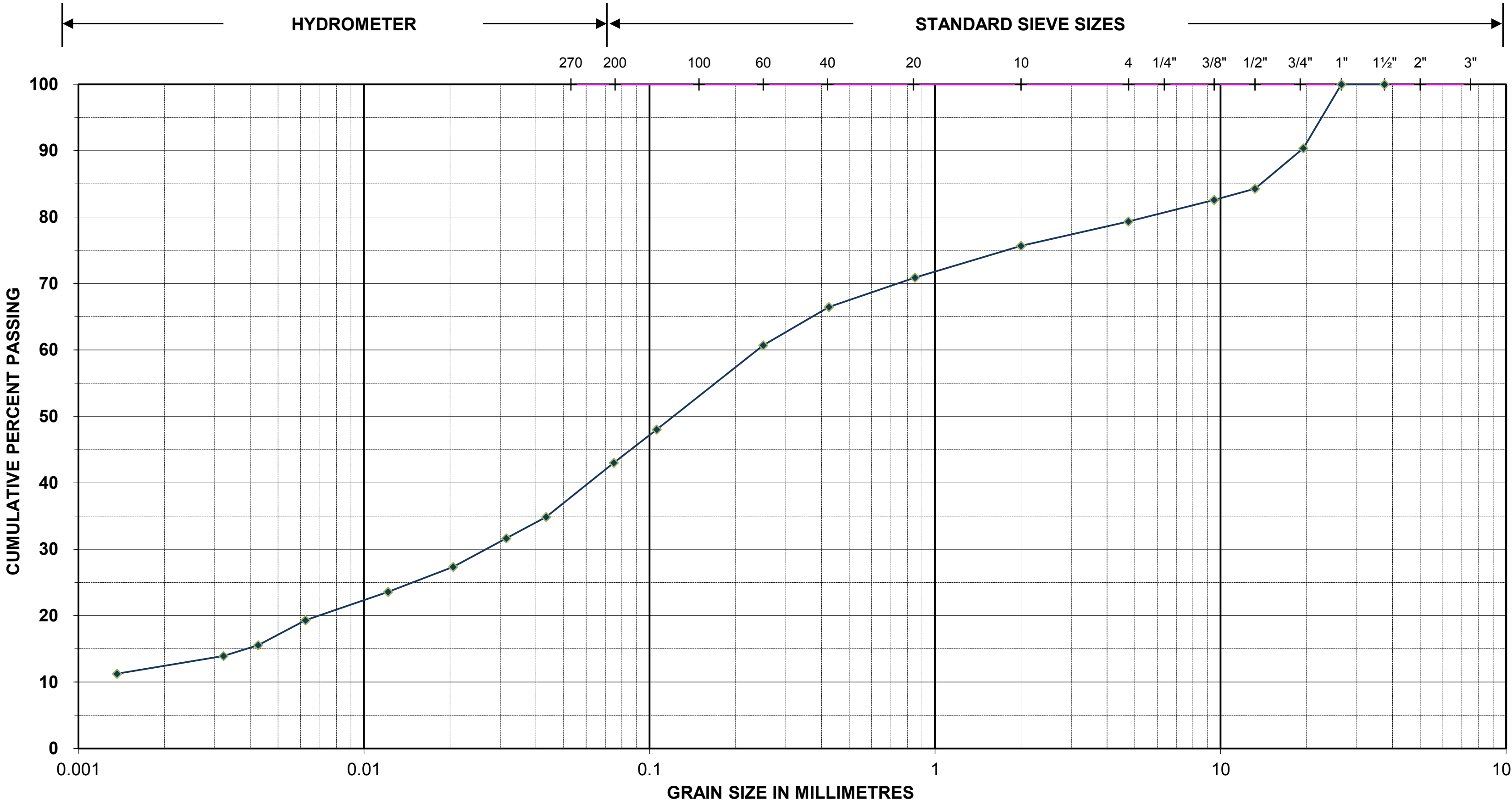


WSP GEOTECH (METRIC) WITH UTM AND MASL 161-17829-00_DRAFTLOGS.GPJ WSP_ENV_V1.GDT 2/8/17

Appendix B

LABORATORY TEST RESULTS

PARTICLE SIZE DISTRIBUTION ASTM D422



MIT Classification System

CLAY	SILT			SAND			GRAVEL			COBBLES
	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	

Project Name: Cobourg MCTS Site

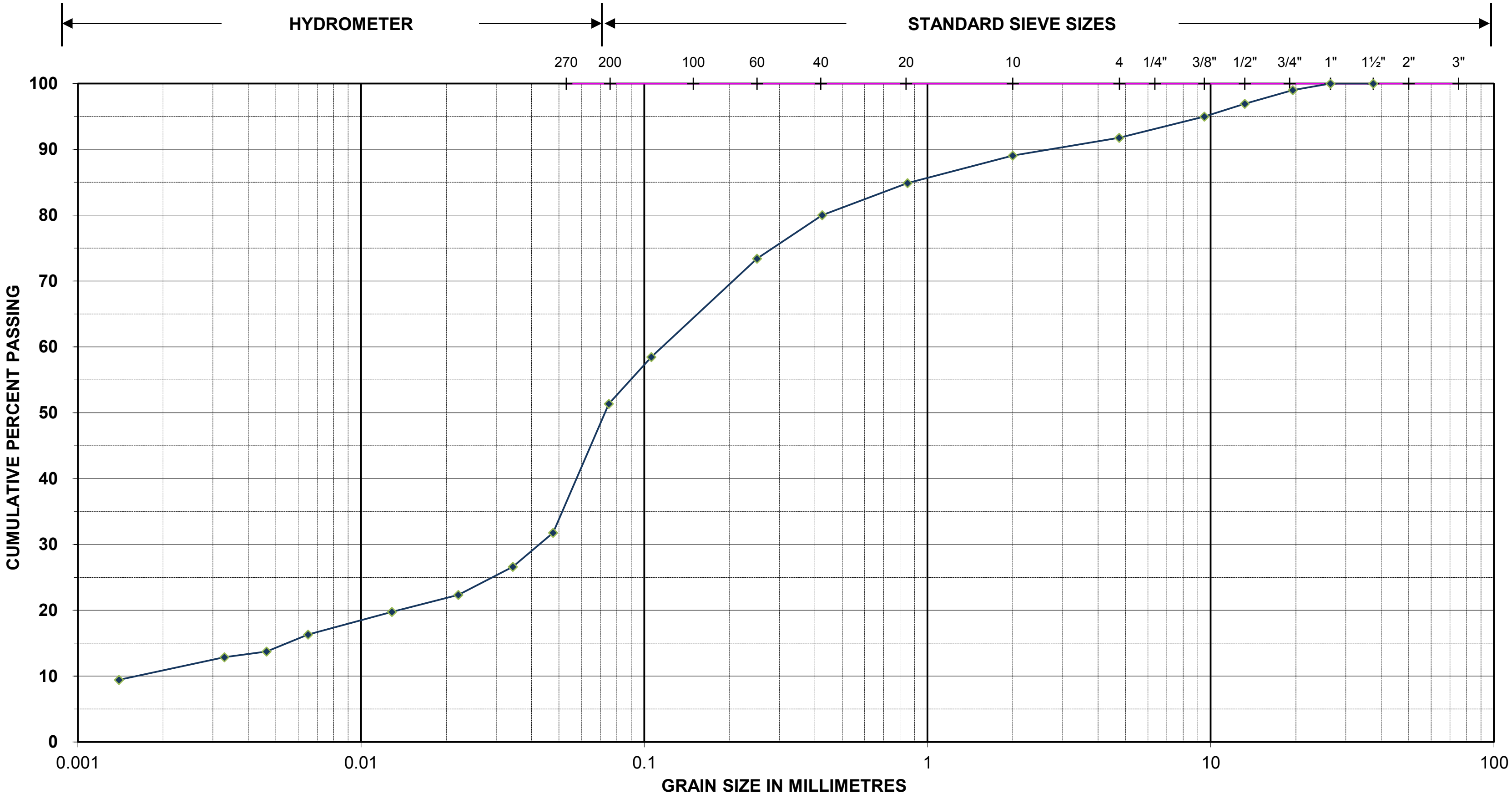
Project No.: 161-17829-00

Location ID.: BH16-1

Sample No./Depth: SS4 / 2.3 - 2.4

Sieve Size	% Passing Coarse	**Sieve Size**	% Passing Fine	Hydrometer (mm)	% Passing
26.5 mm	100.0	**0.850 mm**	70.9	**0.043**	34.8
13.2 mm	84.3	**0.425 mm**	66.5	**0.021**	27.3
9.50 mm	82.6	**0.250 mm**	60.7	**0.006**	19.3
4.75 mm	79.4	**0.106 mm**	48.0	**0.003**	13.9
2.00 mm	75.7	**0.075 mm**	43.0	**0.001**	11.3

PARTICLE SIZE DISTRIBUTION ASTM D422



MIT Classification System

CLAY	SILT			SAND			GRAVEL			COBBLES
	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	

Project Name: Cobourg MCTS Site

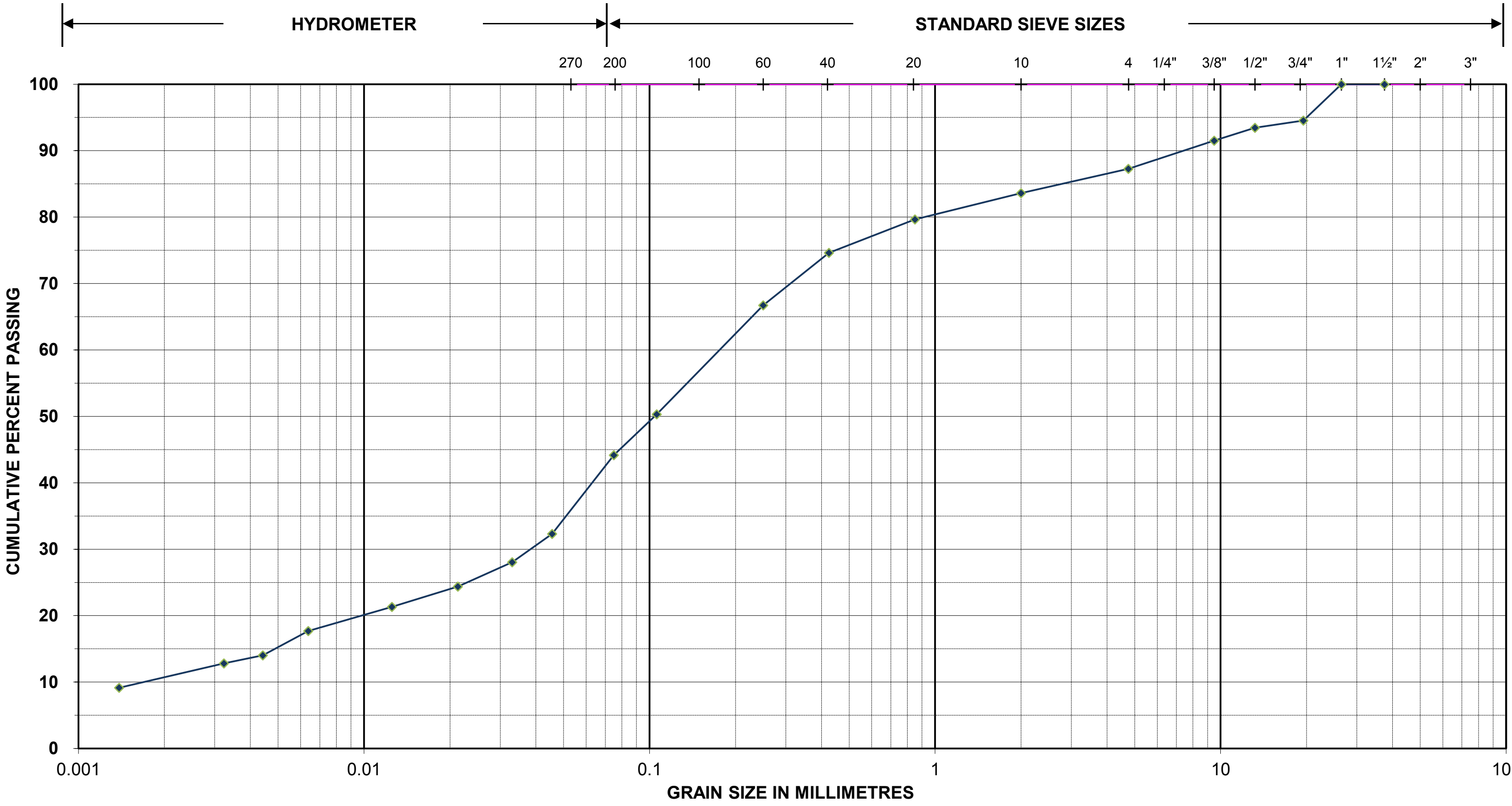
Location ID.: BH16-3

Project No.: 161-17829-00

Sample No./Depth: SS6 / 4.6 - 5.1

Sieve Size	% Passing Coarse	Sieve Size	% Passing Fine	Hydrometer (mm)	% Passing
26.5 mm	100.0	**0.850 mm**	84.9	**0.048**	31.8
13.2 mm	96.9	**0.425 mm**	80.0	**0.022**	22.3
9.50 mm	95.0	**0.250 mm**	73.4	**0.007**	16.3
4.75 mm	91.8	**0.106 mm**	58.5	**0.003**	12.9
2.00 mm	89.0	**0.075 mm**	51.4	**0.001**	9.4

PARTICLE SIZE DISTRIBUTION ASTM D422



MIT Classification System

CLAY	SILT			SAND			GRAVEL			COBBLES
	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	

Project Name: Cobourg MCTS Site

Project No.: 161-17829-00

Location ID.: BH16-4

Sample No./Depth: SS3 / 1.2 - 1.7

Sieve Size	% Passing Coarse	Sieve Size	% Passing Fine	Hydrometer (mm)	% Passing
26.5 mm	100.0	**0.850 mm**	79.7	**0.046**	32.3
13.2 mm	93.5	**0.425 mm**	74.6	**0.021**	24.4
9.50 mm	91.5	**0.250 mm**	66.7	**0.006**	17.7
4.75 mm	87.3	**0.106 mm**	50.3	**0.003**	12.8
2.00 mm	83.6	**0.075 mm**	44.2	**0.001**	9.1

FINAL REPORT

CA15241-JAN17 R1

161-17824-00

Prepared for

WSP Canada Inc.

FINAL REPORT

First Page

CLIENT DETAILS		LABORATORY DETAILS	
Client	WSP Canada Inc.	Project Specialist	Deanna Edwards, B.Sc, C.Chem
		Laboratory	SGS Canada Inc.
Address	294 Rink St. Peterborough, ON K9J 2K2.	Address	185 Concession St., Lakefield ON, K0L 2H0
Contact	Vikki Gledhill	Telephone	705-652-2000
Telephone	705.743.6850	Facsimile	705-652-6365
Facsimile		Email	deanna.edwards@sgs.com
Email	victoria.gledhill@wspgroup.com	SGS Reference	CA15241-JAN17
Project	161-17824-00	Received	01/12/2017
Order Number		Approved	01/18/2017
Samples	Soil (1)	Report Number	CA15241-JAN17 R1
		Date Reported	01/18/2017

COMMENTS

Temperature of Samples upon receipt 8 degrees C

Cooling agent present

Custody Seal not Present

Corrosivity Index is based on the American Water Works Corrosivity Scale according to AWWA C-105. An index greater than 10 indicates the soil matrix may be corrosive to cast iron alloys.

All analysis completed with in holding time.

SIGNATORIES

Deanna Edwards, B.Sc, C.Chem

Deanna Edwards

TABLE OF CONTENTS

RESULTS

		Sample Number	5
		Sample Name	BH16-4/SS3
		Sample Matrix	Soil
		Sampled By	Vikki Gledhill
		Sample Date	11/01/2017
Parameter	**Units**	**RL**	**Result**

| Internal ref.: ME-CA-{ENV}EWL-LAK-AN-27

Corrosivity Index	none	1	1	
Soil Redox Potential	mV	-	303	
Resistivity (calculated)	Ohms.cm	-9999	14000	

Anions by IC

Method: EPA300/MA300-Ions1.3 | Internal ref.: ME-CA-[ENV]IC-LAK-AN-001

Chloride	μg/g	0.4	1.6	
Sulphate	μg/g	0.4	1.8	

Carbon/Sulphur

Method: ASTM E1915-07A | Internal ref.: ME-CA-[ENV]ARD-LAK-AN-020

Sulphide	%	0.02	< 0.02	

Conductivity

Method: SM 2510 | Internal ref.: ME-CA-[ENV]EWL-LAK-AN-006

Conductivity	uS/cm	2	73	

Metals Prep

| Internal ref.: ME-CA-[ENV]ARD-LAK-AN-013

% Moisture (wet wt)	%	0.01	8.6	

pH

Method: SM 4500 | Internal ref.: ME-CA-[ENV]EWL-LAK-AN-001

pH	no unit	0.05	7.85	
pH	no unit	0.05	8.68	

HOLDING TIME SUMMARY

Sample Name	QC Batch Reference	Sample Number	Sampled	Received	Extracted/ Prepared	Analysed	Holding Time	Approved
|								
BH16-4/SS3	NA	5	01/11/2017	01/12/2017	01/17/2017	01/17/2017 †	01/16/2017	01/17/2017
Anions by IC **Method: EPA300/MA300-Ions1.3 | Internal ref.: ME-CA-[ENV]IC-LAK-AN-001**								
BH16-4/SS3	DIO0187-JAN17	5	01/11/2017	01/12/2017	01/17/2017	01/17/2017	02/10/2017	01/18/2017
Carbon/Sulphur **Method: ASTM E1915-07A | Internal ref.: ME-CA-[ENV]ARD-LAK-AN-020**								
BH16-4/SS3	ECS0033-JAN17	5	01/11/2017	01/12/2017	01/13/2017	01/13/2017	01/16/2017	01/13/2017
Conductivity **Method: SM 2510 | Internal ref.: ME-CA-[ENV]EWL-LAK-AN-006**								
BH16-4/SS3	EWL0158-JAN17	5	01/11/2017	01/12/2017	01/13/2017	01/13/2017	01/16/2017	01/13/2017
Metals Prep **| Internal ref.: ME-CA-[ENV]ARD-LAK-AN-013**								
BH16-4/SS3	ESG0048-JAN17	5	01/11/2017	01/12/2017	01/17/2017	01/17/2017 †	01/16/2017	01/17/2017
pH **Method: SM 4500 | Internal ref.: ME-CA-[ENV]EWL-LAK-AN-001**								
BH16-4/SS3	EWL0158-JAN17	5	01/11/2017	01/12/2017	01/13/2017	01/13/2017	01/16/2017	01/13/2017

QC SUMMARY

Anions by IC

Method: EPA300/MA300-Ions1.3 | Internal ref.: ME-CA-[ENV]IC-LAK-AN-001

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Chloride	DIO0187-JAN17	µg/g	0.40	<0.4	14	20	99	80	120	92	75	125
Sulphate	DIO0187-JAN17	µg/g	0.40	<0.4	11	20	99	80	120	NV	75	125

Carbon/Sulphur

Method: ASTM E1915-07A | Internal ref.: ME-CA-[ENV]ARD-LAK-AN-020

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Sulphide	ECS0033-JAN17	%	0.020	<0.02	132	20	127	80	120			

pH

Method: SM 4500 | Internal ref.: ME-CA-[ENV]EWL-LAK-AN-001

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
pH	ARD0034-JAN17	no unit	0.050		0	20	100	80	120			
pH	EWL0158-JAN17	no unit	0.050	NA	0		101			NA		

FINAL REPORT

QC SUMMARY

Method Blank: a blank matrix that is carried through the entire analytical procedure. Used to assess laboratory contamination.

Duplicate: Paired analysis of a separate portion of the same sample that is carried through the entire analytical procedure. Used to evaluate measurement precision.

LCS/Spike Blank: Laboratory control sample or spike blank refer to a blank matrix to which a known amount of analyte has been added. Used to evaluate analyte recovery and laboratory accuracy without sample matrix effects.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate laboratory accuracy with sample matrix effects.

Reference Material: a material or substance matrix matched to the samples that contains a known amount of the analyte of interest. A reference material may be used in place of a matrix spike.

RL: Reporting limit

RPD: Relative percent difference

AC: Acceptance criteria

Multielement Scan Qualifier: as the number of analytes in a scan increases, so does the chance of a limit exceedance by random chance as opposed to a real method problem. Thus, in multielement scans, for the LCS and matrix spike, up to 10% of the analytes may exceed the quoted limits by up to 10% absolute and the spike is considered acceptable.

Duplicate Qualifier: for duplicates as the measured result approaches the RL, the uncertainty associated with the value increases dramatically, thus duplicate acceptance limits apply only where the average of the two duplicates is greater than five times the RL.

Matrix Spike Qualifier: for matrix spikes, as the concentration of the native analyte increases, the uncertainty of the matrix spike recovery increases. Thus, the matrix spike acceptance limits apply only when the concentration of the matrix spike is greater than or equal to the concentration of the native analyte.

LEGEND

FOOTNOTES

NSS	Insufficient sample for analysis.
RL	Reporting Limit.
↑	Reporting limit raised.
↓	Reporting limit lowered.
NA	The sample was not analysed for this analyte
ND	Non Detect

Samples analysed as received. Solid samples expressed on a dry weight basis. "Temperature Upon Receipt" is representative of the whole shipment and may not reflect the temperature of individual samples.

SGS provides criteria information (such as regulatory or guideline limits and summary of limit exceedances) as a service. Every attempt is made to ensure the criteria information in this report is accurate and current, however, it is not guaranteed. Comparison to the most current criteria is the responsibility of the client and SGS assumes no responsibility for the accuracy of the criteria levels indicated. This document is issued, on the Client's behalf, by the Company under its General Conditions of Service available on request and accessible at http://www.sgs.com/terms_and_conditions.htm. The Client's attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein. Any other holder of this document is advised that information contained hereon reflects the Company's findings at the time of its intervention only and within the limits of Client's instructions, if any. The Company's sole responsibility is to its Client and this document does not exonerate parties to a transaction from exercising all their rights and obligations under the transaction documents.

This report must not be reproduced, except in full. This report supersedes all previous versions.

-- End of Analytical Report --

SGS

Request for Laboratory Services and CHAIN OF CUSTODY

No:

Page ___ of ___

SGS Environmental Services
- Lakefield: 185 Concession St., Lakefield, ON K0L 2H0 Phone: 705-652-2000 Toll Free: 877-747-7658 Fax: 705-652-6365
- London: 657 Consortium Court, London, ON, N6E 2S8 Phone: 519-672-4500 Toll Free: 877-848-8060 Fax: 519-672-0361 Web: www.ca.sgs.com

Laboratory Information Section - Lab use only

Received By: Katrina wells
Received Date (mm/dd/yyyy): 01 12 17 (mm/dd/yy)
Received Time: 17:00

Received By (signature): Kwells
Custody Seal Present: ☐ none
Custody Seal Intact: ☐

Cooling Agent Present: ☒
Temperature Upon Receipt (°C): 8.0

LAB LIMS#: Jan 15241

REPORT INFORMATION

Company: Vikki Gledhill
Contact: WSP Canada Inc.
Address: 244 Rink St
Peterborough, ON
Phone: 705 743 6850
Fax: 705 743 6854
Email: victoria.gledhill@wspgroup.com

INVOICE INFORMATION

☒ (same as Report Information)
Company:
Contact:
Address:
Phone:
Email:

PROJECT INFORMATION

Quotation #: 2014-0301
P.O. #: 161-17829-00
Project #: Cobourg Telecommunications Site Location/ID:

TURNAROUND TIME (TAT) REQUIRED

☒ Regular TAT (5-7days)

TAT's are quoted in business days (exclude statutory holidays & weekends). Samples received after 3pm or on weekends : TAT begins the next business day

RUSH TAT (Additional Charges May Apply) ☐ 1 Day ☐ 2 Days ☐ 3-4 Days

PLEASE CONFIRM RUSH FEASIBILITY WITH SGS REPRESENTATIVE PRIOR TO SUBMISSION

Specify Due Date:
Rush Confirmation ID:

DRINKING WATER SAMPLES (POTABLE WATER FOR HUMAN CONSUMPTION) MUST BE SUBMITTED WITH SGS DRINKING WATER CHAIN OF CUSTODY

REGULATIONS

Regulation 153 (2011):
☐ Table 1 ☐ Res/Park
☐ Table 2 ☐ Ind/Com
☐ Table 3 ☐ Agri/Other
☐ Table ____

Soil Texture:
☐ Coarse
☐ Medium
☐ Fine

Other Regulations:
☐ Reg 347/558 (3 Day min TAT)
☐ PWQO ☐ MMER
☐ CCME ☐ Other:
☐ MISA

Sewer By-Law:
☐ Sanitary
☐ Storm
Municipality:

RECORD OF SITE CONDITION (RSC) ☐ YES ☐ NO

ANALYSIS REQUESTED

	SAMPLE IDENTIFICATION	DATE SAMPLED	TIME SAMPLED	# OF BOTTLES	MATRIX	PHC F1-F4 BTEX	O.Reg153 Metals (ICP & hydride metals)	☐Hg ☐B-HWS ☐Cr(VI)	O.Reg 153 VOCs	Corrosivity Pkge								COMMENTS: Field Filtered (F) Preserved (P)
1	BH16-4/SS3	1/11/17			S					X								
2																		
3																		
4																		
5																		
6																		
7																		
8																		
9																		
10																		

Observations/Comments/Special Instructions

Sampled By (NAME): Vikki Gledhill — Signature: VGledhill — Date: 01/11/17 (mm/dd/yy) — Pink Copy - Client

Relinquished by (NAME): Vikki Gledhill — Signature: VGledhill — Date: 01/11/17 (mm/dd/yy) — Yellow & White Copy - SGS

Revision #: 1.0
Date of Issue: 01 June, 2014

SGS

SAMPLE INTEGRITY REPORT

Project Number: 161-17829-00

SGS Sample ID Jan:15241

Date / Time Sampled 01/11/17

Client Sample ID BH16-4/SS3

ONTARIO REGULATION 153/04

	ALL
	Sample Submission General Sample Integrity Violations
Temperature >10 C upon receipt if not sampled same day	☐
No evidence of cooling trend initiated if sampled same day	☐
Chain of Custody not submitted	☐
Chain of Custody incomplete	☐
Chain of Custody not signed / dated	☐
Chain of Custody not a current version	☐
Bottles / Samples listed on CoC but not received	☐
Bottles / Samples received but not listed on the CoC	☐
Sample container received empty	☐

Sample Specific Sample Integrity Violations

Sample received past hold time	☐	☐	☐	☐	☐	☐	☐
Incorrect preservation (including no preservation where required)	☐	☐	☐	☐	☐	☐	☐
Headspace present in VOC vial (aqueous)	☐	☐	☐	☐	☐	☐	☐
Sample(s) received frozen	☐	☐	☐	☐	☐	☐	☐
Bottle(s) broken or damaged in transport	☐	☐	☐	☐	☐	☐	☐
Discrepancy between sample label and chain of custody	☐	☐	☐	☐	☐	☐	☐
Analysis requirements absent / unclear	☐	☐	☐	☐	☐	☐	☐
Missing or incorrect sample label(s)	☐	☐	☐	☐	☐	☐	☐
Inappropriate sample container used	☐	☐	☐	☐	☐	☐	☐
Insufficient number of bottles received	☐	☐	☐	☐	☐	☐	☐
Insufficient sample volume	☐	☐	☐	☐	☐	☐	☐
Sample contains multiple phases	☐	☐	☐	☐	☐	☐	☐

Sediment Log

Groundwater samples contain visible sediment / particulate	☐	☐	☐	☐	☐	☐	☐
Groundwater contains greater than 1cm of sediment / particulate matter in bottle	☐	☐	☐	☐	☐	☐	☐

Additional Comments/Remarks:

No issues upon receipt ☑ Initials: ____

Appendix C

BOREHOLE INVESTIGATION PHOTOGRAPHS

Photograph 1: Looking Northeast, from BH16-2

Photograph 2: Looking East, from BH16-2

Photograph 3: Looking North, from BH16-3

Photograph 4: Looking North, from BH16-4

Photograph 5: Looking North towards BH16-3

Photograph 6: Looking North, from BH16-1

Photograph 7: Looking East, from BH16-1

Photograph 8: Looking Southwest towards BH16-2

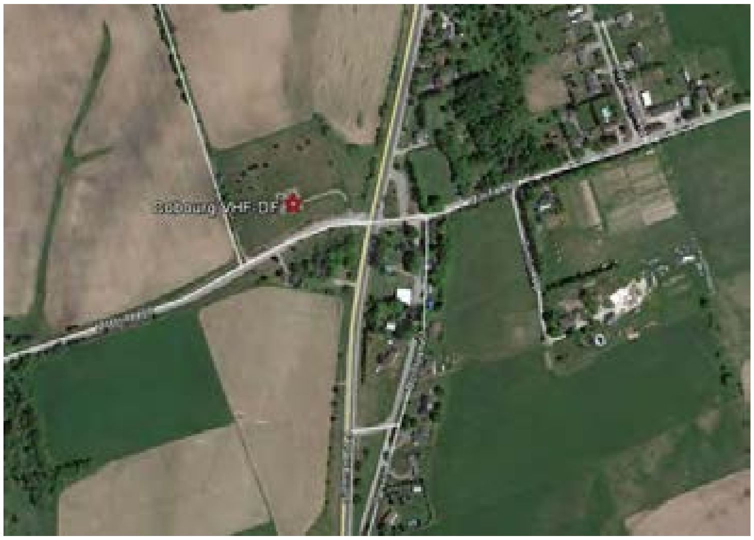
Appendix D

BACKGROUND INFORMATION

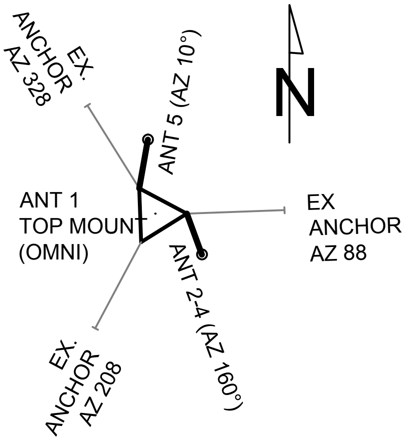
NOTES:

LOADING IS PROVIDED AS A DESIGN REFERENCE ONLY.

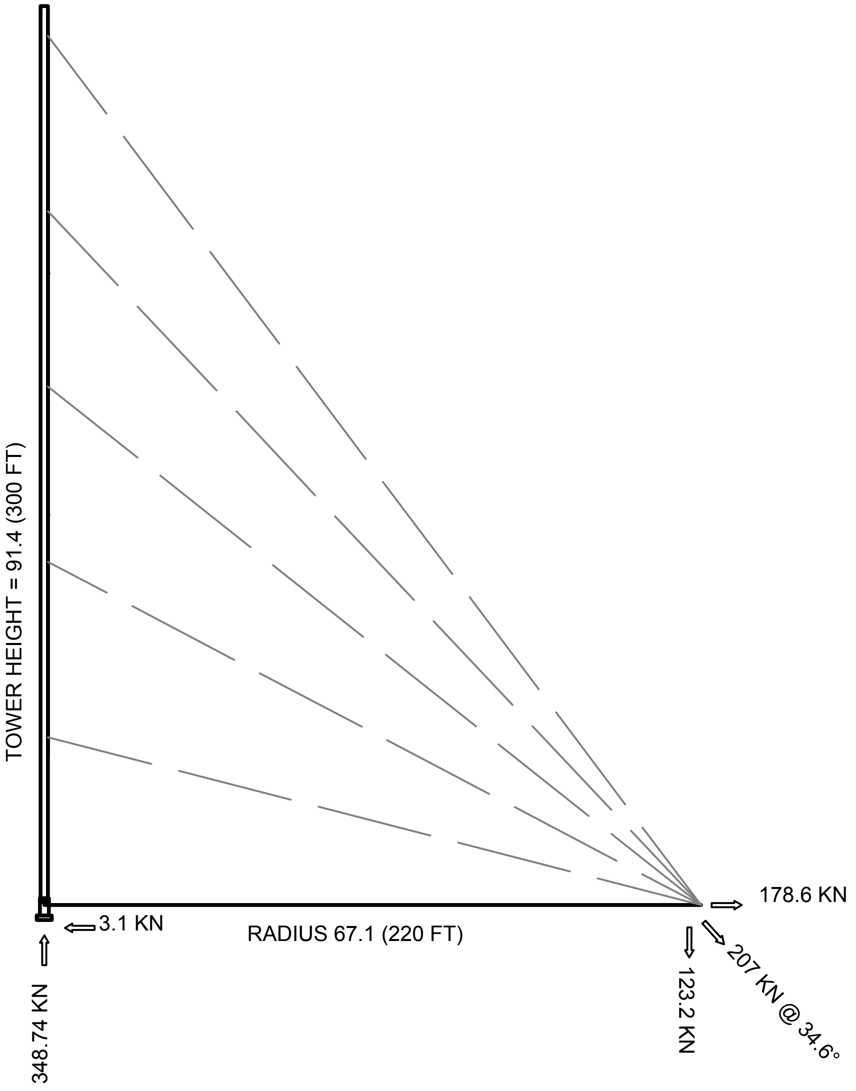
ANTICIPATED STRUCTURAL IN SERVICE LOADS ARE TO BE DETERMINED BY THE SUCCESSFUL CONTRACTOR IN CONSIDERATION OF THEIR PROPOSED TOWER ASSEMBLY AND ANTENNA LAYOUT.



KEY MAP



ANTENNA LAYOUT



ANTICIPATE DIMENSIONS AND LOADS

Fisheries and Oceans Canada
Pêches et Océans Canada
Canadian Coast Guard
Garde côtière Canadienne

Asset - Actif
MCTS COBOURG
8656 McBRIDE RD, COBOURG ON

Drawing - Dessin
TOWER REPLACEMENT
DESIGN AID

designed - conception: NOT APPLICABLE
date

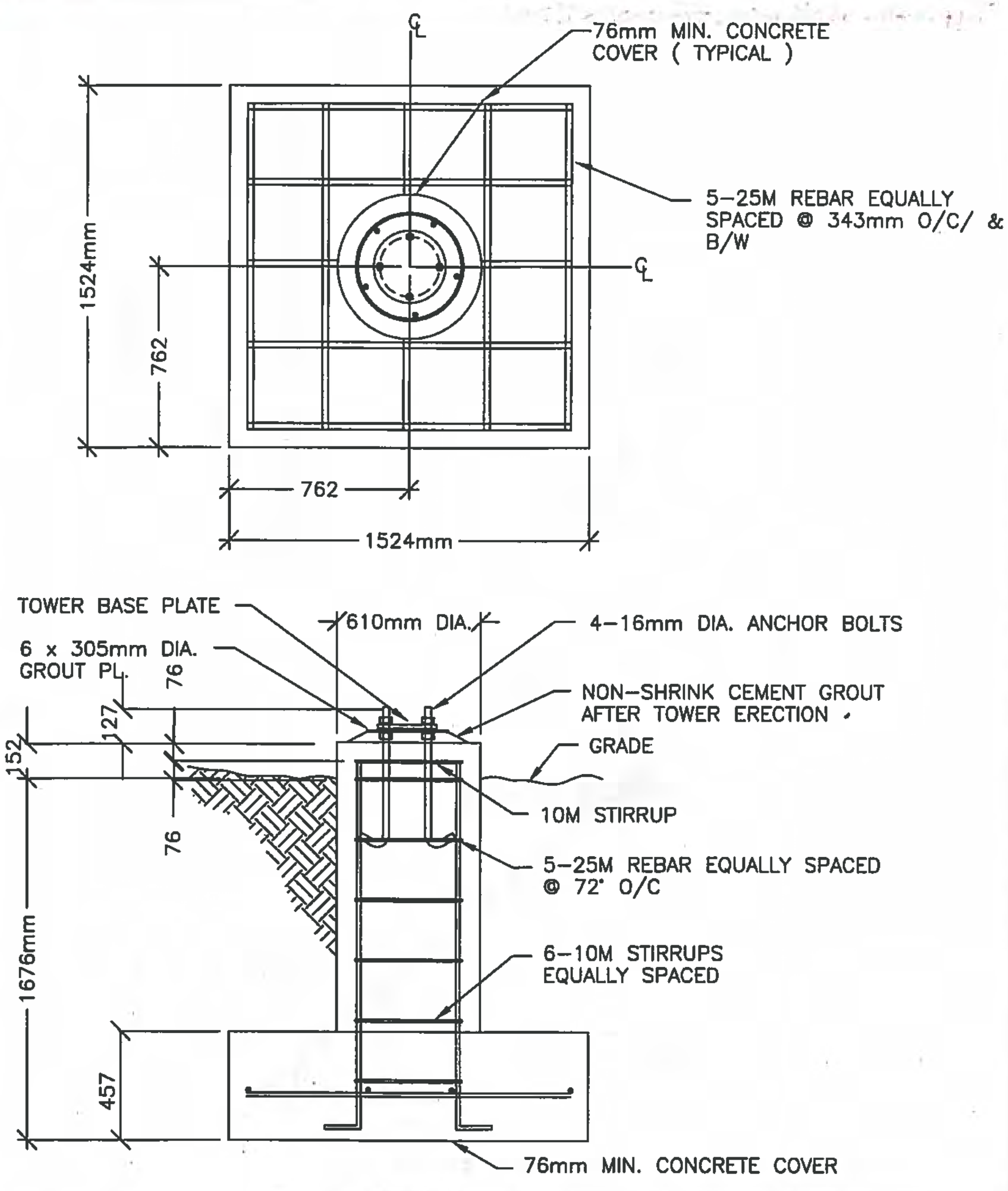
approved - approuvé: B. YOUNG
date: 2016-12-06

CCG ref. no. - no. réf. GCC: EWT 8055-450
scale - échelle: VARIES
drawing no. - no. dessin: UNASSIGNED
sheet-feuille: 01/01
rev: 0

File / Fichier: TOWER REPLACEMENT.DWG - Printed / Imprimé: 2016/12/06 10:47

8½" x 11"

TYPICAL TOWER BASE FOUNDATION



TOWER FOUNDATION DESIGNED TO CAN/CSA–S37–01 FOR:

- CONCRETE STRENGTH TO 30 MPa – 28 DAYS.
- 6% ENTRAINED AIR IN BASE.
- COMPACTED BACKFILL TO 95% PDD.

Maxtower COMPANY LIMITED
5 EDMONDSON ST., P.O.BOX 277
BRANTFORD ONTARIO N3T 5M8
FAX(519)752–4160 TEL(519)752–6601

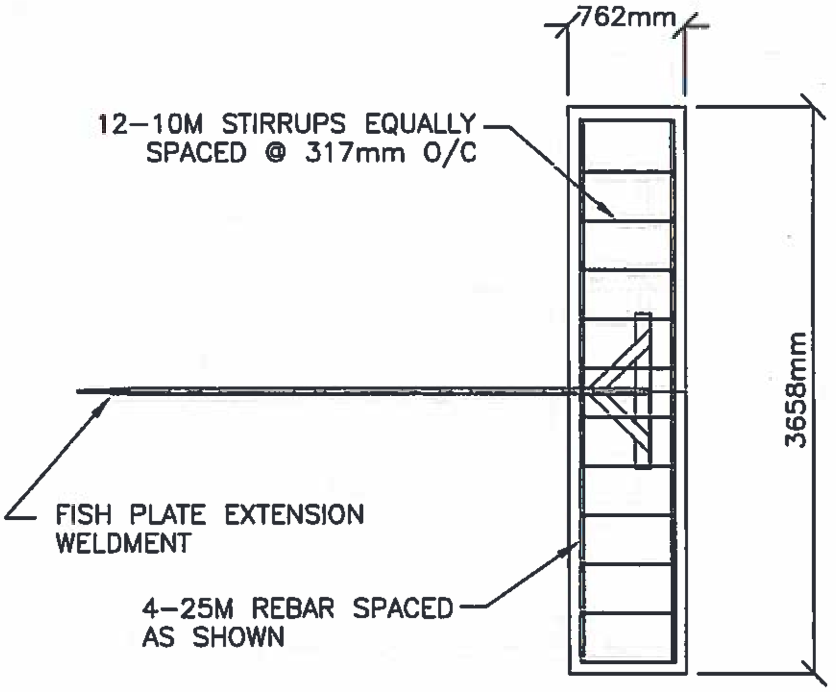
CANADIAN COAST GUARD
RIO

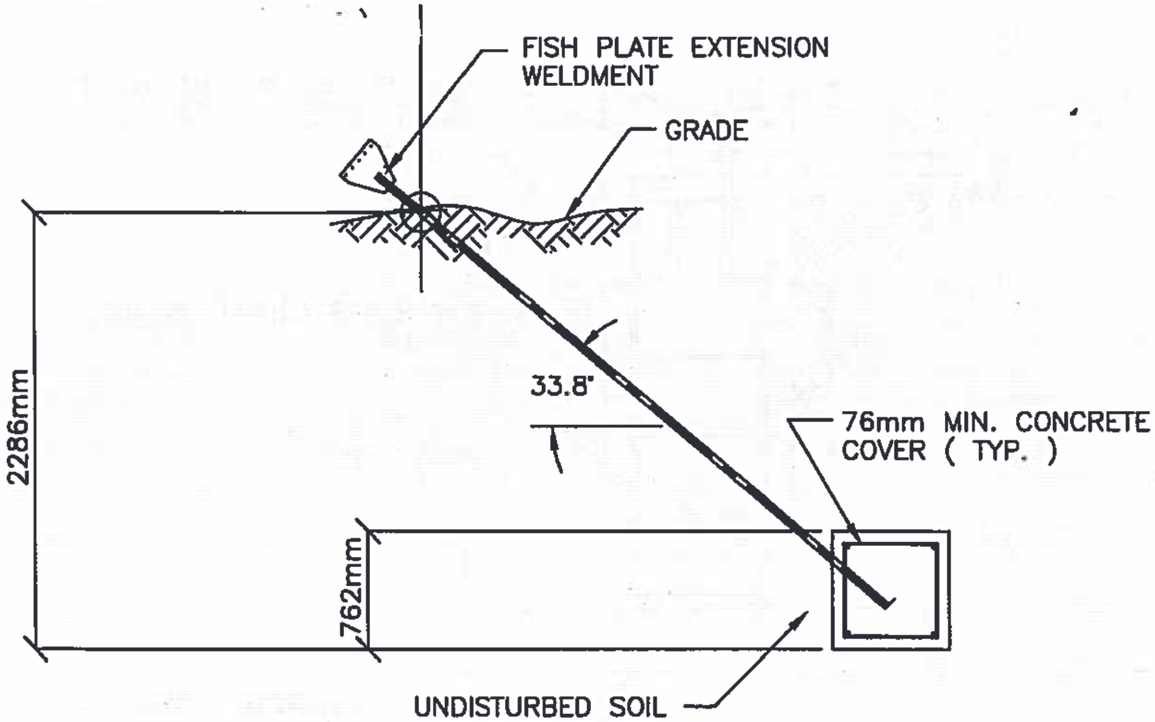
BASE FOUNDATION FOR
91.44m MTG241S TOWER

DATE: SEP. 26, 2005
SCALE: NTS
DRAWN BY: D. STARK
CHECKED BY:
APPROVED BY:
REVISION: NOV.2/05 – DS

DRAWING NUMBER: M5106 SHEET 2 OF 4

TYPICAL ANCHOR FOUNDATION





TOWER FOUNDATION DESIGNED TO CAN/CSA-S37-01 FOR:

–

- CONCRETE STRENGTH TO 30 MPa – 28 DAYS.
- 6% ENTRAINED AIR IN BASE.
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CANADIAN COAST GUARD

ANCHOR FOUNDATION FOR
91.44m MTG241S TOWER

DATE: SEP. 26, 2005
SCALE: NTS
DRAWN BY: D. STARK
CHECKED BY:
APPROVED BY:
REVISION:

DRAWING NUMBER: M5106 SHEET 3 OF 4

APPENDIX H: ENVIRONMENTAL SITE ASSESSMENT

TERRAPEX
Environmental Ltd.

March 23, 2001
CT626.0

Environmental Services, Real Property Services - 11th Floor
Public Works and Government Services Canada
4900 Yonge Street
North York, Ontario
M2N 6A6

Attention: Mr. Tim Palmeter
Senior Environmental Officer

Re: Enhanced Phase I Environmental Site Assessment
Cobourg MCTS
DFRP Reference# 09627
Final Report

Dear Mr. Palmeter:

Terrapex Environmental Ltd. is very pleased to submit this final report of the Enhanced Phase I Environmental Site Assessment at the Cobourg MCTS in Cold Springs, Ontario.

If you have any questions or comments, or wish to discuss the report, please call Jeff Stevenson at 416 245 0011.

Sincerely,

Jeff Stevenson, B. Sc.
Project Manager

attachment

ENHANCED PHASE 1
ENVIRONMENTAL SITE ASSESSMENT
CANADIAN COAST GUARD MCTS PERIPHERAL
COBOURG, ONTARIO
DFRP REFERENCE #09627

Prepared for:

CANADIAN COAST GUARD
DEPARTMENT OF FISHERIES AND OCEANS
CENTRAL AND ARCTIC REGION
and

PUBLIC WORKS AND GOVERNMENT
SERVICES CANADA

Prepared by: Terrapex Environmental Ltd.

Date March 2001

EXECUTIVE SUMMARY

Terrapex Environmental Ltd. (Terrapex) was retained by Public Works and Government Services Canada (PWGSC) on behalf of the Department of Fisheries and Oceans Canada (DFO), Central and Arctic Region, to carry out an Enhanced Phase 1 Environmental Site Assessment (ESA) of the Canadian Coast Guard (CCG) MCTS Peripheral located at R.R. #6 Cobourg, Ontario (DFRP Reference #09627). The subject site is located in the Town of Cold Springs at the northwest corner of County Road 18 and Line 6 (McBride Road). The total area of the site is approximately 2.0 ha.

The purpose of the Enhanced Phase I ESA is:

1. Identify and document actual or potential contamination to assist in reducing the uncertainty about potential environmental liabilities.

2. Develop a *National Classification System (NCS)* score for the site.

3. Meet the requirements of Treasury Board reporting by developing an indicative estimate of liability.

4. Provide the input data for RPIS/CS module.

The MCTS Peripheral was most likely constructed in 1970, the year the property was acquired by CCG. The site is an unattended, VHF radio transmitting facility which broadcasts weather data and pertinent marine conditions for use by boaters navigating in Lake Ontario. This site is important to the coverage of Lake Ontario and particularly critical for the coverage of central Lake Ontario. The site also has a very sensitive ratio direction finding antenna used to assist in locating vessels in distress.

Plans dated 1971, provided by CCG, show the original transmitter trailer (3 m x 12 m) and an additional 3 m x 3 m trailer at the site, presumably the generator shed. A wooden equipment shed, also located at the subject site, was constructed around 1974. In 1995 the generator shed was replaced with the existing structure. The transmitter trailer was replaced in 1997 or 1999.

A site visit was conducted by Terrapex personnel on December 7, 2000. A records review of CCG files was also completed. The operation of the property as a Coast Guard MCTS for the last 30 years suggests that a number of environmental concerns may need to be addressed. These relate to the potential for the presence of surface or subsurface contamination from events associated with operational activities such as fuel spills (relating to on-site use and storage of petroleum hydrocarbon products), and the presence of lead-based paint on the tower structure at the subject site. Small quantities of ozone-depleting substances are also present in air conditioning systems at the site.

Due to the age of the transmitter and generator trailers located at the subject site, the use of building materials containing lead and asbestos would be unlikely. No materials suspected of containing asbestos were observed at the site. Therefore, no samples of suspected asbestos-containing materials were collected. The transmitter tower and on-site shed could contain lead-based paints, based on their age. Paint samples were obtained from these structures and analyzed for arsenic lead and zinc.

The presence of lead in the sample from the shed was not detected at concentrations above 0.5% and paint is therefore not considered to be lead-based. The paint sample obtained from the tower structure is considered lead-based since the lead concentration was greater than 0.5%. The structure appeared to be in good condition at the time of the site inspection.

Two soil samples were obtained from the vicinity of the diesel AST and the reported historical location of a diesel AST. Soil sample analytical results were compared to the criteria for agricultrual landuse published in the MOE *Guideline for Use at Contaminated Sites in Ontario* (September 1998) and in the CCME *Recommended Canadian Soil Quality Guidelines* (1999). The Table A generic cleanup criteria in the MOE Guideline have been used for comparison since Table A provides soil criteria for sites in a potable groundwater situation.

These criteria are applicable since, according to Hamilton Township, residences in Cold Springs would use groundwater as a potable water source and no municipal water supply is available for the site and surrounding areas. Areas surrounding the site are used for agricultural and associated residential purposes. Table A criteria for agricultural land use were used for comparison. Analytical methods used in this project preclude comparison of the current lab data to the MOE Table F cleanup criteria, Ontario Typical Range Soil Concentrations (background). There were no exceedances of applicable CCME or MOE petroleum hydrocarbon criteria in any of the soil samples taken at the site.

Soil samples were not analyzed for metals parameters since this was not included in the scope of work for the project. Painted surfaces on structures appeared to be in good condition at the time of the site inspection and lead-based paint appears to be limited to that applied to the tower structure. Further sampling is not currently recommended. Sediment sampling was also beyond the scope of work of this project.

Potential concerns relating to the following current and historical issues were not identified:

- waste disposal
- the use of lead-based paints on the on-site buildings;
- lead pipes or solder associated with plumbing;
- lead-acid batteries
- hazardous materials associated with site structures or equipment;
- heavy metal contamination;
- presence of PAH contamination;
- presence of ACM;
- presence of ODS in fire-extinguishing equipment;
- bacteriological contamination associated with on-site sewage systems;
- air emissions from on-site heating equipment;
- overuse of pesticides and herbicides;
- PCB containing equipment; no transformers are present at the site and, based on age, fluorescent light ballasts would not contain PCBs; if PCBs are present in transmitting equipment, which was not confirmed, they would be contained.

A number of environmental concerns were identified as a result of this assessment, and are listed below in order of priority.

Lead Paint

The presence of lead in painted surfaces (at concentrations above 0.5%) on the tower structure at the Cobourg MCTS Peripheral has been confirmed. The orange paint applied to the tower was found to be lead-based. These painted surfaces were in good condition at the time of the site inspection.

The presence of lead in paint is primarily a concern if the paint is disturbed by sanding during building renovations or during demolition activities or if the building, or part thereof, is used or inhabited by pre-school children. Under provincial regulations, the only requirement for further action is specified by the *Occupational Health and Safety Act*, which requires that contractors be notified of the presence of lead (and other designated substances) in a building at the tendering stage so that appropriate measures can be taken by the contractor to protect workers from excessive exposure.

Future monitoring of the condition of this paint to ensure it does not deteriorate and result in impact to surrounding soils should be considered.

Fuel Storage Tanks

One aboveground storage tank is present at this site. The 455-L (100 gallon) capacity tank is used for the storage of diesel fuel for the auxiliary diesel generator and is located inside the generator shed.

Federal government policy regarding aboveground storage tanks is provided by the *Environmental Code of Practice for Aboveground Storage Tank Systems Containing Petroleum Products*, August 1994, under the Canadian *Environmental Protection Act*. This Code of Practice applies to all outside aboveground storage tank systems with a capacity of more than 230 L used for the storage of petroleum products, including gasoline, diesel fuel, kerosene and fuel oil, but excluding propane.

Provincial requirements relating to fuel oil storage tanks are prescribed by the *Fuel Oil Code* under the *Energy Act*. A draft version of the *Fuel Oil Code*, dated 1996, has been issued by the Technical Standards and Safety Authority. This draft code, not yet adopted, proposes to implement many of the recommendations set out in the Federal Codes of Practice for storage tank systems.

Provincial requirements which apply to tanks used for storage of propane are specified in Ontario Regulation 514/96 *Propane Storage, Handling and Utilization* made under the *Energy Act*.

Overall the tank was in good condition. However, non-compliance issues were identified with respect to operational practices. The issues of non-compliance are related to inventory control and inspection. This is outlined in the *Fuel Storage Tank Compliance Report, Canadian Coast Guard, Cobourg MCTS* (draft report) completed by Terrapex in March 2001. As previously mentioned, there were no exceedances of applicable petroleum hydrocarbon criteria in any of the soil samples taken at the site.

Ozone-depleting Substances

Equipment at the subject site which contains ODS, includes two air conditioners located in the transmitter trailer. All equipment appeared to be in good condition at the time of the site inspection. Any servicing of these units must be carried out by a certified contractor. If the equipment is to be permanently taken out of service, the refrigerant must be drained by a qualified contractor and the equipment tagged to indicate that it is ODS-free.

Air Emissions

The MOE does not issue Certificates of Approval (C of As) for equipment installed prior to June 29, 1988. Fuel-burning equipment used solely for the purpose of comfort heating in a dwelling is also exempt from the requirement to obtain a C of A. If the buildings at the subject site were replaced between 1995 and 1999, as records suggest, it is possible that the diesel generator may also have been replaced and that a C of A may be required for the associated air emissions. Since no records were located by the MOE with respect to the site, it is not likely that a C of A was obtained. Representatives from the MOE suggested that C of As may be required for the diesel generator at the site but that this is often overlooked on federal sites. It is recommended that the requirements for a C of A with respect to the diesel generator be verified and a C of A be obtained for the equipment if necessary.

Based on the results of the Enhanced Phase I ESA, the following recommendations are made:

.1 The condition of the AST in the generator shed should be maintained in its currently good condition. Care should be taken to avoid spillage when re-filling the tank. Measures to ensure compliance of tanks with applicable regulations should be taken.

.2 The ODS-containing equipment at the site, consisting of two air conditioners in the transmitter trailer, should be monitored to ensure it is maintained in good condition. Any servicing of these units must be carried out by a certified contractor. If the equipment is to be permanently taken out of service, the refrigerant must be drained by a qualified contractor and the equipment tagged to indicate that it is ODS-free.

.3 Appropriate precautionary measures (use of polyethylene drop sheets, filtered exhaust for power tools, etc.) should be implemented during future painting and maintenance activities to ensure that lead and other metallic elements present in paint applications do not contaminate soils (or interior surfaces of buildings). The condition of the lead-based paint identified on the communication tower should be monitored to ensure that it does not deteriorate which could result in impact to surrounding soils. The paint is currently in good condition.

4. It is recommended that the requirements for a C of A with respect to the diesel generator be verified and a C of A be obtained for the equipment if necessary.

It should be noted that sampling of air and groundwater was beyond the scope of work of this project. No sediment or surface water was present at the subject site. Impacts to soil at the subject site were not found and therefore further sampling is not currently recommended.

CONTENTS

LIST OF APPENDICES

1.0 INTRODUCTION

Terrapex Environmental Ltd. (Terrapex) was retained by Public Works and Government Services Canada (PWGSC) on behalf of the Department of Fisheries and Oceans Canada (DFO), Central and Arctic Region, to carry out an Enhanced Phase 1 Environmental Site Assessment (ESA) of the Canadian Coast Guard (CCG) MCTS Peripheral located at R.R. #6 Cobourg, Ontario (DFRP Reference #09627). The subject site is located in the Town of Cold Springs at the northwest corner of County Road 18 and Line 6 (McBride Road). The total area of the site is approximately 2.0 ha.

The MCTS Peripheral was most likely constructed in 1970, the year the property was acquired by CCG. The site is an unattended, very high frequency (VHF) radio transmitting facility which broadcasts weather data and pertinent marine conditions for use by boaters navigating in Lake Ontario. This site is important to the coverage of Lake Ontario and particularly critical for the coverage of central Lake Ontario. The site also has a very sensitive ratio direction finding antenna used to assist in locating vessels in distress.

Plans dated 1971, provided by CCG, show the original transmitter trailer (3 m x 12 m) and an additional 3 m x 3 m trailer at the site, presumably the generator shed. A wooden equipment shed, also located at the subject site, was constructed around 1974. In 1995 the generator shed was replaced with the existing structure. The transmitter trailer was replaced in 1997 or 1999.

1.1 Assessment Objectives

In general, ESAs are completed in phases. "Phase 1" typically involves research, consultation, visual reconnaissance, limited sampling, and confirmatory testing. A Phase 1 report will indicate whether any remedial work is required, or if further (Phase 2) work is needed to achieve an adequate assessment of the property.

A Phase 2 ESA generally includes a more detailed field investigation (subsurface sampling, further analytical testing, etc.) in order to gain a better understanding of the environmental condition of the subject property.

The assessment of the Cobourg MCTS generally follows the procedures of a Phase 1 ESA, with additional sampling and confirmatory testing carried out. This has allowed a greater quantity of data to be acquired without completing a full Phase 2 assessment.

This report presents the results of this assessment and provides conclusions on the environmental condition of the site, based on the information presented. Recommendations on the need for further assessment or remedial work are also provided.

Terrapex understands, based on the Terms of Reference, that the purpose of the Enhanced Phase I ESA is:

1. Identify and document actual or potential contamination to assist in reducing the uncertainty about potential environmental liabilities.

2. Develop a *National Classification System (NCS)* score for the site.

3. Meet the requirements of Treasury Board reporting by developing an indicative estimate of liability.

4. Provide the input data for DFO's RPIS/CS module.

Further to this, the project objectives as outlined in the Terms of Reference include:

1. Complete an Enhanced Phase I ESA by following the guidelines and principles established by the Canadian Standards Association in the document *Z768-94 Phase I Environmental Site Assessment, April 1994* to meet the first objective.

2. Conduct a preliminary intrusive investigation using current investigative practices to determine the presence or absence of contamination.

3. Determine compliance status, assess environmental risk and recommend necessary remedial action.

4. Fill out a detailed evaluation form from the document, *National Classification System for Contaminated Sites, Canadian Council of ministers of the Environment (CCME), March 1992* to meet the second objective.

5. Utilize the information provided in *Appendix G of Chapter 2-1 of the Treasury Board Manual, Information and Administrative Management Component, Capital Plans, Projects and Procurement, 199410 7108* to develop an indicative estimate of liability to meet objective #3.

6. Input data into the RPIS/CS module.

2.0 ASSESSMENT METHODOLOGY

The evaluation of the site consisted of four basic components: background research; consultation with individuals and agencies associated with the property; a site visit (which included both visual evaluation and sampling); and analytical testing and interpretation of results.

2.1 Research

Information was collected and reviewed from the following sources:

- Canadian Coast Guard, Department of Fisheries and Oceans
  Sarnia Base, Sarnia, Ontario
    - administration, operations, and maintenance files; site plans; title documents.
- Ministry of Natural Resources
  MNR Map Room, Toronto, Ontario
    - aerial photographs.
- Ministry of Northern Development and Mines
  Map 2566, Quarternary Geology of Ontario, Southern Sheet
    - information regarding quaternary geology of site.
- Ministry of Northern Development and Mines
  Map 2544, Bedrock Geology of Ontario, Southern Sheet
    - information regarding bedrock geology of site.
- The Physiography of Southern Ontario (publ. Ontario Geological Survey, Special Volume II)
  Ministry of Natural Resources
    - physiography and bedrock geology maps and information.

Copies of aerial photographs are provided in Appendix D.

2.2 Consultation

In an effort to obtain information pertaining to the subject property and vicinity, the following agencies and/or individuals were contacted:

- National Historic Sites Directorate, Federal Heritage Buildings Review Office, Hull, Québec
  C. Trudel, Registrar
    - provided information on heritage status of site structures.
- Archaeological and Heritage Planning, Ministry of Citizenship, Culture, and Recreation, Toronto
  R. von Bitter, Archaeological Data Coordinator
    - provided information on the archaeological status of the site.
- Ministry of the Environment, Peterborough District Office
  M. Longpre, Senior Environmental Officer
    - provided information regarding environmental compliance pertaining to the subject site or nearby sites.

- Ministry of the Environment, Toronto, Freedom of Information and Protection of Privacy Office
  F. Ruiter
  - requested to provide information on environmental concerns, spills, charges/prosecutions, and Certificates of Approval.

- Ministry of Natural Resources, Peterborough Area Office
  J. Wiltshire, Senior Resource Technician
  - provided general information on environmental conditions in the area, areas of natural significance and requested to provide information regarding hunting and fishing activity in the area.

- The Township of Hamilton, Cobourg, Ontario
  - provided information regarding water services in the vicinity of the site and local groundwater resource utilization.

- Environment Canada, www.weatheroffice.com website
  - provided information regarding historical climatological data for the site.

- Canadian Coast Guard, Oakville, Ontario
  A. Harish, Ship Radio Inspector, Technical Services Equipment and System Maintenance
  - provided general information regarding the site, activities, and structures.

- Environment Canada, Emergencies and Enforcement Division, Toronto
  R. Read, GIS and Sensitivity Mapping Specialist
  - Provided information regarding mapping of significant features at the site and surrounding areas.

Copies of correspondence are included in Appendix F. Complete information from the MNR Peterborough Office had not been received as at the date of submission of this report.

2.3 Site Reconnaissance

The site was visited by Terrapex field personnel on December 7, 2000. Mr. Amrik Harish, a Ship Radio Technician from the Oakville Coast Guard Office, was on site that day, and provided access to the site structures.

Climatic conditions were clear and very cold with light winds. There was 100% snow cover during the site visit. General site characteristics were observed and documented, and a limited sampling program was conducted, as discussed in Section 2.4. A key plan and site plan are provided in Appendices A and B, respectively. A historical site plan showing former structures at the subject site was reviewed. The locations of former structures are shown in relation to current structures on the site plan in Appendix B. Selected photographs taken during the site visit are presented in Appendix C.

2.3.1 Site Specific Health and Safety Plan

Field personnel followed protocols outlined in the *PWGSC Phase I Site Specific Health and Safety Plan* (HASP), prepared by Terrapex prior to the commencement of field activities. The HASP was designed to recognize general work hazards and safety measures as described in the Ontario Ministry of Labour, Occupational Health and Safety Act, as well as identify specific hazards associated with this particular project. The HASP identified key project personnel as Health and Safety Coordinators responsible for implementing the HASP to protect the health and safety of Terrapex personnel, clients, subcontractors, and the general public.

2.4 Sampling and Analytical Testing

Painted surfaces were present on the transmitter building and generator shed, however, due to the date of construction of these structures, it is unlikely that lead-based paint has been applied. Two paint samples were obtained from the communication tower and a wooden shed at the site, as the age of these structures was unknown. These samples were submitted for laboratory analysis. The use of building materials containing asbestos would also be unlikely, based on the age of the structures. No materials suspected of containing asbestos were observed at the site. All paint samples were placed in individual plastic bags, identified and logged for location, base material (if applicable), physical properties and quantity present.

Soil samples were collected using a stainless steel hand auger and/or pick axe as necessary, which was cleaned before completing subsequent sample locations to reduce the risk of cross-contamination. Soil samples were collected in individual glass jars, identified and logged for physical properties. All soil samples were screened in the field for volatile organic compounds with a *Gastector* hydrocarbon surveyor, using a standard headspace method. Sample analyses, locations, and field screening results are summarized in Section 5.2.3.

Soil sampling activities conducted while on site included the collection of two samples to provide an indication of the presence/absence of petroleum hydrocarbons associated with fuel storage at the site. One of these samples was collected along the exterior wall of the on-site generator structure in the vicinity of the fuel storage tank, specifically near the fill and vent areas. A second soil sample was collected in the reported vicinity of the former generator structure, specifically in the area where the former AST had been locate. This information was provided by the on-site CCG representative at the time of the site inspection. A later file review completed by Terrapex showed that the former generator shed was actually located south of the existing structure and not to the west, as initially reported.

Soil samples were not analyzed for metals parameters since this was not included in the scope of work for the project. Painted surfaces on structures appeared to be in good condition at the time of the site inspection and lead-based paint appears to be limited to that applied to the tower structure. Further sampling is not currently recommended.

SAMPLE DESIGNATORS	LOCATION	MATRIX	ANALYSIS PERFORMED
CSSS-1	2 m west and 1 m north of southwest corner of generator shed, in vicinity of former storage tank fill pipe and vent	soil	BTEX, TPH (gas/diesel) and (heavy oil)
CSBH-101	4m west of southwest corner of generator shed, in reported vicinity of former storage tank fill pipe and vent	soil	BTEX, TPH (gas/diesel) and (heavy oil)
Cold Springs PS-1	Paint from surface of communication tower.	paint	Lead, arsenic, zinc
Cold Springs PS-2	Paint from wooden shed.	paint	Lead, arsenic, zinc
Cold Springs PS-3	Paint from door of generator building.	paint	Not analyzed

NOTE:

BTEX = benzene, toluene, ethylbenzene, xylenes
TPH = Total Petroleum Hydrocarbons.

The indicated soil and paint samples were submitted to Philip Analytical Services Corporation (PASC) for analysis of the indicated parameters.

The laboratory Certificates of Analysis are included in Appendix E. Soil sample locations are plotted on the site plan provided in Appendix B.

2.4.1 QA/QC

Quality Assurance/Quality Control (QA/QC) for this project consisted of the submission of approximately 5% of soil samples collected for blind duplicate laboratory analyses in addition to the routine laboratory QA/QC procedures. This resulted in the submission of one duplicate soil sample for the project (six sites in total) which was analyzed for petroleum hydrocarbon parameters. The duplicate sample was not collected from this particular site but from an MCTS Peripheral site near Leamington, Ontario.

The results indicated that all parameters were below the laboratory method detection limit in the original sample and lab replicate sample. In the blind duplicate sample, detectable concentrations of ethylbenzene and xylenes were reported. These concentrations were only marginally above the method detection limit. Relative percent differences cannot be calculated since the original results and most of the duplicate results are below the method detection limit. However, due to the extremely low analyte concentrations in the blind duplicate sample, the correlation of analyte concentrations is considered good, with acceptable variance. The laboratory Certificates of Analysis for the QA/QC samples are included in Appendix E.

2.5 Regulations and Guidelines for Environmental Compliance

Analytical results of samples collected on-site and the compliance status of various environmental issues were only compared to the relevant regulations and/or guidelines selected from the items listed and described below.

2.5.1 AIR EMISSIONS	Ont. Reg. 346/90 stipulates that no person shall cause or permit to be caused the emission of any air contaminant to such a degree as may: - cause discomfort to persons - cause loss of enjoyment of normal use of property - interfere with normal conduct of business - cause damage to property Certificates of Approval are issued by the MOE stipulating the maximum acceptable contaminant discharge from the emissions source.

2.5.2 ASBESTOS

PWGSC DM Directive 057- Asbestos Management, outlines procedures for the evaluation of asbestos containing materials and recommendations for control. The Ontario Ministry of Labour (MOL) considers any material which contains greater than 0.5% asbestos fibre (by volume) to be an asbestos-containing material for the purposes of application of the requirements of the *Regulation Respecting Asbestos on Construction Projects and in Buildings and Repair Operations* (Ont. Reg. 838/90 as amended by O. Reg. 510/92).

Disposal of asbestos waste is governed by Ontario Regulation 347. The *Transportation of Dangerous Goods Act* and Regulations prescribe additional requirements related to the transportation of asbestos waste.

Asbestos is classified as a "designated substance" under the Ontario *Occupational Health and Safety Act*, which requires that a list of designated substances present at a project site be provided to all bidders on a project at the bidding stage.

2.5.3 FUEL STORAGE TANKS

Aboveground tanks or tank systems are governed by the Canadian Council of Ministers of the Environment's (CCME's) *Environmental Code of Practice for Aboveground Storage Tank Systems Containing Petroleum Products* (CCME-EPC-LST-71E, August 1994). The Code of Practice applies to all outside aboveground storage tank systems with a capacity of more than 230 L used for the storage of petroleum products, including gasoline, diesel fuel, aviation fuel, kerosene, naphtha, lubricating oil, fuel oil and engine oil, but excluding propane, paint and solvents. Any tank or tank system having a capacity greater than 4,000 L must be registered with the authority having jurisdiction. Tank systems containing fuel oil for heating or emergency power generation must also be constructed, installed and maintained in accordance with CAN/CSA-B139-00, *Installation Code for Oil Burning Equipment*.

Regulatory requirements which apply to tanks used for the storage of propane are specified in Ontario Regulation 514/96 *Propane Storage, Handling and Utilization* made under the *Energy Act*.

2.5.4 LEAD IN PAINT

The Federal Hazardous Products Act (1976) limits the quantity of lead permissible in newly manufactured paints to 0.5% (5,000 ppm). Paints having a lead content greater than 0.5% (5,000 ppm) are thus considered to be lead-based.

Lead is a Designated Substance under the Ontario *Occupational Health and Safety Act* (Ont. Reg. 843/90 as amended by O.Reg. 519/92 and O. Reg. 389/00). While it does not strictly regulate lead-based paint, the *Regulation respecting Lead* sets limits on exposure to airborne lead for workers in industrial operations. The Act also requires that a list of designated substances present at a project site be provided to all bidders at the bidding stage.

2.5.5 OZONE-DEPLETING SUBSTANCES (ODS)	The *Federal Halocarbon Regulations* assist in the development of strategic plans for the use, control and phase-out of ODSs and their halocarbon alternatives for operations under federal jurisdiction. In addition, the Montreal Protocol is an international agreement for the reduction and elimination of the use of ODSs. Maintenance of ODS containing equipment is regulated by the federal *Environmental Code of Practice for the Elimination of Fluorocarbon Emissions from Refrigeration and Air Conditioning Systems.* Provincial regulations under the Environmental Protection Act include: O. Reg. 356 (ODS regulation in general); O. Reg. 189/94 (refrigerants regulation); O. Reg. 413/94, (halon fire extinguishing equipment); O. Reg. 717/94 (solvents regulation); and O. Reg. 718/94 (sterilants regulation).
2.5.6 PCB-CONTAINING EQUIPMENT	Equipment containing solids or fluids with a polychlorinated biphenyl (PCB) concentration greater than 50 ppm is considered to be PCB-containing. There is no regulatory requirement to remove PCB-containing equipment from service, however, a review of regulatory requirements (O. Reg. 362/90, SOR/92-507 Canadian Environmental Protection Act) should be undertaken for all PCB-containing equipment present and the equipment should be properly identified and labeled.
2.5.7 SOIL	Soil sample analytical results were compared to the criteria for agricultural landuse published in the Ontario Ministry of the Environment (MOE) *Guideline for Use at Contaminated Sites in Ontario* (September 1998) and the CCME *Recommended Canadian Soil Quality Guidelines* (1999). The Table A cleanup criteria in the MOE Guideline have been used for comparison to results of analysis of samples of soil collected at the site. Table A provides soil criteria which may be used at sites where the local groundwater is considered a potable resource. The new C*CME Canada Wide Standard for Petroleum Hydrocarbons in Soil* (June 2000) were not ratified at the time of this project and have therefore not been used. Analytical methods used in this project preclude comparison of the current lab data to the proposed CCME guideline. Similarly these methods also precluded comparison to the MOE Table F cleanup criteria, Ontario Typical Range Soil Concentrations (background).
2.5.8 POTABLE WATER	No potable water samples were analyzed for this site.

2.6 Assessment Limitations

(i) A title search and legal survey of the subject property was beyond the scope of this environmental assessment. Therefore, all information regarding the property description is based on existing information, which is presumed to be accurate.

(ii) The entire site was snow-covered at the time of the site inspection. Therefore, evaluation of surfaces for evidence of staining was impeded.

(iii) Access to the wooden shed was not provided by CCG. According to Mr. Harish, this structure "belongs to the City" (presumably Hamilton Township) and is also used to store communication equipment. CCG does not have access to this structure.

3.0 GENERAL PROPERTY INFORMATION

1. Common Name	Cobourg MCTS Peripheral (Cold Springs)
2. Light List No.	Not applicable

3. CCG Region	Central & Arctic
4. CCG District	Parry Sound
5. DFRP reference #	09627

6. Location	Province	Ontario
	Waterway	None
	Region/District	Northumberland County, Hamilton Township
	Municipality	R.R. #6 Cobourg (Cold Springs)
	Additional	Actual town closest to site is Cold Springs

7. Geog. Coordinates	Lat.:	44° 04' 02" N	Long.:	78° 12' 38" W

8. Property Description	137 m x 153 m; Inland lot, site located at northwest corner of County Road 18 and Line 6 (McBride Road); grassy open area.
9. Total Property Area	Approximately 2 ha
10. No. of Structures	four structures including, guyed steel-skeleton tower, transmitter building, generator shed, and wooden shed

11. Operational Status	Active VHF transmitter
12. Present Custodian	Canadian Coast Guard, Central and Arctic Region Department of Fisheries and Oceans.

4.0 LAND USE PROFILE

4.1 Land Use History

The following briefly summarizes the history of land use at the subject property, as determined from files maintained at the Canadian Coast Guard Base in Sarnia, Ontario, provided by PWGSC staff, and the sources noted in Section 2.0.

DATE	LAND USE/NOTABLE EVENT
1970	CCG acquires the property at Cold Springs (subject site) and constructs 90 m communications tower; site is equipped with electricity and an emergency generator. Land use zoning for site is "Farming".
1971	Construction of original transmitter trailer (3 m x 12 m); trailer sat on blocks and was one story. Plans dated 1971, provided by CCG, also show an additional 3 m x 3 m trailer at the site (presumably the generator shed).
1974	Permission is granted to the Township of Hamilton by the Ministry of Transportation to mount an antenna at the 46 m level of the communications tower and locate a small portable equipment house adjacent to the Ministry's trailer. This equipment house is presumably the wooden shed currently located at the site.
1982	New roof installed on transmitter trailer; replacement of ventilating fans and louvers as well as air conditioning unit.
1983	RCMP receives permission from Transport Canada, Coast Guard Central Region to mount communication equipment on the communication tower.
1985	Replacement of perimeter fences at the site.
1987	Road upgrades at the site, including installation of a culvert to prevent road washout.
1992	Draft subdivision approval accorded to Cold Springs Estates Ltd. for residential development of areas surrounding site.
1993	Emergency repairs conducted on the roof of the equipment trailer as a result of falling ice from the transmitter tower.
1995	"EPU building" changed. This refers to the generator shed. According to Mr. Harish, this new shed was brought from another site and was constructed around 1982. This new generator shed was moved once between its installation and the site inspection by Terrapex.
1997	Arrival of existing transmitter trailer at the site, according to Mr. Harish. CCG plans suggest this may have occurred in 1999.
2000	Removal of original transmitter trailer from the site.
Present	• site operates as an active Canadian Coast Guard MCTS Peripheral
Future	• *site to continue as active Canadian Coast Guard MCTS Peripheral.*

The operation of the property as a Coast Guard MCTS for the last 30 years suggests that a number of environmental concerns may need to be addressed. These relate to the potential for the presence of surface or subsurface contamination from events associated with operational activities such as fuel spills (relating to on-site use and storage of petroleum hydrocarbon products), and the presence of lead-based paint on the tower structure at the subject site. Small quantities of ozone-depleting substances are also present in air conditioning systems at the site. These concerns are outlined in the following table.

Potential concerns relating to the following current and historical issues were <u>not</u> identified:

- waste disposal
- the use of lead-based paints on the on-site buildings;
- lead pipes or solder associated with plumbing;
- lead-acid batteries
- hazardous materials associated with site structures or equipment;
- heavy metal contamination;
- presence of PAH contamination;
- presence of ACM;
- presence of ODS in fire-extinguishing equipment;
- bacteriological contamination associated with on-site sewage systems;
- air emissions from on-site heating equipment;
- overuse of pesticides and herbicides;
- PCB containing equipment; no transformers are present at the site and, based on age, fluorescent light ballasts would not contain PCBs; if PCBs are present in transmitting equipment, which was not confirmed, they would be contained.

KNOWN/POTENTIAL ENVIRONMENTAL CONCERN	ACTUAL/POSSIBLE USAGE
HEAVY METAL CONTAMINATION	• Lead-based paints were in common usage until the late 1970s. On-site buildings have not likely been finished with lead-based paints, based on their age, however, the presence of lead-based paint on the on-site tower has been verified. Paint removal by sand blasting can result in contaminated soil.
HYDROCARBON CONTAMINATION	• Small quantities of diesel fuel (455 L) are stored on-site for the auxiliary generator. Impacts to soil may have resulted from fuel spills or tank leakage.
PRESENCE OF OZONE-DEPLETING SUBSTANCES (ODS)	• Ozone depleting substances are present in two air conditioners located within the transmitter trailer at the site.

In order to establish whether any past problems with respect to environmental compliance have been recorded by the MOE, Mr. Fred Ruiter of the Freedom of Information (FOI) and Protection of Privacy office was asked to review any files pertaining to this site. The FOI office also searches files of the Peterborough District Office, Investigations and Enforcement Branch and Spills Action Centre. A response was received from the FOI office on February 23, 2001 stating that no records were located in response to the request. A copy of this correspondence is included in Appendix F.

In a telephone interview with Terrapex, Mr. Michael Longpres, Senior Environmental Officer, MOE Peterborough District Office, stated that he is unaware of any environmental concerns associated with the Cobourg MCTS Peripheral.

4.2 Heritage Status

Federal buildings 40 years or older qualify for review by the Federal Heritage Buildings Review Office (FHBRO). Buildings may be designated as either "Recognized" or "Classified" (highest level), based on the heritage value assessed. The federal custodian of declared heritage property must consult with FHBRO if a change in the condition or ownership of the building is proposed. Similarly, bridges, parkland, and waterways under federal jurisdiction may also be identified as having historical or cultural significance, and therefore can be subject to special management provisions.

Most archaeological resources (both documented and unexplored, but considered to have high potential) are catalogued and protected by the provincial Ministry of Citizenship, Culture, and Recreation (MCCR). The Cultural Resources Management Section at Parks Canada also catalogues archaeological resources, particularly in National Parks and surrounding lands. Restrictions may be placed on land use in areas with known or potential archaeological significance.

4.2.1	STRUCTURES	The Federal Heritage Buildings Review Office (FHBRO) was contacted regarding the Cobourg MCTS Peripheral. According to Ms. Carol Trudell, there are no records pertaining to the site and therefore the site is not a recognized heritage building. The FHBRO was contacted during the initial records review, prior to the discovery of the age of the on-site structures. Buildings 40 years old or more qualify for review.
4.2.2	LAND/WATERWAY	According to information provided by Mr. Robert von Bitter of the Ontario Ministry of Culture and Tourism, there are three archaeological sites in the vicinity of the subject site. These areas are located northwest of the site and are not in the immediate vicinity.
4.2.3	ARCHAEOLOGICAL FEATURES CULTURAL SIGNIFICANCE	

4.3 Land Use: Adjacent Property

While reviewing the land use history of the subject property, past and present land uses on adjacent properties were also examined with respect to the potential for off-site impacts. The key plan and site plan provided in Appendices A and B, respectively, should be consulted to assist in interpretation. The following table summarizes adjacent land use.

DESCRIPTION OF ADJACENT LANDS	PAST OWNER/USE	PRESENT OWNER/USE
NORTH *Fields; sparse trees forest beyond*	Assumed vacant or farm land	• Privately owned vacant (possible agricultural land) with associated residential structure
WEST *Fields; sparse trees*	Assumed vacant or farm land	• Privately owned vacant (possible agricultural land)
EAST *County Road 18, residences and fields; forested areas beyond*	Assumed vacant or farm land and associated residential	• Privately owned residential and associated agricultural or vacant lands
SOUTH *Line 6 (McBride Road), residences and fields; forested areas beyond*	Assumed vacant or farm land and associated residential	• Privately owned residential and associated agricultural or vacant lands

5.0 PHYSICAL CHARACTERISTICS

5.1 Geology and Topography

5.1.1	GEOLOGY	The quarternary geology of the site consists of undifferentiated sandy silt to silt till; commonly rich in clasts, often high in total matrix carbonate content. Drumlins may also be common in this area. The bedrock geology of the site consists of Middle Ordovician limestone, dolostone, shale, arkose, and sandstone of the Ottawa Group and Simcoe Group, Shadow Lake Formation. According to the *Physiography of Southern Ontario*, the site is in a physiographic region known as the South Slope. This region contains a variety of soils. The area of the South Slope around the subject site is drumlinized.
5.1.2	SITE TOPOGRAPHY	The site topography is relatively flat with a gentle slope toward the southeast. Most of the area is covered with wild grasses. There is an imported gravel driveway and small parking area.

5.2 Soils

5.2.1	PHYSICAL DESCRIPTION	Samples collected suggest that local surficial soil materials are predominantly a fine to medium-textured, dark brown, sand and gravel with some organic content. Gravel fill comprised the driveway and parking lot.
5.2.2	USE	No agricultural land use of any type is currently carried out at the property. Surrounding land use is agricultural and associated residential. The station operates as a Coast Guard MCTS Peripheral VHF transmitter. Agricultural landuse criteria from the CCME guidelines and MOE guidelines were selected for the purpose of comparison of results of soil sample analysis to cleanup criteria. Agricultural criteria in CCME are more stringent than residential/parkland criteria and some areas surrounding the site may be used for agricultural purposes.

Soil samples were obtained from the vicinity of the diesel AST and the reported historical location of a diesel AST. Information with respect to soil quality is provided in Table 5.2.3. Soil sample analytical results were compared to the criteria for agricultural landuse published in the MOE *Guideline for Use at Contaminated Sites in Ontario* (September 1998) and the CCME *Recommended Canadian Soil Quality Guidelines* (1999). The Table A generic cleanup criteria in the MOE Guideline have been used for comparison since Table A provides soil criteria for sites in a potable groundwater situation.

CCME criteria were used to determine impacts, however, where criteria did not exist, such as for total petroleum hydrocarbons, Table A was used. These criteria are applicable since, according to Hamilton Township, residences in Cold Springs would use groundwater as a potable water source and no municipal water supply is available for the site and surrounding areas. Areas surrounding the site are used for agricultural and associated residential purposes.

Analytical methods used in this project preclude comparison of the current lab data to the MOE Table F cleanup criteria, Ontario Typical Range Soil Concentrations (background).

5.2.3 SOIL QUALITY INFORMATION

Location (Sample Designator)*	*Description*	*Analysis Conducted*	*Summary of Results (i.e., values which exceed generic criteria)***
CSSS-1: 2 m west and 1 m north of southwest corner of generator shed, in vicinity of former storage tank fill pipe and vent	Sand and gravel, trace asphalt particles	• vapour readings (jar-headspace method) • MOE BTEX and TPH (gas/diesel), TPH (heavy oils)	None
CSBH-101: 4m west of southwest corner of generator shed, in reported vicinity of former storage tank fill pipe and vent	Sand and gravel, trace asphalt particles	• vapour readings (jar-headspace method) • MOE BTEX and TPH (gas/diesel), TPH (heavy oils)	None

NOTE:

TPH total petroleum hydrocarbons

* Sample locations are presented on the site plan in Appendix B.
Analytical results are presented in Appendix E-6B and E-6C.
Laboratory reports are also provided in Appendix E.

** Generic criteria for agricultural landuse specified by CCME *Recommended Soil Quality Guidelines* (1999) and MOE *Guidelines for Use at Contaminated Sites in Ontario* (September, 1998) - Table A.

As outlined in the preceding table, all soil samples obtained from the site were below applicable criteria from both the MOE and CCME guidelines. It should be noted that CCME criteria for TPH do not exist, and therefore applicable MOE criteria were used. Quality Assurance/Quality Control (QA/QC) for this project consisted of the submission of approximately 5% of soil samples collected for blind duplicate laboratory analyses in addition to the routine laboratory QA/QC procedures. This resulted in the submission of one duplicate soil sample for the project (six sites in total) which was analyzed for petroleum hydrocarbon parameters. The duplicate sample was not collected from this particular site but from an MCTS Peripheral site near Leamington, Ontario.

The results indicated that all parameters were below the laboratory method detection limit in the original sample and lab replicate sample. In the blind duplicate sample, detectable concentrations of ethylbenzene and xylenes were reported. These concentrations were only marginally above the method detection limit. Relative percent differences cannot be calculated since the original results and most of the duplicate results are below the method detection limit. However, due to the extremely low analyte concentrations in the blind duplicate sample, the correlation of analyte concentrations is considered good, with acceptable variance. The laboratory Certificates of Analysis for the QA/QC samples are included in Appendix E.

Soil samples were not analyzed for metals parameters since this was not included in the scope of work for the project. Painted surfaces on structures appeared to be in good condition at the time of the site inspection and lead-based paint appears to be limited to that applied to the tower structure. Further sampling is not currently recommended.

5.3 Sediment

5.3.1	LOCATION & EXTENT	There is no water lot associated with this site
5.3.2	PHYSICAL DESCRIPTION	Not applicable
5.3.3	SEDIMENT QUALITY INFORMATION	Not applicable; no sediment present at the subject site

5.4 Surface Water

5.4.1	OCCURRENCE & DESCRIPTION	There are no major surface water bodies adjacent to the site. There is a drainage ditch along the roadways south and east of the site. No standing water was noted at the time of the assessment.
5.4.2	USE	No anticipated use of intermittent ditch water. It is anticipated that the nearest surface water bodies used for either recreational or municipal water use would be Rice Lake, located 6.25 km north, and Lake Ontario, located 12.5 km south.
5.4.3	SURFACE WATER QUALITY INFORMATION	Surface water quality samples were not collected, as there are no ponds or streams on the property.

5.5 Groundwater

5.5.1	DESCRIPTION, PHYSICAL PARAMETERS	No wells are known to have been installed on the station.
5.5.2	LOCAL USE	There is no indication that the groundwater supply has ever been developed or used on the site. According to Hamilton Township, residences in Cold Springs would use groundwater as a potable water source. No water service exists for the subject site. A communal well for Hamilton Township is also located in Canborne, approximately 2 km south of Cold Springs, however this water is not utilized by residents in the Cold Springs area. The nearest residences are within 1 km of the subject site and, according to the Township, would have potable water wells.
5.5.3	GROUNDWATER QUALITY INFORMATION	No groundwater quality information is known to be available for the site. Groundwater sampling was beyond the scope of work of this project.

6.0 BIOLOGICAL CHARACTERISTICS

6.1 Vegetation

6.1.1 AQUATIC/LITTORAL ZONE	There is no water lot associated with the site.
6.1.2 WETLANDS/MARSHES	No significant wetlands have been identified on, or adjacent to, this site.
6.1.3 TERRESTRIAL	Terrestrial vegetation on site consists of grasses and a few trees beyond the site boundaries.
6.1.4 PESTICIDE/HERBICIDE USE	There is no reported use of herbicides or pesticides at the site.

6.2 Fish and Fish Habitat

6.2.1 COMMON SPECIES KNOWN IN VICINITY	There is no water lot associated with the site.
6.2.2 HABITAT UTILIZATION	Not applicable
6.2.3 PROTECTED OR SIGNIFICANT HABITAT	Not applicable
6.2.4 RECREATIONAL & COMMERCIAL FISHING	Not applicable

6.3 Wildlife

6.3.1 COMMON SPECIES	Information regarding common wildlife species in the area has not yet been received from the MNR. It is likely that the site houses species common to southern and central Ontario, as identified in correspondence from other MNR offices, specifically those preferring open areas such as white-tailed deer, rabbits and hares, songbirds, raptors, foxes, skunks, wolves, shrews, mice, moles, voles, raccoons, weasels, and woodchucks.
6.3.2 HABITAT UTILIZATION OF PROPERTY	The site may be used by deer for grazing and for burrowing by ground-dwelling creatures. Predatory birds may also hunt in the fields of the site.
6.3.3 PROTECTED OR SIGNIFICANT HABITAT	No protected or significant habitat was identified in the immediate vicinity of the site.
6.3.4 HUNTING	Information regarding hunting has not yet been received from the MNR.

7.0 STRUCTURES & IMPROVEMENTS

7.1 Inventory of Structures

Site structures consist of a 90-m guyed steel tower, a prefabricated transmitter building, and a generator shed. The locations of the structures are shown on the site plan provided in Appendix B. Photographs of the structures are presented in Appendix C.

STRUCTURE		LOCATION	WATER[1]	DESCRIPTION/CONDITION	DATE
1	Tower	Central portion of site between wooden shed and generator shed	Rice Lake: 6.25 km north; Lake Ontario 12.5 km south	90-m guyed steel tower	1970
2	Transmitter Building	Central portion of site; westernmost structure	Rice Lake: 6.25 km north; Lake Ontario 12.5 km south	Single-story, prefabricated, slab-on-grade, 3 m X 13 m building; painted metal exterior and synthetic interior walls, floor and ceiling	1997
3	Generator Shed	Central portion of site; easternmost structure	Rice Lake: 6.25 km north; Lake Ontario 12.5 km south	Single-story, skid mounted, 3 m X 6.5 m shed; metal exterior and painted metal floor, walls and ceiling	1982
4	Wooden Shed	Central portion of site between transmitter building and tower	Rice Lake: 6.25 km north; Lake Ontario 12.5 km south	Single-story, no foundation, 2 m X 2 m shed; painted wooden exterior; interior not accessible	1974

1. Distance to water is a consideration for future projects that may be subject to the Canadian Environmental Assessment Act (CEAA).

7.2 Structures - Environmental Issues

The following tables provide a summary of the environmental issues associated with each structure. Detailed tables enumerating the samples collected and tested at each site, and information on equipment are included in Appendix E. A summary of the results of sample analysis for soils suspected of containing petroleum hydrocarbons is provided in Appendix E-6C.

Note: Y - yes; presence confirmed
N - no; not present
U – unknown; not confirmed

1. TOWER

.1	AIR EMISSIONS (E-1)	N	No air emissions.
.2	ASBESTOS (E-2)	N	No materials suspected to contain asbestos.
.3	LEAD (E-3)	Y	Paint was in good condition. The presence of lead-based paint was verified by laboratory analyses.
.4	FUEL STORAGE	N	None
.5	MERCURY (ELEMENTAL)	N	No known mercury-containing equipment is associated with this structure.
.6	ODS (E-4)	N	No known ODS at this location.
.7	PCBS (E-5)	N	None.
.8	WASTEWATER	N	None.
.9	POTABLE WATER SUPPLY	N	No potable supply on-site, however, groundwater is used locally.
.10	HAZARDOUS MATERIALS/WASTE	N	No containers of hazardous materials were noted.
.11	NON-HAZARDOUS DEBRIS	N	No non-hazardous debris was observed.

2. TRANSMITTER BUILDING

.1	AIR EMISSIONS (E-1)	N	No air emission sources.
.2	ASBESTOS (E-2)	N	No materials suspected of containing asbestos were observed.
.3	LEAD (E-3)	N	Painted surfaces would have been painted during trailer construction (around 1997) and are not likely to be lead-based.
.4	FUEL STORAGE	N	No fuel storage at this location.
.5	MERCURY (ELEMENTAL)	U	Mercury-containing equipment may be present in switches in the building thermostats which are fully contained within the units.
.6	ODS (E-4)	Y	Two window mounted air conditioner units contain ODS.
.7	PCBS (E-5)	N	No PCB containing equipment reported. All 13 fluorescent light ballasts present in the structure are new, according to Mr. Harish. No transformers exist at the site. PCBs may be present in electrical equipment but would be contained.
.8	WASTEWATER	N	No sewage generated at this building; an electric toilet is present within the structure but does not generate wastewater.
.9	POTABLE WATER SUPPLY	N	No potable supply on-site, however, groundwater is used locally.
.10	HAZARDOUS MATERIALS/WASTE	N	No hazardous materials present.
.11	NON-HAZARDOUS DEBRIS	N	None. Housekeeping is good. Stored materials were limited to a bag of salt for melting ice and extra fluorescent light tubes.

3. GENERATOR SHED

.1	AIR EMISSIONS (E-1)	Y	No emissions other than from diesel engine used to power the generator. Exhaust outlet on north wall of structure.
.2	ASBESTOS (E-2)	N	No materials suspected of containing asbestos were observed.
.3	LEAD (E-3)	N	Painted surfaces would have been painted during trailer construction (around 1982) and are not likely to be lead-based.
.4	FUEL STORAGE (present)	Y	455-L diesel-fuel AST to provide fuel to generator. There is a hole in the north wall of the shed for vent pipe access.
.5	MERCURY (ELEMENTAL)	N	No known mercury-containing equipment is associated with this building.
.6	ODS (E-4)	N	No ODS present at this location.
.7	PCBs (E-5)	N	No PCB containing equipment reported. All 6 fluorescent light ballasts present in the structure are new, according to Mr. Harish. No transformers exist at the site.
.8	WASTEWATER	N	No sewage generated at this location.
.9	POTABLE WATER SUPPLY	N	No potable supply on-site, however, groundwater is used locally
.10	HAZARDOUS MATERIALS/WASTE	N	No hazardous materials present with the exception of a single sulfuric acid battery (C8D 36) stored adjacent to the generator on a raised metal platform.
.11	NON-HAZARDOUS DEBRIS	N	No non-hazardous debris observed.

4. WOODEN SHED

.1	AIR EMISSIONS (E-1)	N	None observed or reported
.2	ASBESTOS (E-2)	N	No materials suspected of containing asbestos were observed on the exterior of the structure.
.3	LEAD (E-3)	N	Painted surfaces were sampled and found not to be lead-based.
.4	FUEL STORAGE (present)	N	No reported fuel storage.
.5	MERCURY (ELEMENTAL)	N	No known mercury-containing equipment is associated with this building.
.6	ODS (E-4)	N	No ODS known to be associated with structure.
.7	PCBs (E-5)	N	No PCB containing equipment reported.
.8	WASTEWATER	N	No sewage generated at this location.
.9	POTABLE WATER	N	No potable supply on-site, however, groundwater is used locally
.10	HAZARDOUS MATERIALS/WASTE	N	No hazardous materials visible on exterior of structure
.11	NON-HAZARDOUS DEBRIS	N	No non-hazardous debris observed.

OTHER CONCERNS

It is apparent that gravel fill has been used to construct the access driveway for the site. It is assumed that this material was clean, imported fill.

7.3 Easements/Site Services

There are no reported easements at the site. Road easements exist to the south and east of the subject site.

The site is serviced by Ontario Hydro with hydroelectric power. Bell cables also service the site. The washroom at the site is located in the transmitter trailer and is furnished with an electric toilet. This does not generate wastewater.

8.0 MATERIALS STORED, USED, OR DISCARDED

8.1 Aboveground Storage Tanks

One aboveground storage tank is currently located on the Coast Guard property. Information pertaining to this tank is included in the following tables and also in the *Fuel Storage Tank Compliance Report, Canadian Coast Guard, Cobourg MCTS* (draft report) completed by Terrapex in March 2001.

1	**ABOVEGROUND STORAGE TANK: Cobourg MCTS (Generator Shed)**				
a	Contents	Diesel fuel	m	Construction	steel
b	Capacity (L)	455 l (100 gallon)	n	Tank Supports	Raised above the floor on steel supports
c	Indoor/Outdoor	Indoor	o	Pipe Construction	Steel and copper
d	Vertical/ Horizontal	Horizontal	p	Model/Spec/CSA #	unknown
e	Year Installed	unknown	q	Owned/Leased	owned

f	Location	Inside generator building
g	Function	Used to supply fuel to auxiliary diesel fired generator.
h	Containment	No containment.
i	Protection	Not cathodically protected.
j	Fuel Supplier	Unknown.
k	Delivery & Frequency	Unknown.
l	General Condition & Remarks	Good condition. No visible signs of leakage. A small plastic container is located under a portion of the piping to contain any leaks.

8.2 Underground Storage Tanks

A review of existing information and observations made while on site suggest no underground storage tanks are, or ever were, located on the subject property.

8.3 Hazardous Materials/Waste

No hazardous materials or wastes were observed at the site with the exception of a single battery located in the generator shed.

	MATERIAL	LOCATION	QUANTITY	COMMENTS
a	Battery	Generator Shed	1 (sulfuric acid type C8D 36)	Stored on raised metal stand; good condition with no signs of leaking.
b	ODS (R-22)	Contained in two air conditioners in transmitter building	Typically 0.5 kg	Units are in good condition with no signs of leaking.

8.4 Non-Hazardous Materials/Waste

No non-hazardous waste materials were observed on site. Housekeeping practices at the site were good.

8.5 Placement of Fill, Dredged Materials

It is apparent that gravel fill has been used to construct the access driveway for the site. It is assumed that this material was clean, imported fill. According to documents provided by CCG, gravel on the driveway area was placed in a 3.7 m width at a minimum thickness of 23 cm. Immediate vicinity of site structures (area roughly 26 m by 30 m) was graveled to a minimum thickness of 15 cm.

9.0 NATIONAL CLASSIFICATION SYSTEM FOR CONTAMINATED SITES

The National Classification System for Contaminated Sites (NCSCS) is a method for evaluating contaminated sites according to their current or potential adverse impact on human health and the environment. The purpose of the NCSCS is to provide scientific and technical information to identify sites as high, medium, or low risk. The NCSCS is not designed to provide a general or quantitative risk assessment, but rather as a tool for the classification and general prioritization of contaminated sites. Application of the NCSCS is a screening method only, and does not provide conclusive risk assessment.

Based on known or estimated contaminant characteristics, exposure pathways, and potential receptors, sites are scored out of 100. Sites having a score of greater than 70 out of 100 are Class 1 (action required), scores between 50 and 70 are Class 2 (action likely required) and Class 3 (action may be required) are those scoring less than 50 out of 100. Class I sites require further information before they can be classified.

The MCTS Peripheral near Cobourg was not classified using the NCSCS since no impacts were identified in the Enhanced Phase I ESA.

10.0 INDICATIVE ESTIMATE OF LIABILITY OR CONTINGENT LIABILITY

The Treasury Board guidelines for assignment of Liability indicate that impacted Sites with a NCSCS score of "Class 1 or 2" are considered to have a *Liability* equivalent to the estimated remedial costs, while Sites with an NCSCS score of "Class 3" represent a *Contingent Liability* also equivalent to the estimated remedial costs. Sites with a "Class N" designation have no *Liability* or *Contingent Liability*.

Because contamination was not identified at the site, an NCSCS score was not assigned and therefore an estimate of liability or contingent liability was not conducted. However, lead-based paint was identified on the surface of the tower structure at the site. Future monitoring of the condition of this paint to ensure it does not deteriorate and result in impact to surrounding soils should be considered.

11.0 REAL PROPERTY INFORMATION SYSTEM FOR CONTAMINATED SITES (RPIS/CS) MODULE

Based on the results of the Enhanced Phase I ESA, Terrapex has input the data into the Real Property Information System For Contaminated Sites (RPIS/CS) Module and has provided copies of the module screens from all relevant sections of the module in Appendix H.

12.0 SUMMARY

Terrapex was retained by PWGSC on behalf of DFO, to carry out an Enhanced Phase 1 ESA of the CCG MCTS Peripheral near Cobourg, Ontario (Cold Springs). The subject site is located in the Town of Cold Springs at the northwest corner of County Road 18 and Line 6 (McBride Road). The total area of the site is approximately 2.0 ha.

The MCTS Peripheral was most likely constructed in 1970, the year the property was acquired by CCG. The site is an unattended, VHF radio transmitting facility which broadcasts weather data and pertinent marine conditions for use by boaters navigating in Lake Ontario. This site is important to the coverage of Lake Ontario and particularly critical for the coverage of central Lake Ontario. The site also has a very sensitive ratio direction finding antenna used to assist in locating vessels in distress.

Plans dated 1971, provided by CCG, show the original transmitter trailer (3 m x 12 m) and an additional 3 m x 3 m trailer at the site, presumably the generator shed. A wooden equipment shed, also located at the subject site, was constructed around 1974. In 1995 the generator shed was replaced with the existing structure. The transmitter trailer was replaced in 1997 or 1999.

A site visit was conducted by Terrapex personnel on December 7, 2000. A records review of CCG files was also completed. The operation of the property as a Coast Guard MCTS for the last 30 years suggests that a number of environmental concerns may need to be addressed. These relate to the potential for the presence of surface or subsurface contamination from events associated with operational activities such as fuel spills (relating to on-site use and storage of petroleum hydrocarbon products), and the presence of lead-based paint on the tower structure at the subject site. Small quantities of ozone-depleting substances are also present in air conditioning systems at the site.

Due to the age of the transmitter and generator trailers located at the subject site, the use of building materials containing lead and asbestos would be unlikely. No materials suspected of containing asbestos were observed at the site. Therefore, no samples of suspected asbestos-containing materials were collected. The transmitter tower and on-site shed could contain lead-based paints, based on their age. Paint samples were obtained from these structures and analyzed for arsenic lead and zinc. The presence of lead in the sample from the shed was not detected at concentrations above 0.5% and paint is therefore not considered to be lead-based. The paint sample obtained from the tower structure is considered lead-based since the lead concentration was greater than 0.5%. The structure appeared to be in good condition at the time of the site inspection.

Two soil samples were obtained from the vicinity of the diesel AST and the reported historical location of a diesel AST. Soil sample analytical results were compared to the criteria for agricultural landuse published in the MOE *Guideline for Use at Contaminated Sites in Ontario* (September 1998) and the CCME *Recommended Canadian Soil Quality Guidelines* (1999). The Table A generic cleanup criteria in the MOE Guideline have been used for comparison since Table A provides soil criteria for sites in a potable groundwater situation. These criteria are applicable since, according to Hamilton Township, residences in Cold Springs would use groundwater as a potable water source and no municipal water supply is available for the site and surrounding areas.

Areas surrounding the site are used for agricultural and associated residential purposes. Analytical methods used in this project preclude comparison of the current lab data to the MOE Table F cleanup criteria, Ontario Typical Range Soil Concentrations (background). There were no exceedances of applicable CCME or MOE petroleum hydrocarbon criteria in any of the soil samples taken at the site.

Soil samples were not analyzed for metals parameters since this was not included in the scope of work for the project. Painted surfaces on structures appeared to be in good condition at the time of the site inspection and lead-based paint appears to be limited to that applied to the tower structure. Further sampling is not currently recommended. Sediment sampling was also beyond the scope of work of this project.

Potential concerns relating to the following current and historical issues were <u>not</u> identified:

- waste disposal
- the use of lead-based paints on the on-site buildings;
- lead pipes or solder associated with plumbing;
- lead-acid batteries
- hazardous materials associated with site structures or equipment;
- heavy metal contamination;
- presence of PAH contamination;
- presence of ACM;
- presence of ODS in fire-extinguishing equipment;
- bacteriological contamination associated with on-site sewage systems;
- air emissions from on-site heating equipment;
- overuse of pesticides and herbicides;
- PCB containing equipment; no transformers are present at the site and, based on age, fluorescent light ballasts would not contain PCBs; if PCBs are present in transmitting equipment, which was not confirmed, they would be contained.

A number of environmental concerns were identified as a result of this assessment, and are listed below in order of priority.

Lead Paint

The presence of lead in painted surfaces (at concentrations above 0.5%) on the tower structure at the Cobourg MCTS Peripheral has been confirmed. The orange paint applied to the tower was found to be lead-based. These painted surfaces were in good condition at the time of the site inspection.

The presence of lead in paint is primarily a concern if the paint is disturbed by sanding during building renovations or during demolition activities or if the building, or part thereof, is used or inhabited by pre-school children. Under provincial regulations, the only requirement for further action is specified by the *Occupational Health and Safety Act*, which requires that contractors be notified of the presence of lead (and other designated substances) in a building at the tendering stage so that appropriate measures can be taken by the contractor to protect workers from excessive exposure. Future monitoring of the condition of this paint to ensure it does not deteriorate and result in impact to surrounding soils should be considered.

Fuel Storage Tanks

One aboveground storage tank is present at this site. The 455-L (100 gallon) capacity tank is used for the storage of diesel fuel for the auxiliary diesel generator and is located inside the generator shed. Federal government policy regarding aboveground storage tanks is provided by the *Environmental Code of Practice for Aboveground Storage Tank Systems Containing Petroleum Products*, August 1994, under the Canadian *Environmental Protection Act*. This Code of Practice applies to all outside aboveground storage tank systems with a capacity of more than 230 L used for the storage of petroleum products, including gasoline, diesel fuel, kerosene and fuel oil, but excluding propane.

Provincial requirements relating to fuel oil storage tanks are prescribed by the *Fuel Oil Code* under the *Energy Act*. A draft version of the *Fuel Oil Code*, dated 1996, has been issued by the Technical Standards and Safety Authority. This draft code, not yet adopted, proposes to implement many of the recommendations set out in the Federal Codes of Practice for storage tank systems.

Provincial requirements which apply to tanks used for storage of propane are specified in Ontario Regulation 514/96 *Propane Storage, Handling and Utilization* made under the *Energy Act*.

Overall the tank was in good condition. However, non-compliance issues were identified with respect to operational practices. The issues of non-compliance are related to inventory control and inspection. This is outlined in the *Fuel Storage Tank Compliance Report, Canadian Coast Guard, Cobourg MCTS* (draft report) completed by Terrapex in March 2001. As previously mentioned, there were no exceedances of applicable petroleum hydrocarbon criteria in any of the soil samples taken at the site.

Ozone-depleting Substances

Equipment at the subject site which contains ODS, includes two air conditioners located in the transmitter trailer. All equipment appeared to be in good condition at the time of the site inspection. Any servicing of these units must be carried out by a certified contractor. If the equipment is to be permanently taken out of service, the refrigerant must be drained by a qualified contractor and the equipment tagged to indicate that it is ODS-free.

Air Emissions

The MOE does not issue Certificates of Approval (C of As) for equipment installed prior to June 29, 1988. Fuel-burning equipment used solely for the purpose of comfort heating in a dwelling is also exempt from the requirement to obtain a C of A. If the buildings at the subject site were replaced between 1995 and 1999, as records suggest, it is possible that the diesel generator may also have been replaced and that a C of A may be required for the associated air emissions. Since no records were located by the MOE with respect to the site, it is not likely that a C of A was obtained. Representatives from the MOE suggested that C of As may be required for the diesel generator at the site but that this is often overlooked on federal sites. It is recommended that the requirements for a C of A with respect to the diesel generator be verified and a C of A be obtained for the equipment if necessary.

13.0 RECOMMENDATIONS

.1 The condition of the AST in the generator shed should be maintained in its currently good condition. Care should be taken to avoid spillage when re-filling the tank. Measures to ensure compliance of tanks with applicable regulations should be taken.

.2 The ODS-containing equipment at the site, consisting of two air conditioners in the transmitter trailer, should be monitored to ensure it is maintained in good condition. Any servicing of these units must be carried out by a certified contractor. If the equipment is to be permanently taken out of service, the refrigerant must be drained by a qualified contractor and the equipment tagged to indicate that it is ODS-free.

.3 Appropriate precautionary measures (use of polyethylene drop sheets, filtered exhaust for power tools, etc.) should be implemented during future painting and maintenance activities to ensure that lead and other metallic elements present in paint applications do not contaminate soils (or interior surfaces of buildings). The condition of the lead-based paint identified on the communication tower should be monitored to ensure that it does not deteriorate which could result in impact to surrounding soils. The paint is currently in good condition.

4. It is recommended that the requirements for a C of A with respect to the diesel generator be verified and a C of A be obtained for the equipment if necessary.

It should be noted that sampling of air and groundwater was beyond the scope of work of this project. No sediment or surface water was present at the subject site. Impacts to soil at the subject site were not found and therefore further sampling is not currently recommended.

All of which is respectfully submitted,

Terrapex Environmental Ltd.

Elise Croll, H.B.Sc., CESA
Project Scientist

P. Jeff Stevenson, B.Sc.
Project Manager

APPENDIX A:

Key Plan

TERRAPEX
Environmental Ltd.

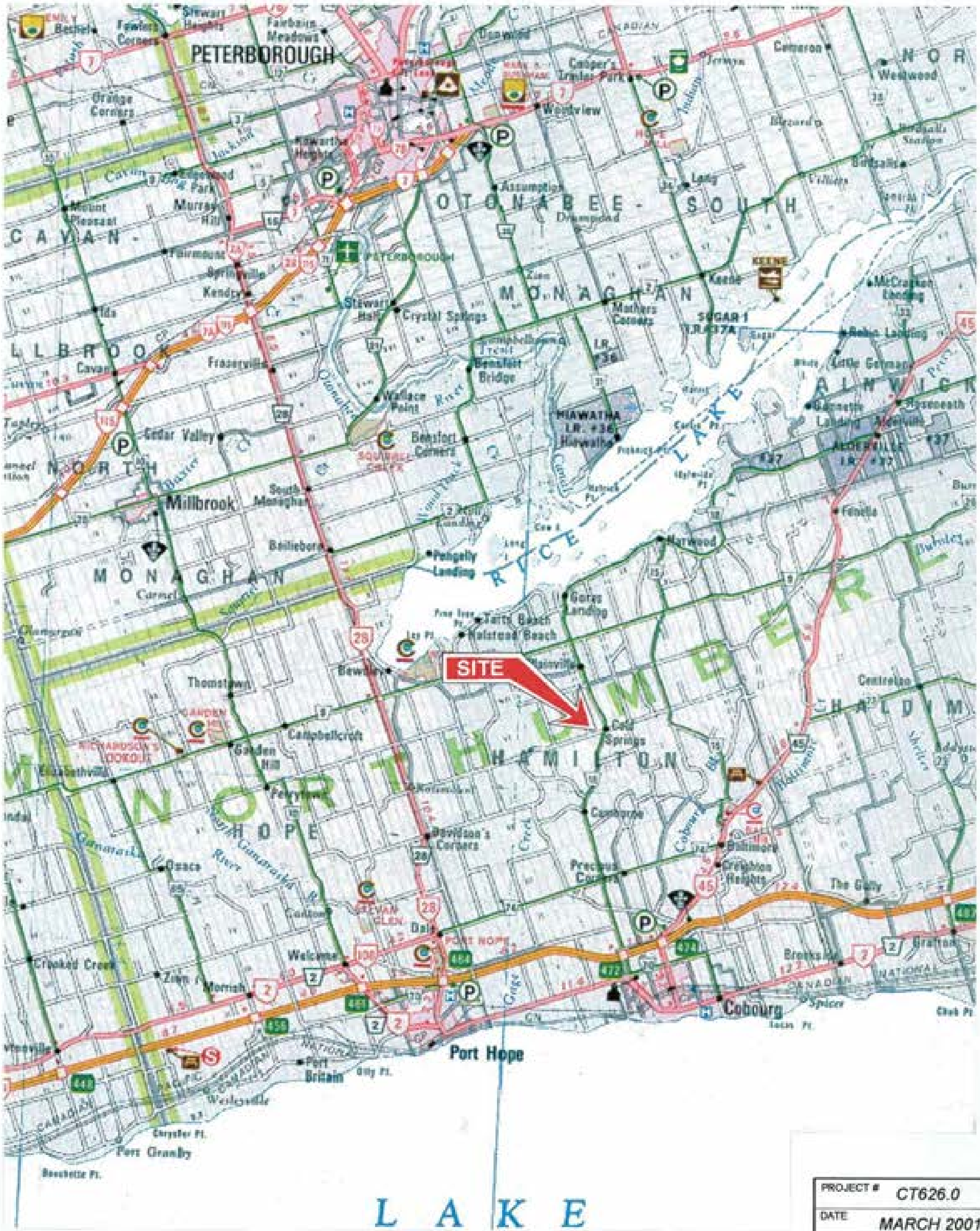
SITE LOCATION

COBOURG MCTS
COLD SPRINGS, ONTARIO

CLIENT

Public Works and
Government Services
Canada

N



NOTE: MAP IMAGE TAKEN FROM RAND McNALLY ROAD MASTER, PAGE 30.

PROJECT # CT626.0	
DATE MARCH 2001	
DRAWN	CHECKED PJS
DRAWING # FIGURE 1	

APPENDIX B:

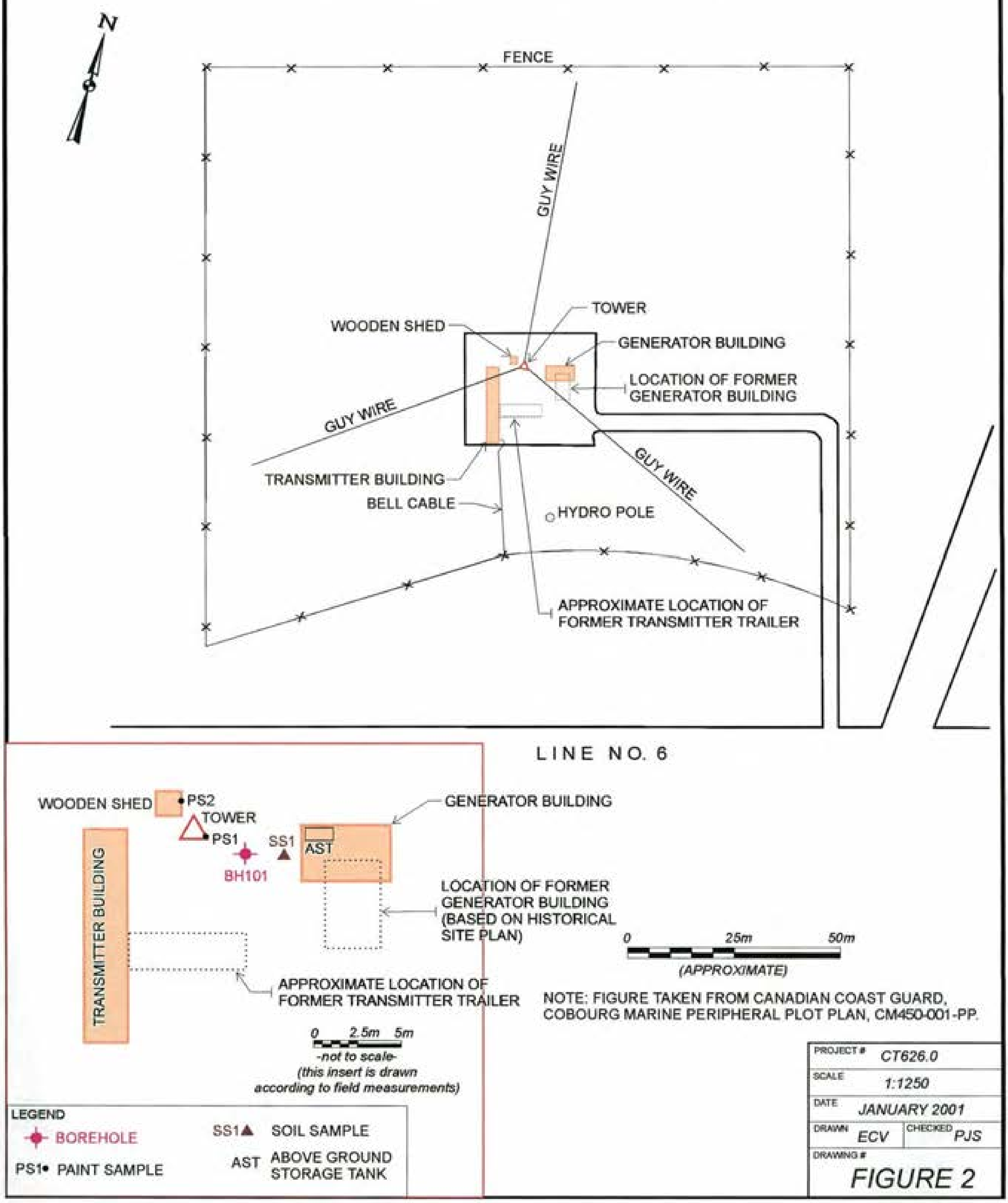
Site Plan

TERRAPEX
Environmental Ltd.

GENERAL SITE LAYOUT

COBOURG MCTS
COLD SPRINGS, ONTARIO

CLIENT
Public Works and
Government Services
Canada



-not to scale-
(this insert is drawn according to field measurements)

(APPROXIMATE)

NOTE: FIGURE TAKEN FROM CANADIAN COAST GUARD, COBOURG MARINE PERIPHERAL PLOT PLAN, CM450-001-PP.

PROJECT # CT626.0
SCALE 1:1250
DATE JANUARY 2001
DRAWN ECV
CHECKED PJS
DRAWING #

FIGURE 2

APPENDIX C:

Site Photographs

PHOTO 1: VIEW OF SITE LOOKING NORTH-NORTHWEST FROM PARKING AREA; NOTE SITE STRUCTURES.

PHOTO 2: VIEW OF SITE LOOKING NORTHWEST FROM DRIVEWAY ENTRANCE.

PHOTO 3: VIEW OF SURROUNDING LAND USE TO THE EAST OF THE SITE LOOKING EAST DOWN ACCESS DRIVEWAY ACROSS COUNTY ROAD 18.

PHOTO 4: VIEW OF GENERATOR SHED LOOKING NORTHEAST.

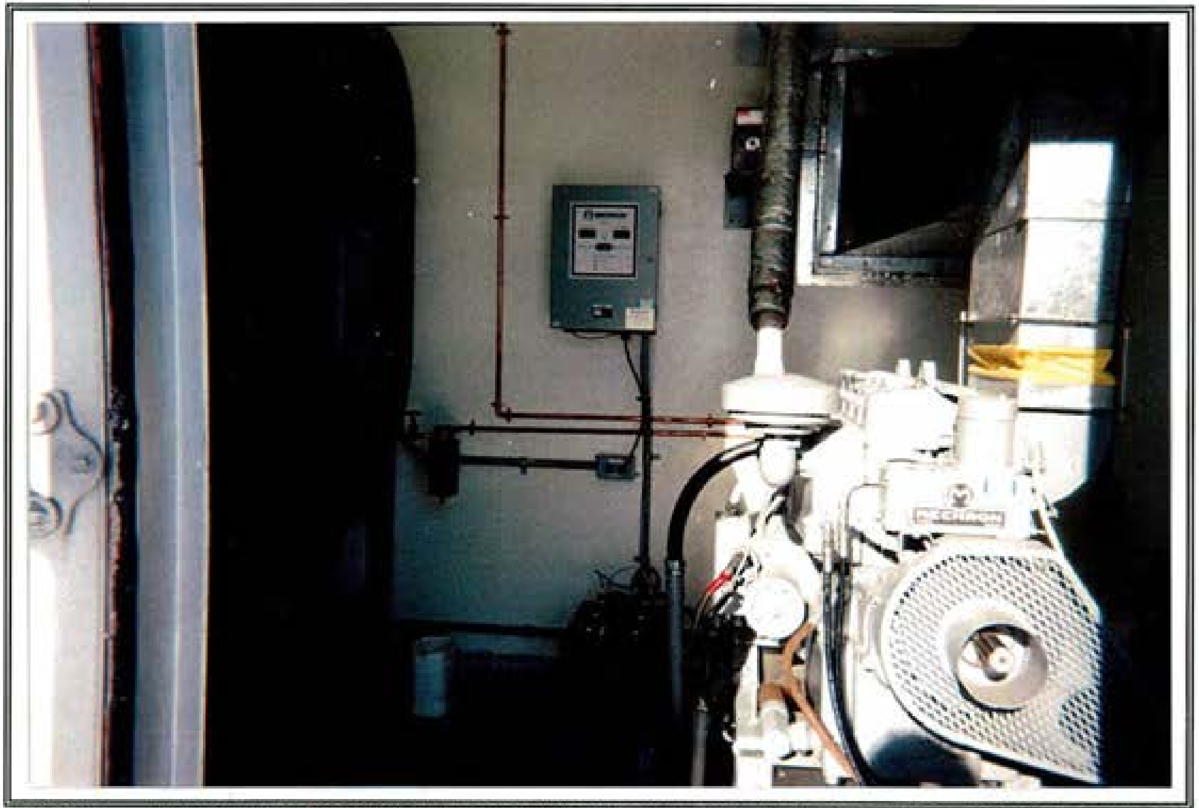


PHOTO 5: VIEW OF INTERIOR OF GENERATOR BUILDING; NOTE POSITIONS OF AST, BATTERY, AND GENERATOR.

PHOTO 6: VIEW OF DIESEL FUEL AST IN GENERATOR BUILDING; NOTE VENT PIPE EXITING STRUCTURE AND FILL PIPE AT TOP OF TANK.

APPENDIX D:

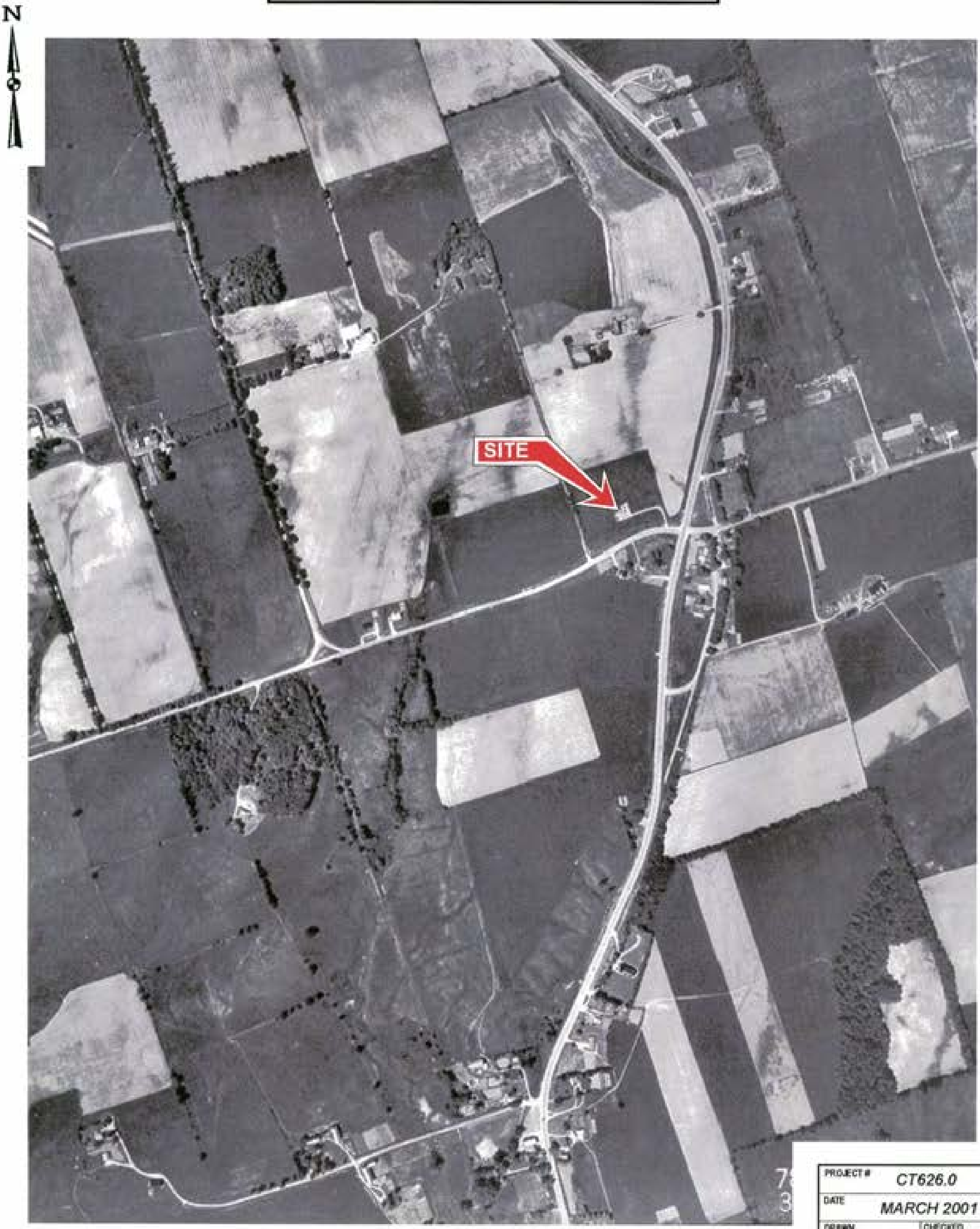
Aerial Photographs

TERRAPEX
Environmental Ltd.

1978 AERIAL PHOTOGRAPH

COBOURG MCTS
COLD SPRINGS, ONTARIO

CLIENT
Public Works and
Government Services
Canada



PROJECT #	CT626.0
DATE	MARCH 2001
DRAWN	CHECKED PJS
DRAWING #	FIGURE D1

APPENDIX E:

Supporting Information

E-1: Air Emissions

E-1 Air Emissions Sources

Cobourg MCTS Peripheral, December 7, 2000.

SOURCE		LOCATION/FUNCTION	EQUIPMENT INFORMATION			POTENTIAL CONTAMINANTS	APPROVAL REQUIRED?
			MFR.	MODEL	SERIAL #		
1	Diesel fired generator	Located in generator shed to provide backup power at the site.	Mechron diesel engine, Stamford Alternator, Newage Lyon Ltd., Stamford, Lincolnshire, England	unknown	MA202-6A	NOx, SO_2, CO	According to the MOE, a C of A is required for generators, however, the site may have been overlooked since it is Federally owned. This information will be provided once the results of the FOI request are received.

NOTE:

APPENDIX E (CONT'D):

Supporting Information

E-2: Asbestos-Containing Materials, Sample Log

E-2 Sample Log, Asbestos-Containing Materials

Cobourg MCTS Peripheral, December 7, 2000.

Definition of "exposure hazard":

1 - Minimal risk associated with material in its present condition (e.g. well-encapsulated elbows; VATs in good condition).

2 - Minor upgrades or repairs required to reduce a potential exposure hazard (e.g. small tears in the outer covering of a pipe elbow).

3 - A significant exposure hazard exists, with immediate remedial action required (e.g. loose friable asbestos accessible in a house).

SAMPLE No.	LOCATION/ AFFECTED AREA	DESCRIPTION	CONDITION	TEST RESULT	FRIABILITY	EXP. HAZARD	ESTIMATED QUANTITY
No Samples Collected							

ND = No asbestos fibres detected (detection limit = 0.5% by volume)
NA = Not applicable

APPENDIX E (CONT'D):

Supporting Information

E-3: Sample Log, Lead-Based Paints

E-3 Sample Log, Lead-Based Paints

Cobourg MCTS Peripheral, December 7, 2000.

SAMPLE	LOCATION/AFFECTED AREA	DESCRIPTION	BASE MATERIAL	CONDITION	LEAD* CONTENT	ARSENIC CONTENT	ZINC CONTENT	ESTIMATED QTY.
Cold Springs PS-1	Tower Structure	Orange paint on exterior of tower	Metal	Fair to good; minor chipping	40,500 ppm	nd	365,000 ppm	Entire area of tower; all orange paint and possibly some white paint.
Cold Springs PS-2	Exterior of wooden shed	Brown paint on exterior of structure	Wood	Poor; significant peeling and chipping	205 ppm	13.8 ppm	164 ppm	Entire exterior area of shed.
Cold Springs PS-3	Paint from door of generator building	White paint	Metal	Fair to good	NA	NA	NA	Interior and exterior of generator shed.

* The *Federal Hazardous Products Act* limits the amount of lead permissible in new interior paint to 0.5% or 5,000 ppm. While this limit does not apply to paints already applied, it is generally accepted as the level over which a paint is considered to be "lead-based".

nd	not detected (<1.0 ppm)
NA	not analysed

RECEIVED JAN 0 8 2001

Client: Terrapex Environmental Ltd.
557 Dixon Road
Suite 108
Etobicoke, ON, CANADA
M9W 6K1
Fax: 416-245-0012

Attn: Elise Croll

Date Received: December 12/2000
Date Reported: December 21/2000
Lab Ref#: G206534
Lab Quote#: VG808-0858

Client Ref#: CT.626.0
Sampled By: EGC/GG

Certificate of Analysis

Analysis Performed:
Lead analysis by FAAS
Arsenic, Hydride Generation AA
Zinc by ICP

Methodology:

1) Analysis of lead in paint or paint chips by Flame Atomic Absorption Spectrophotometry.
U.S. EPA Method No. 7420
2) Analysis of arsenic in paint by Hydride Generation Atomic Absorption.
U.S. EPA Method No. 7061 (Modified)
3) Analysis of trace zinc in paint by Inductively Coupled Plasma Spectrophotometry.
U.S. EPA Method No. 200.7
(Ministry of Environment ELSCAN)

Instrumentation:

1) Thermo Jarrell Ash Video 12E AA/AE Spectrophotometer
2) Varian SpectrAA 400 Plus AA/Vapour Accessory VGA 76
3) Thermo Jarrell Ash ICAP 61E Plasma Spectrophotometer

Client: Terrapex Environmental Ltd.
557 Dixon Road
Suite 108
Etobicoke, ON, CANADA
M9W 6K1
Fax: 416-245-0012

Attn: Elise Croll

Date Received: December 12/2000
Date Reported: December 21/2000
Lab Ref#: G206534
Lab Quote#: VG808-0858

Client Ref#: CT.626.0
Sampled By: EGC/GG

Certificate of Analysis

Sample Description: Paint

QA/QC: Refer to CERTIFICATE OF QUALITY CONTROL report.

Results: Refer to REPORT of ANALYSIS attached.

Certified By
Nick Boulton
Service Manager

Certified By
N. Boulton, B.Sc., C.Chem.
Customer Service Manager

Philip Analytical Services Corp

Certificate of Quality Control

Client : Terrapex Environmental Ltd.
Contact: Elise Croll

Date Reported: December 21/2000
Lab Ref # : G206534
Lab Quote#: VG808-0858

Analysis of Paint

Client Ref#: CT.626.0

Parameter	SAMPLE ID (spike)	EQL	Units	Process Blank			Process % Recovery				Matrix Spike					Overall QC Acceptable
				Result	Upper Limit	Accept	Result	Lower Limit	Upper Limit	Accept	Result	Target	Lower Limit	Upper Limit	Accept	
Lead	na	10	mg/kg	nd	20	yes	102	80	120	yes	na	na	na	na	na	yes
Arsenic	na	0.2	mg/kg	na	na	na	99	70	130	yes	na	na	na	na	na	yes
Zinc	na	1	mg/kg	nd	5	yes	94	80	120	yes	na	na	na	na	na	yes

EQL = Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence
* = Unavailable due to dilution required for analysis
na = Not Applicable
ns = Insufficient Sample Submitted
nd = parameter not detected
TR = trace level less than EQL.

Philip Analytical Services Corp

Report of Analysis

Client : Terrapex Environmental Ltd.		Report Date:	December 21/2000
Contact: Elise Croll		Lab Ref # :	G206534
		Lab Quote #:	VG808-0858

Analysis of Paint

Client Ref#: CT.626.0

Parameter	EQL	Units	COBOURG PS1 2000/12/07	COBOURG PS2 2000/12/07	* COLD SPRINGPS1 2000/12/07	* COLD SPRINGPS1 Replicate	* COLD SPRINGPS2 2000/12/07
Lead	10	mg/kg	169000	1930	40500	-	205
Arsenic	0.2	mg/kg	0.4	nd!(0.5)	nd!(1.0)	ns	13.8
Zinc	1	mg/kg	121000	2300	365000	-	164

EQL	Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence.
-	Not Requested
nd	parameter not detected ! = EQL higher than listed due to dilution ( ) Adjusted EQL
ns	Insufficient Sample Submitted

APPENDIX E (CONT'D):

Supporting Information

E-4: Ozone-Depleting Substances and DFO Halocarbon Inventory Form

E-4 Equipment Containing Ozone-Depleting Substances

Cobourg MCTS Peripheral, December 7, 2000.

Equipment		Location	Equipment Data	ODS information		Action Required?
				QTY.	SUBSTANCE	
1	Air Conditioner	Transmitter Building	Electrohome	unknown - typically 0.5 kg	unknown - typically R22	If discarded, refrigerant must be drained by a licensed technician.
2	Air Conditioner	Transmitter Building	Electrohome	unknown - typically 0.5 kg	unknown - typically R22	If discarded, refrigerant must be drained by a licensed technician.

Department of Fisheries and Oceans - Environmental Management System		
Section: Halocarbon Inventory Form	Subject: Halocarbon Management Program for DFO Facilities, Vessels and Vehicles	Page 1 of 3
Version: 1	Approved by:	Issued: November 18, 1999 Revised:

DEPARTMENT OF FISHERIES AND OCEANS
HALOCARBON INVENTORY FORM

ate: **Tag Number:**

1. **Location:**

Cobourg MCTS Peripheral DFRP Reference # 09672

Floor: 1st

Room Number: Transmitter Trailer - located on east wall nearer to north end and west wall nearer to south end

Location on-board Ship/Aircraft:

2. **Equipment Type:**

(a) Refrigeration Systems and Air Conditioning Systems

Refrigeration System:

Refrigeration Capacity (<19kW?): Yes/No

Capacity (kW

Amount of Halocarbon (kg.):

Air Conditioning System:

Refrigeration Capacity (kW.) (<19kW?): Yes/No Unknown, typically

Capacity 2.6 (kW)

Amount of Halocarbon (kg.): typically 0.5 kg

Vehicle Air Conditioning System:

Capacity (kW.) (<19kW?): Yes/No

Capacity (kW

Amount of Halocarbon (kg.):

Department of Fisheries and Oceans - Environmental Management System		
Section: Halocarbon Inventory Form	Subject: Halocarbon Management Program for DFO Facilities, Vessels and Vehicles	Page 2 of 3
Version: 1	Approved by:	Issued: November 18, 1999 Revised:

(b) Fire Extinguishing System

Portable System (<25kg.?): Yes/No — Amount of Halocarbon (kg.): /

Fixed System: Yes/No — Amount of Halocarbon (kg.): /

(c) Solvents/Cleaning System Type: /

Amount of Halocarbon (kg.): /

[Note: The Federal Halocarbon Regulations define a "Solvent System" as "an application or system that employs halocarbons as solvents, including cleaning applications and associated equipment containing or designed to contain a halocarbon solvent. It does not include halocarbons used in laboratories as analytical standards or laboratory reagents, or halocarbons in a process in which they are being converted to another substance or are generated but ultimately converted to a different substance."]

(d) Other Halocarbon Applications including Halocarbon Bank: (Descriptions)

/

Amount of Halocarbon (kg.): /

3. **Halocarbon Type:** (Select from attached list from Schedule 1 of the Regulations. If a chemical within a class (eg. CFCs), state specific type (eg. CFC-11 or R-11)).

Unknown, CFC typically HCFC-22, Type R-22

4. **Records:**
Location, brief description of contents:

Electrohome window air conditioners (2)
in transmitter trailer

5. **Comments:**

6. The information contained in this Halocarbon Inventory Form is an accurate representation of the facts pertaining to the use of Halocarbons in the referenced equipment.

Department of Fisheries and Oceans - Environmental Management System		
Section: Halocarbon Inventory Form	Subject: Halocarbon Management Program for DFO Facilities, Vessels and Vehicles	Page 3 of 3
Version: 1	Approved by:	Issued: November 18, 1999 Revised:

Responsible Officer*:

Location: Phone Number:

Signature: ________________________ Date:

Responsible Manager: __________________ Date:________________________

[*Officer charged with responsibility for ownership, maintenance and servicing, of the relevant equipment and halocarbon.]

HALOCARBON TYPES
(As set out in the Federal Halocarbon Regulations)

1. Tetrachloromethane (carbon tetrachloride)
2. 1,1,1-trichloroethane (methyl chloroform), not including 1,1,2-trichloroethane
3. Chloroflourocarbons (CFC)
4. Bromochlorodifluoromethane (Halon 1211)
5. Bromotrifluoromethane (Halon 1301)
6. Dibromotetrafluoroethane (Halon 2402)
7. Bromoflourocarbons other than those set out in items 4 to 6
8. Hydrobromofluorocarbons (HBFC)
9. Hydrochlorofluorocarbons (HCFC)
10. Hydrofluorocarbons (HFC)
11. Perfluorocarbons (PFC)

APPENDIX E (CONT'D):

Supporting Information

E-5: PCB-Containing Equipment

E-5 PCB-Containing Equipment

Cobourg MCTS Peripheral, December 7, 2000.

LOCATION	QTY.	EQUIPMENT	EQUIPMENT INFORMATION		
			MANUFACTURER, BRAND NAME	SERIAL #, DATE STAMP	PCB-CONTAINING?
None Sampled					

APPENDIX E (CONT'D):

Supporting Information

E-6A: Soil Sample Log Notes

E-6A Soil Sample Log Notes

Cobourg MCTS Peripheral, December 7, 2000.

SAMPLE	SOIL DESCRIPTION	DEPTH TO BEDROCK (cm)	SOIL GAS VAPOUR READING (ppm)
CS BH-101	Brown, sand and gravel (0 - 0.3 m)	unknown	10
CS SS-1	Brown, sand and gravel with some organic material (surface sample)	unknown	10

APPENDIX E (CONT'D):

Supporting Information

E-6B: Results of Analyses for MOE Inorganic Parameters in Soil

No soil samples were submitted for analysis of inorganic parameters.

APPENDIX E (CONT'D):

Supporting Information

E-6C: Results of Analyses for Petroleum Hydrocarbons in Soil

Client: Terrapex Environmental Ltd.
557 Dixon Road
Suite 108
Etobicoke, ON, CANADA
M9W 6K1
Fax: 416-245-0012

Attn: Elise Croll

Date Received: December 12/2000
Date Reported: December 19/2000
Lab Ref#: G206534
Lab Quote#: VG808-0858

Client Ref#: CT.626.0
Sampled By: EGC/GG

Certificate of Analysis

Analysis Performed:
Extractable Hydrocarbon Analysis(MUST), C10-C24
TPH(Hot Extractable), Gravimetry
BTEX and Total Purgeable Hydrocarbons

Methodology:

1) The characterization of HydroCarbon in soil by GC analysis, following a solvent extraction.
U.S. EPA Method No.8011(microextraction)
2) Determination of TPH(hot extractable) in soil, using solvent extraction. Analysis of evaporated extract by gravimetry.
U.S. EPA Method No. 9071(Modification)
3) Analysis of Benzene, Toluene, Ethylbenzene, Xylenes & Purgeable Hydrocarbons by Static Headspace Capillary GC-PID/FID. External std quantitation with Surrogate stds.
U.S. EPA Method No. 3810(Modification)

Instrumentation:

1) GC/FID/FID, Hewlett-PackardII GC, Dual injector, Dual FID, A/S
2) Precision Mechanical Convention Oven/Sartorius Research Balance
3) Varian 3400 GC PID/FID, Genesis Headspace Analyzer

Client:	Terrapex Environmental Ltd. 557 Dixon Road Suite 108 Etobicoke, ON, CANADA M9W 6K1
Fax:	416-245-0012
Attn:	Elise Croll

Date Received:	December 12/2000
Date Reported:	December 19/2000
Lab Ref#:	G206534
Lab Quote#:	VG808-0858
Client Ref#:	CT.626.0
Sampled By:	EGC/GG

Certificate of Analysis

Analysis Performed:	Extractable Hydrocarbon Analysis(MUST), C10-C24 TPH(Hot Extractable), Gravimetry BTEX and Total Purgeable Hydrocarbons
Methodology:	1) The characterization of HydroCarbon in soil by GC analysis, following a solvent extraction. U.S. EPA Method No.8011(microextraction) 2) Determination of TPH(hot extractable) in soil, using solvent extraction. Analysis of evaporated extract by gravimetry. U.S. EPA Method No. 9071(Modification) 3) Analysis of Benzene, Toluene, Ethylbenzene, Xylenes & Purgeable Hydrocarbons by Static Headspace Capillary GC-PID/FID. External std quantitation with Surrogate stds. U.S. EPA Method No. 3810(Modification)
Instrumentation:	1) GC/FID/FID, Hewlett-PackardII GC, Dual injector, Dual FID, A/S 2) Precision Mechanical Convention Oven/Sartorius Research Balance 3) Varian 3400 GC PID/FID, Genesis Headspace Analyzer

Client: Terrapex Environmental Ltd.
557 Dixon Road
Suite 108
Etobicoke, ON, CANADA
M9W 6K1
Fax: 416-245-0012

Attn: Elise Croll

Date Received:	December 12/2000
Date Reported:	December 19/2000
Lab Ref#:	G206534
Lab Quote#:	VG808-0858
Client Ref#:	CT.626.0
Sampled By:	EGC/GG

Certificate of Analysis

Sample Description:	Soil
QA/QC:	Refer to CERTIFICATE OF QUALITY CONTROL report.
Results:	Refer to REPORT of ANALYSIS attached.

Certified By
Nick Boulton
Service Manager

Certified By
N. Boulton, B.Sc., C.Chem.
Customer Service Manager

Philip Analytical Services Corp

Certificate of Quality Control

Client : Terrapex Environmental Ltd.
Contact: Elise Croll

Date Reported: December 19/2000
Lab Ref # : G206534
Lab Quote#: VG808-0858

Client Ref#: CT.626.0

Analysis of Soil, expressed on a dry weight basis

				Process Blank			Process % Recovery				Matrix Spike					Overall
Parameter	**SAMPLE ID (spike)**	**EQL**	**Units**	**Result**	**Upper Limit**	**Accept**	**Result**	**Lower Limit**	**Upper Limit**	**Accept**	**Result**	**Target**	**Lower Limit**	**Upper Limit**	**Accept**	**QC Acceptable**
Total Extractable Hydrocarbons(C10-C24)	na	10.0	ug/g	nd	20.0	yes	84	70	120	yes	na	na	na	na	na	yes
TPH(Hot Extractable)	na	100.0	ug/g	nd	150.0	yes	96	75	115	yes	na	na	na	na	na	yes
Benzene	na	0.02	ug/g	nd	0.04	yes	84	60	120	yes	na	na	na	na	na	yes
Ethylbenzene	na	0.02	ug/g	nd	0.04	yes	88	60	120	yes	na	na	na	na	na	yes
mp-Xylenes	na	0.04	ug/g	nd	0.08	yes	84	60	120	yes	na	na	na	na	na	yes
o-Xylene	na	0.02	ug/g	nd	0.04	yes	90	60	120	yes	na	na	na	na	na	yes
Toluene	na	0.02	ug/g	nd	0.04	yes	90	60	120	yes	na	na	na	na	na	yes
Total Purgeable Hydrocarbon	na	10	ug/g	nd	10	yes	101	60	120	yes	na	na	na	na	na	yes

EQL = Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence
* = Unavailable due to dilution required for analysis
na = Not Applicable
ns = Insufficient Sample Submitted
nd = parameter not detected
TR = trace level less than EQL

Philip Analytical Services Corp

Report of Analysis

Client : Terrapex Environmental Ltd.
Contact: Elise Croll

Report Date: December 19/2000
Lab Ref # : G206534
Lab Quote #: VG808-0858

Analysis of Soil, expressed on a dry weight basis

Client Ref#: CT.626.0

Parameter	EQL	Units	COBOURG E 2000/12/07	COBOURG E Replicate	COBOURG W 2000/12/07	CSBH1 2000/12/07	CSSS1 2000/12/07
Resemblance	na	na	EMO?	EMO?	EMO?	PSWD	EMO?
Total Extractable Hydrocarbons(C10-C24)	10.0	ug/g	76.0	68.7	109	TR	21.1
TPH(Hot Extractable)	100.0	ug/g	nd	nd	237	nd	nd
Benzene	0.02	ug/g	nd	nd	nd	nd	nd
Ethylbenzene	0.02	ug/g	nd	nd	0.03	nd	nd
mp-Xylenes	0.04	ug/g	nd	nd	0.07	nd	nd
o-Xylene	0.02	ug/g	nd	nd	nd	nd	nd
Toluene	0.02	ug/g	nd	nd	nd	nd	nd
Total Purgeable Hydrocarbon	10	ug/g	nd	nd	nd	nd	nd

EQL	Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence.
EMO?	Contaminant elutes in the motor oil range but does not match reference standard.
na	Not Applicable
nd	parameter not detected ! = EQL higher than listed due to dilution ( ) Adjusted EQL
PSWD	Possible weathered diesel.
TR	trace level less than EQL ! = EQL higher than listed due to dilution ( ) Adjusted EQL

Philip Analytical Services Corp

Report of Analysis

Project CT626.0

Client : Terrapex Environmental Ltd.
Contact: Jeremy Wilson/Jeff Stevenson
QA/QC Results
MCTS Peripheral - Leamington
Analysis of Soil, expressed on a dry weight basis

Report Date: January 22/2001
Lab Ref # : G210145
Lab Quote #: VG808-0858

Client Ref#: CT626.0

			Original	Lab Replicate	Blind Duplicate		
Parameter	EQL	Units	S-1 2001/01/12	S-1 Replicate	S-11 2001/01/12		
Resemblance	na	na	na	na	na		
Total Extractable Hydrocarbons(C10-C24)	10.0	ug/g	nd	nd	nd		
Benzene	0.02	ug/g	nd	nd	nd		
Ethylbenzene	0.02	ug/g	nd	nd	0.07		
mp-Xylenes	0.04	ug/g	nd	nd	0.06		
o-Xylene	0.02	ug/g	nd	nd	nd		
Toluene	0.02	ug/g	nd	nd	nd		
Total Purgeable Hydrocarbon	10	ug/g	nd	nd	nd		

EQL	Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence.
na	Not Applicable
nd	parameter not detected ! = EQL higher than listed due to dilution ( ) Adjusted EQL

APPENDIX F:

Correspondence

COVER SHEET

FAX

To: Jeff Stevenson
Fax #: (416) 245-0012
Subject: Coast Guard Sites
Date: December 5, 2000
Pages: 2, including this cover sheet.

COMMENTS:

Hi Jeff,

Of your list, I found only the following two which are close in name.

Cobourg East - Pier Head Tower	<u>Not</u> Heritage
Coldspring Head - Tower	Recognized

Cheers
Carole

From the desk of...

Carole Trudel
Registrar, Federal Heritage Buildings Review Office
Parks Canada
25 Eddy Street, Jules Leger Building
Hull (Québec) K1A 0M5

(819) 997-6740
Fax: (819) 953-6146

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Ministry of Citizenship,
Culture and Recreation

400 University Avenue
Toronto ON M7A 2R9

Ministère des Affaires civiques,
de la Culture et des Loisirs

400 avenue University
Toronto ON M7A 2R9

Ontario

Heritage and Libraries Branch
Heritage Operations Unit
Tel. (416)314-7161 Fax: (416)314-7175

December 20, 2000

Elise Croll
Terrapex Environmental Ltd.
557 Dixon Road, Suite 108
Etobicoke, Ontario
M9W 6K1

RE: Canadian Coast Guard Environmental Site Assessment

Dear Elise Croll,

This letter is in response to your inquiry about registered archaeological resources in proximity to a number of locations Terrapex Environmental Ltd. is investigating for Public Works and Government Services. The Ontario Ministry of Citizenship Culture and Recreation (MCzCR) has consulted it's records and has found there are a number of registered archaeological sites located within or in proximity to some of the properties you are investigating. From the maps provided to the MCzCR it was difficult to see the exact location of some of your properties, so for properties where archaeological sites appeared closest, a map has been included that shows the exact location of archaeological sites on or near your properties.

Areas within and in proximity to your research area may have the **potential** for archaeological resources even where **none** have been registered at this time. Therefore, for planning purposes you may require information regarding archaeological potential for each of the Coast Guard sites. Determining archaeological potential and the need for archaeological assessments for Environmental Assessment Projects in Ontario is determined by Heritage Planners in this office. I have included a map that shows the review areas of each of the planners in the Heritage Operations Unit at the MCzCR.

In the best interests of heritage conservation, please do not publish the site specific locations or release archaeological information to the general public or other third party interests.

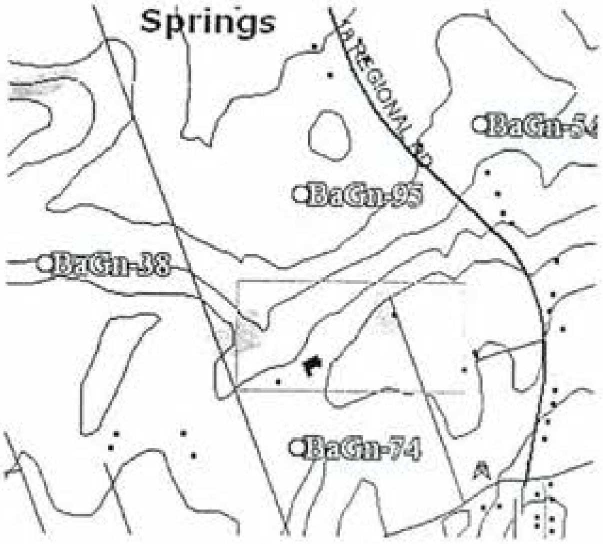
While the MCzCR attempts to maintain a current and reliable database covering all known archaeological resources in Ontario, we waive responsibility for the quality, accuracy and completeness of this information and any damages, which may be incurred through its use.

If you have any questions or need any other information, please feel free to contract me at (416) 314-7161.

Sincerely,

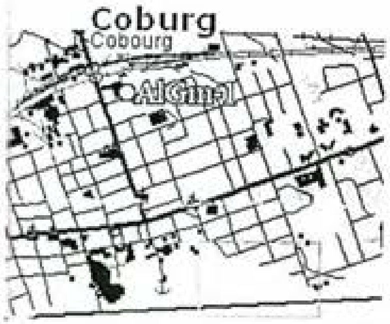
Robert von Bitter
Archaeological Data Co-ordinator

* Cold Springs

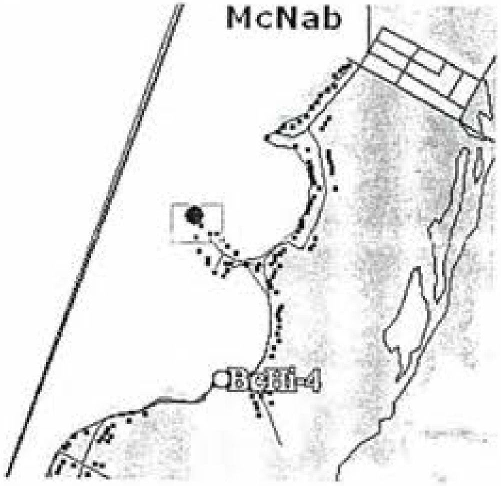


Meaford

Coburg

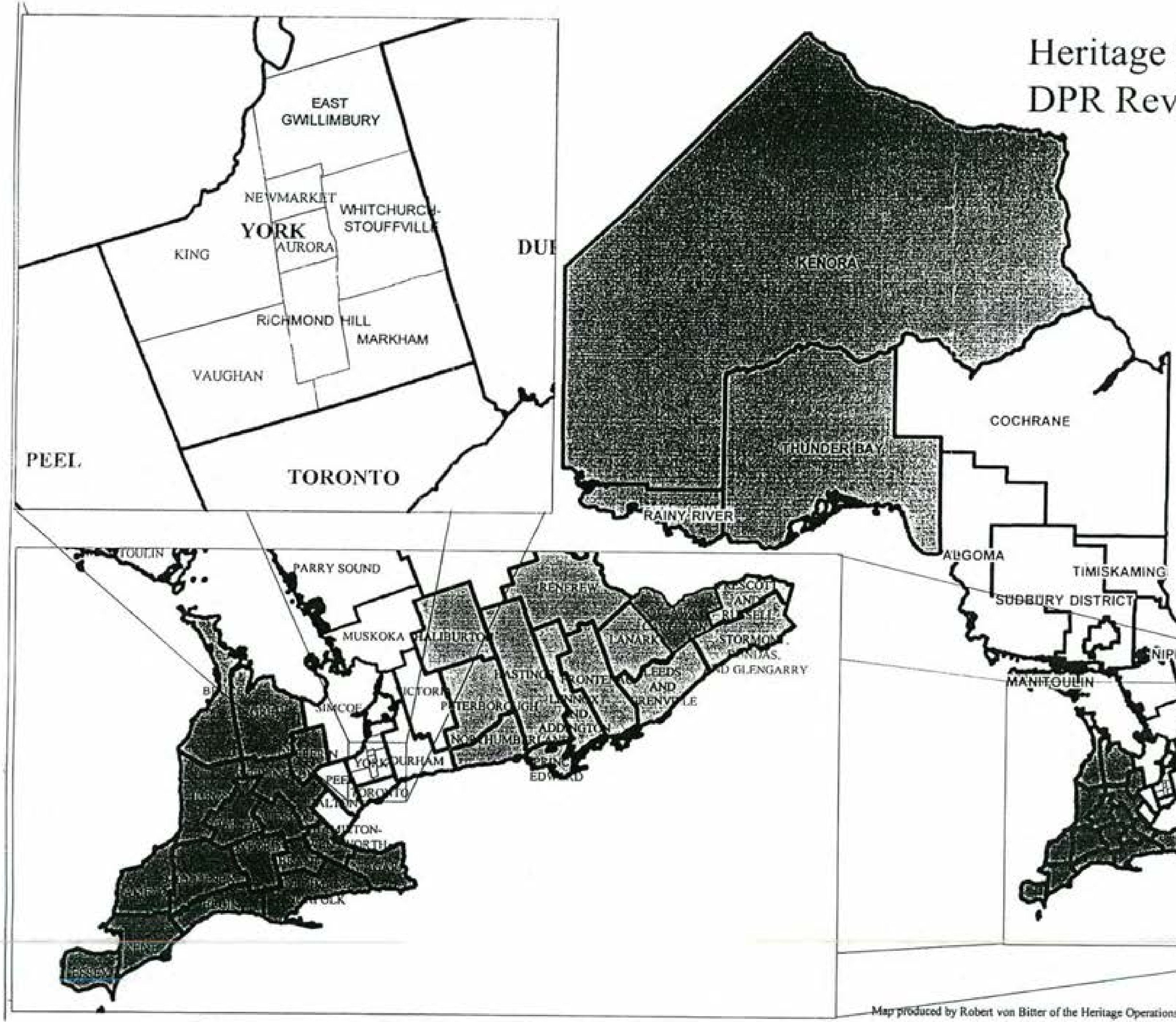


McNab



Leamington

Heritage Operations
DPR Review Areas



▨ Bill Ross

Winston Wong
(416)314-7147

☐ Winston Wong
and Bill Ross
(416) 314-7147

Chris Andersen
416 314-7153

Malcolm Horne
(416) 314-7146

John MacDonald
(416) 314-7132

▩ Neal Ferris
and Peter Timmims
(519)675-7742

Map produced by Robert von Bitter of the Heritage Operations Unit April 27, 2000

Ministry of Natural Resources
Peterborough District Office
300 Water St., 1st Floor, South Tower
Peterborough, Ontario
K9J 8M5

Telephone: (705) 755-2001
Facsimile: (705) 755-3125

Ontario

FAX

To:	*Elise @ TERRAPEX*	**From:**	*Jeff Wiltshire*
Fax:	(416) 245-0012	**Phone:**	Direct Line (705) 755-3295
Pages:	1 (Including this page).	**Date:**	Tuesday, January 23, 2001
Re:	Cobourg Harbour	**CC:**	

☐ **Urgent** X **For Review** ☐ **Please Comment** ☐ **Please Reply** ☐ **Please Recycle**

Elise:

The stream flowing into Cobourg Harbour is listed in our files as Hamilton Unnamed # 3. The following fish species have been found in the stream: creek chub, blacknose dace, brook trout, brook stickleback and fathead minnow.

Cobourg Beach significant natural area lies just to the west of Cobourg Harbour.

For information on fish species in the harbour, you should contact the Lake Ontario Management Unit at (613) 470-3255.

Prior to any in water work, the following agencies should be contacted, as permits may be required: Conservation Authority, Federal Department of Fisheries and Oceans and the Ministry of Natural Resources.

I hope this helps.

Please call if you have any questions,

Jeff

Ministry
of the
Environment

Freedom of Information and
Protection of Privacy Office

40 St. Clair Avenue West
9th Floor
Toronto ON M4V 1M2
Tel. (416) 314-4075
Fax (416) 314-4285

Ministère
de
l'Environnement

Bureau de l' accès à l' information
et de la protection de la vie privée

40, avenue St. Clair ouest
9e étage
Toronto ON M4V 1M2
Téléphone (416) 314-4075
Télécopieur (416) 314-4285

Ontario

February 20, 2001

Ms. Elise Croll
Terrapex Environmental Ltd.
557 Dixon Road, Suite 108
Toronto, Ontario
M9W 6K1

Dear Ms. Croll:

Re: ***Freedom of Information and Protection of Privacy Act*** **Request**
Our File Number ER010186
Your reference #CT626.0

This letter is in response to your request made pursuant to the *Freedom of Information and Protection of Privacy Act* relating to part 1, Lots 15 and 16, Concession VI, Township of Hamilton.

After a thorough search through the files of the Ministry's Peterborough District Office, Spills Action Centre, and the Investigations and Enforcement Branch, no records were located in response to your request. In accordance with section 57 of the *Freedom of Information and Protection of Privacy Act*, **the fee owed is $30.00 for search time of 1 hour @ $30.00 per hour**.

Please forward to me at the above address a cheque made payable to the Minister of Finance (FOI) in the above amount.

If you object to any decision I have made, you may request a review by contacting the Information and Privacy Commissioner, 80 Bloor Street West, 17th Floor, Toronto, M5S 2V1. Please note that there is a $25.00 fee and you only have 30 days from receipt of this letter to request a review.

If you have any questions regarding this matter, please contact me.

Yours truly,

Fred Ruiter
Co-ordinator

cc: D. Goodberry, P. McIsaac

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APPENDIX G:

Completed NCS Classification Form

An NCS sheet was not completed for this site as no impacts were identified.

APPENDIX H:

RPIS/CS Module

Contaminated Site Activities

March 16, 2001

RPIS
CS Module

Region: Central/Arctic

Site Number	Site Name	Site Descriptor	Province	Sector
C F 51230	Cobourg MCTS (Cold Springs)	Peripheral VHF Site	Ontario	Canadian Coast Guard

Contaminated Site Name	Status	CS Number
Cobourg MCTS	Assessed - No Action Required	

Activity Level	Activity Description	Completion Date	Fiscal Year	Expenditure
Phase I ESA	Enhanced Phase I ESA - site inspection and limited sampling program - two soil samples were collected 2-4 m west of AST in the vicinity of the fill and vent pipes	December 7, 2001	2000-2001	$2,500.00

Total Site Expenditure $2,500.00

Total Regional Expenditure $2,500.00

Contaminated Site Issues

March 16, 2001

RPIS
CS Module

Region: Central/Arctic

Site Name Cobourg MCTS (Cold Springs)

Site Number C F 51230

Site Descriptor Peripheral VHF Site

Province Ontario

Contaminated Site Name Cobourg MCTS

CS Number

Status Assessed - No Action Required

Description Peripheral VHF Site

Contaminant Category Heavy Metals

Specify

Impacts

Soil ☑ **Status** Potential

Sediment ☐ **Status**

Air ☐ **Status**

Ground Water ☐ **Status**

Surface Water ☐ **Status**

Sources

Batteries ☐

Landfill ☐

Dumping/Waste ☐

Unknown ☐

Ash Dump ☐

Storage Tank(s) ☐

Fuel Cache ☐

Other (Specify) ☐

Hazardous Const. Materials ☑

Waste Storage Area ☐

Chemical Storage Area ☐

Contaminated Site Issues

March 16, 2001

RPIS
CS Module

Region: Central/Arctic

Site Name Cobourg MCTS (Cold Springs)

Site Number C F 51230

Site Descriptor Peripheral VHF Site

Province Ontario

Contaminated Site Name Cobourg MCTS

CS Number

Status Assessed - No Action Required

Description Peripheral VHF Site

Contaminant Category Petroleum Hydrocarbons and PAHs

Specify

Impacts

Soil ☑ **Status** None

Sediment ☐ **Status**

Air ☐ **Status**

Ground Water ☐ **Status**

Surface Water ☐ **Status**

Sources

Batteries ☐

Landfill ☐

Dumping/Waste ☐

Unknown ☐

Ash Dump ☐

Storage Tank(s) ☑

Fuel Cache ☐

Other (Specify) ☐

Hazardous Const. Materials ☐

Waste Storage Area ☐

Chemical Storage Area ☐

Federal Contaminated Site Inventory Report

March 16, 2001

RPIS
CS Module

Region:

Site Number	Site Name	Site Descriptor	Province	Sector

Contaminated Site Name	Status	CS Number	NCSCS Rating

Contaminant Category

Fiscal Year	Expenditure(s)

NCS Classification

March 16, 2001

RPIS
CS Module

Region: Central/Arctic

Site Number	Site Name	Site Descriptor	Province	Sector
C F 51230	Cobourg MCTS (Cold Springs)	Peripheral VHF Site	Ontario	Canadian Coast Guard

Contaminated Site Name	Status	CS Number
Cobourg MCTS	Assessed - No Action Required	

NCSCS Status	Score	Variance	Classification	Completion Date	Comments
Not Completed					NCSCS not completed for site, no contamination found

Contaminated Site Samples

March 16, 2001

RPIS
CS Module

Region: Central/Arctic

Site Number	Site Name	Site Descriptor	Province	Sector
C F 51230	Cobourg MCTS (Cold Springs)	Peripheral VHF Site	Ontario	Canadian Coast Guard

Contaminated Site Name	Status	CS Number
Cobourg MCTS	Assessed - No Action Required	

Sampling Date	Media	Parameter	Measurement			Federal Criteria	Criteria	Other Criteria	Criteria	Samples
			Min	*Max*	*Units*					
December 7, 2000	Soil	benzene	0.01	0.01	ug/g	1999 CCME Soil Quality Guidelines - agricultural	0.05	1997 MOE GUSCO Table A - agricultural	0.24	2

Contaminated Sites Summary

March 16, 2001

RPIS
CS Module

Region: Central/Arctic

Site Name	Cobourg MCTS (Cold Springs)	**Site Number**	C F 51230
Site Descriptor	Peripheral VHF Site	**List of Lights Number**	
Province	Ontario	**Land Descriptor Unit**	09627
Sector	Canadian Coast Guard	**Status**	Active
		Custodian	F&OCG

Site Location Part Lots 15 & 16, conc. 6, Township of Hamilton, County of Northumberland.

Street Address Pt Lots 15 & 16, Con 6

City	Cobourg	**Postal Code**	
Latitude	44-04-01	**Longitude**	78-12-42

Contaminated Site Name	Cobourg MCTS	**CS Number**	
Status	Assessed - No Action Required		
Regional File Number		**National File Number**	

Description Peripheral VHF Site

Location of Contamination Area of concern included location of AST inside generator building - AST located on the west side of the building - No petroleum hydrocarbon impact identified in soil surrounding the fill and vent pipes for AST

Latitude 0 0 0 **Longitude** 0 0 0

Action Plan

Additional Information potential lead contamination from lead-based paint on communications tower - paint in good condition

Total Assessment Cost $2,500.00 **Total Remediation Cost**

Contaminated Site Activities

March 19, 2001

RPIS
CS Module

Region: Central/Arctic

Site Number	Site Name	Site Descriptor	Province	Sector
C F 51230	Cobourg MCTS (Cold Springs)	Peripheral VHF Site	Ontario	Canadian Coast Guard

Contaminated Site Name	Status	CS Number
Cobourg MCTS	Assessed - No Action Required	

Reviewed By	Organization	Review Date	Comments
	Terrapex Environmental Ltd.	March 19, 2001	

Review Scope (Section): EA ☑ EB ☑ EC ☑ ED ☑ EE ☑ EF ☑

APPENDIX I:

References

REFERENCES

Canadian Council of Ministers of the Environment (CCME), March 1992, *National Classification system for Contaminated Sites*

Public Works and Government Services Canada (PWGSC), October 2000, *Terms of Reference for Phase II Environmental Site Assessments and Associated Activities for Canadian coast Guard Lighthouse Sites*

Ministry of Natural Resources (publ. Ontario Geological Survey, Special Volume II), 1984, *The Physiography of Southern Ontario (publ. Ontario Geological Survey, Special Volume II)*

Canadian Council of Ministers of the Environment (CCME), 1999, *Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health*

Canadian Council of Ministers of the Environment (CCME), 2000, *Canada Wide Standard for Petroleum Hydrocarbons in Soil*

Ontario Ministry of the Environment (MOE), 1997, *Guideline for Use at Contaminated Sites in Ontario*

Ontario Ministry of the Environment (MOE), 1996, *Guidance on Sampling and Analytical Methods for Use at Contaminated Sites in Ontario*

Ontario Ministry of the Environment (MOE), 1996, *Guidance on Site Specific Risk Assessment for Use at Contaminated Sites in Ontario*

Treasury Board of Canada, *Treasury Board Policy on Accounting for Costs and Liabilities related to Contaminated Sites*

Treasury Board of Canada, *Directory of Federal Real Property (DFRP)*

Treasury Board of Canada, 2000, *Real Property Information System/Contaminated Sites (RPIS/CS), Data Definitions Contaminated Sites Module*

Ministry of Natural Resources (publ. Ontario Geological Survey, Special Volume II), 1984, *The Physiography of Southern Ontario (publ. Ontario Geological Survey, Special Volume II)*

Ministry of Natural Resources, MNR Map Room, Toronto, Ontario, Aerial photographs

Ministry of Northern Development and Mines, 1991, *Map 2566, Quarternary Geology of Ontario, Southern Sheet*

Ministry of Northern Development and Mines, 1991, *Map 2544, Bedrock Geology of Ontario, Southern Sheet*

National Historic Sites Directorate, Federal Heritage Buildings Review Office, Hull, Québec, C. Trudel, Registrar

Archaeological and Heritage Planning, Ministry of Citizenship, Culture, and Recreation, Toronto, R. von Bitter, Archaeological Data Coordinator

Ministry of the Environment, Toronto, Freedom of Information and Protection of Privacy Office, F. Ruiter

Environment Canada, www.weatheroffice.com website

Canadian Coast Guard, Sarnia Office, file information

Environment Canada, Emergencies and Enforcement Division, Toronto
R. Read, GIS and Sensitivity Mapping Specialist

Ministry of the Environment, Peterborough District Office
M. Longpre, Senior Environmental Officer

Ministry of Natural Resources, Peterborough Area Office
J. Wiltshire, Senior Resource Technician

The Township of Hamilton, Cobourg, Ontario

Canadian Coast Guard, Oakville, Ontario
A. Harish, Ship Radio Inspector, Technical Services Equipment, System Maintenance

APPENDIX J:

Qualifications of Assessors

ELISE CROLL, H.B.Sc., C.E.S.A.

Education
H.B.Sc. Geography and Environmental Science, Minor Degree, Geology, 1995
McMaster University, Hamilton, Ontario

Courses Completed
Standard First Aid and CPR Training
Workplace Hazardous Material Information System (WHMIS) Training Program
40 Hour Hazardous Waste Site Worker Course (OSHA)
8 hour Contaminated Site Health and Safety Annual Refresher Training Courses
Associated Environmental Site Assessors of Canada (AESAC) Certified Environmental Site Assessor - Phase I (C.E.S.A.)

Associations
Association of Geoscientists of Ontario (AGO)
Associated Environmental Site Assessors of Canada (AESAC)

EXPERIENCE

March 2000 to present - Terrapex Environmental Ltd., Toronto, Ontario

Project Scientist

Duties and responsibilities will include:

- Phase I Environmental Site Assessments including; historical research, site inspection, interviews, report preparation, client liaison;
- Phase II Environmental Site Assessments including; supervision of drilling and test pitting operations, soil logging and sampling, installation of monitoring wells, hydrogeological assessment of ground water movement and contaminant plumes, report preparation, client liaison;
- supervision of underground storage tank decommissioning; report preparation, client liaison;
- Remedial Action Programs including; supervision of contaminated soil removal programs, supervision of contaminated soil on-site management approaches, report preparation, client liaison;
- Third party observation of assessment and remediation projects; report preparation; peer review.

June 1997 to March 2000 - Conor Pacific Environmental Technologies Inc., Mississauga, Ontario

Project Manager (July 1999 to March 2000)

Duties and responsibilities included:

- Project management including preparation of work plans and proposals, budget tracking, scheduling, and supervision of project staff; client and regulatory agency liaison; business development;
- Design, implementation and management of Phase I, II, and III ESAs, storage tank decommissioning, and remediation projects in various sectors (oil and gas, transportation, government, industry, commercial, financial, real estate development);
- Implementation and management of brownfield development projects including tank removals, remedial excavations, asbestos removal and air quality monitoring, and PCB waste removal;
- Representative to office and company wide Health and Safety Committees.

Project Scientist (June 1997 to July 1999)

Duties and responsibilities included:

- Conducting Phase I, II, and III ESAs, storage tank decommissioning, and remediation projects including inspection and sampling of potential asbestos containing materials, sampling of soil, groundwater and surface water and assisting in the installation of soil and groundwater treatment systems;
- Data interpretation and preparation of detailed technical reports, reviewing and evaluating physical and chemical data.

1996 - O'Connor Associates, Edmonton, Alberta (contract)
Field Technician

- Site monitoring including groundwater treatment systems and vapour extraction systems;
- Soil and groundwater sampling for Phase II ESAs, storage tank decommissioning and remediation projects.

1995 - Severn Sound Remedial Action Plan, Midland, Ontario (contract)
Field Technician

- Surface and groundwater sampling, interpretation of analytical data and report preparation and presentation to regulatory agencies; public liaison in implementing surface water remedial projects.

PROJECT EXPERIENCE

Phase I Environmental Site Assessments

CIBC: conducted or managed Phase I assessments of 11 sites across southern Ontario.

PWGSC: conducted or managed Phase I assessments and enhanced Phase I assessments (including designated substance and soil sampling) of 10 sites across Ontario, including CCG lighthouses and automation buildings.

Royal Bank: conducted or managed Phase I assessments of 8 sites across southern Ontario.

Scotia Merchant Capital: managed Phase I assessments of 5 light industrial/manufacturing sites across Ontario, Quebec and British Columbia.

Various Clients: Completion/management of over 80 Phase I ESAs at various other sites in Ontario, including manufacturing facilities, industrial sites, commercial and residential properties and vacant lots.

Phase II and III Environmental Site Assessments

Canada Lands Corporation: completed all aspects of Phase II and III ESAs at four large land parcels in southern Ontario, including extensive drilling and testpitting activities, soil and groundwater investigations.

CanAmera Foods: completed Phase II and III ESAs in Hamilton Ontario including drilling, monitoring well installation, soil and groundwater sampling at a bulk fuel storage site, former landfill and construction yard/former rail site.

CIBC: manager or project scientist for three Phase II soil and/or groundwater investigations at petroleum impacted sites in southern and eastern Ontario.

CNREM: completed Phase II reports for soil and groundwater analyses at 22 sites along the Beachburg Subdivision in Algonquin Park, Ontario; conducted Phase III ESAs including soil and groundwater investigations at active station ground and right of way in southern Ontario.

CN/Imperial Oil: field supervision for 10 Phase II ESAs including borehole and monitoring well installation at former and active petroleum retail outlets and bulk plants along rail lines in the vicinity of Edmonton and Peace River Alberta.

INCO Ltd.: managed Phase II ESA surrounding bulk fuel storage area at Port Colborne Refinery.

MTO: completed all aspects of Phase II ESA at former service station in Peterborough, Ontario, including drilling and monitoring well installation, soil and groundwater sampling.

Municipal Hydro-Electric Commission: managed Phase II and III ESAs at four transformer stations for a municipal hydro-electric commission in southern Ontario including soil sampling for various chemicals of concern including petroleum hydrocarbons, PAHs, metals, PCBs and VOCs.

Niagara Falls Bridge Commission: completed extensive drilling program at Rainbow Bridge Plaza during construction activities in order to identify and delineate potential petroleum hydrocarbon and metal contamination.

NOCO: field supervisor for Phase II ESA at bulk fuel storage area in Toronto, Ontario including drilling and monitoring well installation, soil and groundwater sampling.

Petro Canada: completion of drilling, monitoring well and recovery well installation, soil and groundwater sampling at six active or former service stations at sites throughout Ontario; includes emergency response at one site.

St. Lawrence Resin: completed Phase III ESA including soil and groundwater sampling and sediment sampling at former industrial chemical manufacturing site in Cayuga, Ontario.

UCAR Inc.: conducted extensive baseline study including completion of over 100 boreholes, monitoring wells and testpits, and soil and groundwater sampling for an extensive parameter list at industrial site in Welland, Ontario.

Various clients: managed or completed Phase II and III soil and groundwater assessments at approximately 25 other properties at various locations in Ontario.

Hazardous and Non-Hazardous Site Remediations and Remedial Excavations:

AT Plastics: participated in large scale remedial excavation, soil segregation and confirmatory sampling during construction activities for an addition to a raw plastic manufacturing facility in northern Alberta; included decommissioning of a former lagoon used to dump hazardous chemical waste.

Imperial Oil: supervision of underground storage tank upgrade and remedial excavation at a commercial cardlock facility in Slave Lake, Alberta.

Petro Canada: supervision of the decommissioning of underground storage tanks and/or remedial excavations and the removal of contaminated soil at three former retail petroleum outlets across Ontario.

PWGSC: management of remedial excavation and removal of petroleum impacted soil at a CCG automation building in southern Ontario.

Royal Bank: Co-ordinated, supervised and documented removal of hazardous chemicals from light manufacturing facility in Fisherville, Ontario.

Sunoco Inc.: supervision of the decommissioning of underground storage tanks, or piping upgrades, and/or the removal of contaminated soil at six retail petroleum outlets across Ontario; assist with construction of ex-situ, on-site treatment cells for petroleum contaminated soil at one of the sites.

Various clients: managed or supervised remedial excavations at thee other petroleum hydrocarbon or metal impacted sites in southern and eastern Ontario; co-ordinated tank decommissioning at two other sites in southern Ontario.

Other Projects

Cadillac-Fairview: completed asbestos inventory, and sampling at three large shopping malls in southern Ontario; completed asbestos inventory and sampling for confidential client at a commercial facility in Niagara Falls, Ontario.

Confidential Client: field supervisor for installation of vapour extraction and recovery wells for in-situ remediation system at a former petroleum retail outlet and surrounding properties concurrently with commercial development and construction on-site; included angled drilling of several recovery wells.

Northern Nishnawbe Education Council: all aspects of Phase III ESA and partial remediation at a First Nations Highschool in Sioux Lookout Ontario; included drilling boreholes, installation of monitoring wells, test pitting, soil and groundwater sampling, asbestos inventory and sampling, PCB inventory, asbestos remediation and building demolition.

Urbanex Development Corporation: manager and field scientist for all environmental aspects of brownfield development project in Mississauga Ontario including decommissioning of USTs, hazardous chemical removal, PCB waste removals and extensive Level I through III asbestos remediation, air sampling, and completion of asbestos management plan.

Various clients: involved with groundwater monitoring and/or sampling at approximately 35 petroleum hydrocarbon impacted sites in Ontario and Northern Alberta; including assistance with installation, monitoring and/or maintenance of liquid-phase petroleum-hydrocarbon recovery systems or vapour extraction systems at approximately 15 of these sites.

Publications

Croll, Elise G., 1995. *Soil Heat Flux in Four Sub-Arctic Climates.* Bachelors thesis, Faculty of Science, McMaster University, Hamilton, Ontario.

P. JEFF STEVENSON

Education

Biology and Environmental Studies 1990
Bachelor of Science

Brock University
St. Catharines, Ontario

Courses Completed

WHMIS Training Program
Red Cross Standard First Aid Certificate
Red Cross Adult CPR

EXPERIENCE

September 2000 to present - Terrapex Environmental Ltd. Toronto, Ontario

Project Manager

Responsible for management of a wide range of site assessment and remediation projects for a diverse client base. Responsibilities include direct accountability to clients for development of, and successful completion of projects on time and on budget. Project duties include preparation of proposals and budgets, funding and regulatory agency submissions, project design, allocation of resources, provision of technical and remote logistics expertise, and preparation of reports.

Typical projects include:

- Environmental Issues Inventory (EII) Phase II and III Site Assessments;
- Geo-environmental assessment of soil and groundwater;
- Management/remediation of contaminated soil and groundwater.

1996 to 2000 - Conor Pacific Environmental Technologies Inc., Mississauga, Ontario

Project Manager, Assessment and Remediation

Duties and responsibilities included:

- complete project management including project design, cost projection, budget tracking, scheduling, client/regulatory agency liaison, and supervision of project team members;
- design and implementation of environmental investigation projects in accordance with Federal, Provincial, and Municipal protocols;
- development, implementation, and supervision of remedial action plans for contaminated sites;
- development of INAC project submissions, tender documents, engineering specifications, and contracts for assessment and remediation projects;
- preparation of detailed proposals and cost estimates for complex and simple projects;
- liaison with and presentation to clients, government agencies, contractors, and the public; and,

1990 to 1996 - Arcturus Environmental Limited, Niagara Falls, Ontario

Project Manager/Technical Coordinator

Duties and responsibilities included:

- management of Phase I, II, and III environmental site assessments, and soil and groundwater remediation projects;
- project design, costing, and proposal preparation for site assessments and remediation projects;
- coordination/supervision of management of:
  - Phase I, II, and III environmental site assessments;

  - sediment and surface water sampling programs;
  - soil and groundwater remediation projects;
- performed assessment tasks including; supervision of drilling operations, soil logging and sampling, installation of monitoring wells, hydrogeological assessment of ground water movement and contaminant plumes, report preparation, and surveying (total station);
- performed remediation tasks including; installation of ground water treatment systems, supervision of contaminated soil removal programs, supervision of soil treatment facility construction, report preparation.

PROJECT EXPERIENCE

Phase I Environmental Site Assessments

Transport Canada: Phase I assessments of approximately 10 airport non-directional beacon sites in Ontario.

CN Real Estate: Phase I assessments of approximately 6 Rail Yard Sites in Ontario

Rentway Ltd.: Phase I assessments of approximately 5 truck maintenance facilities in Ontario

Private: Phase I assessments of approximately 20 residential, commercial, and industrial sites for various private clients

Phase II Environmental Site Assessments

Sunoco Inc.:Project Manager for assessments of soil and groundwater at approximately 35 retail petroleum outlets and three distribution terminals in Ontario.

Petro-Canada: Technical Coordinator/Field Supervisor/ for soil and groundwater assessments at approximately 30 retail petroleum outlets, and six bulk terminals across Ontario.

ICG Propane: Project Manager for soil and groundwater assessments of approximately three retail outlets in Ontario.

United Co-op: Technical Coordinator/Field Supervisor for assessments of soil and groundwater at approximately 8 bulk petroleum outlets in Ontario.

CP Rail: Field Supervisor for assessments of soil and groundwater at 8 major rail yards and subdivision in Ontario.

CN Real Estate: Field Supervisor for assessments of soil and groundwater at two major rail yards in Ontario.

Department of National Defence/Public Works Canada: Field Supervisor for an assessment of fuel oil contaminated soil at approximately 300 military housing facilities at CFB Borden.

Transport Canada: Project Manager for assessment of soil and groundwater at approximately 13 NDB and airport sites in Ontario.

Plazek Auto-Recyclers: Project Manager of assessment of impacted fill materials at a major auto-wrecking yard, including MOE and third party liason

RCMP and Public Works and Government Services Canada: Tecnnical Coordinator/Field Supervisor for environmental impact assessment at a former RCMP firing range

CIBC: Project Manager for Phase II and Phase III assessment of soil and groundwater on residential properties in Ontario

Rentway Ltd.: Project Manager for assessment of soil and groundwater at approximately 5 truck maintenance facilities in Ontario.

Hydro One Remotes: Project Manager for assessment of soil and groundwater at a diesel generating station in Kingfisher Lake, Ontario, including remedial options feasibility study and development of a remedial action plan.

Hazardous and Non-Hazardous Site Remediations

Sunoco Inc.: Project Manager/Technical Coordinator for decommissioning and remediation of approximately 55 retail petroleum outlets and two distribution terminals in Ontario.

Petro Canada: Technical Coordinator/Field Supervisor for decommissioning and remediation of approximately 20 retail petroleum outlets and three distribution terminals in Ontario.

RCMP and Public Works and Government Services Canada: Project Manager for a delineation study, remedial action plan, and hazardous soil remediation at a former RCMP firing range in Ontario.

Timminco Metals: Project Manager for hazardous chlorinated solvent remediation including remedial action plan development, recovery and treatment system design, and project implementation at a former Adhesives plant in Ontario.

Fort Albany First Nation: Project Manager/Technical Coordinator for an on-site surface water and groundwater pumping and treatment and ex-situ soil bioremediation project at a Contractor's camp in the community of Fort Albany, including project design, approvals, and implementation.

Kingfisher Lake First Nation: Project Manager for a large scale soil bio-remediation project in the community of Kingfisher Lake, including project design, approvals, and implementation.

Kasabonika Lake First Nation: Project Manager for a large scale soil bio-remediation project in the community of Kasabonika Lake, including project design, approvals, and implementation

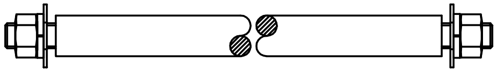
Plazekl Auto-recyclers: Project Manager for preliminary negotiations for a Site Specific Risk Assessment of impacted fill at an auto-wrecking yard in Ontario.

Transport Canada: Project Manager for underground storage tank decommissioning and remediation at three airport sites in Ontario.

CIBC:Project Manager for remediation of impacted soils at a residential property in Ontario including temporary relocation of a residential strcuture

Rentway Ltd.: Project Manager for remediation of three truck maintenance facilities in Ontario.

APPENDIX I: GROUND BUS BARS



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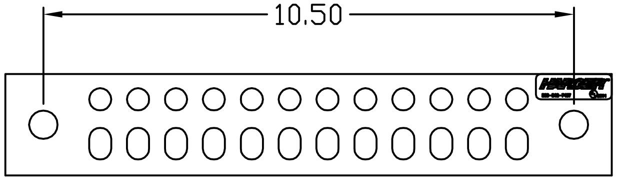

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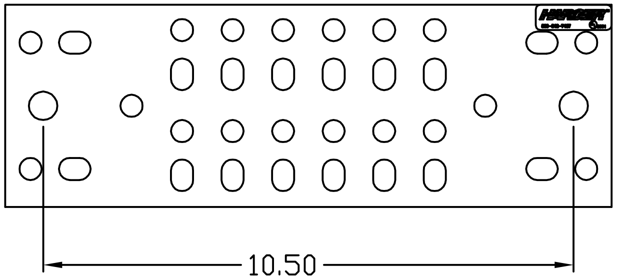

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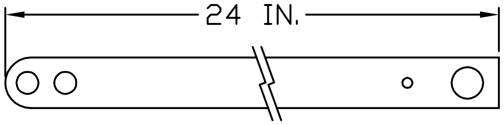
SHRINK TAPE TOGETHER.



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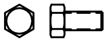


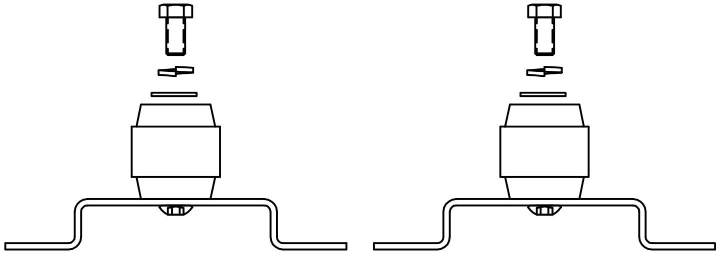
CS66S (24)

LW6S (24)

N616S (24)

POLYBAG

SHRINK TAPE TOGETHER.



WBKT1KIT (1)

EST. WT. 17#

APPROVED

☐ AS DRAWN:____________

☐ AS NOTED:____________

DATE:____________

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LET	REVISION	DATE	BY

TOLERANCES UNLESS NOTED:
FRACTIONAL +/- 1/16
.00 +/- .03
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PART NO. EPK6CCG

6 UNIT ENTRANCE PANEL KIT
CANADIAN COAST GUARD
–

DRAWN BY: LAL
CHECKED BY:
DATE: 051205

HARGER™
301 ZIEGLER DRIVE
GRAYSLAKE, IL 60030
(847) 548-8700

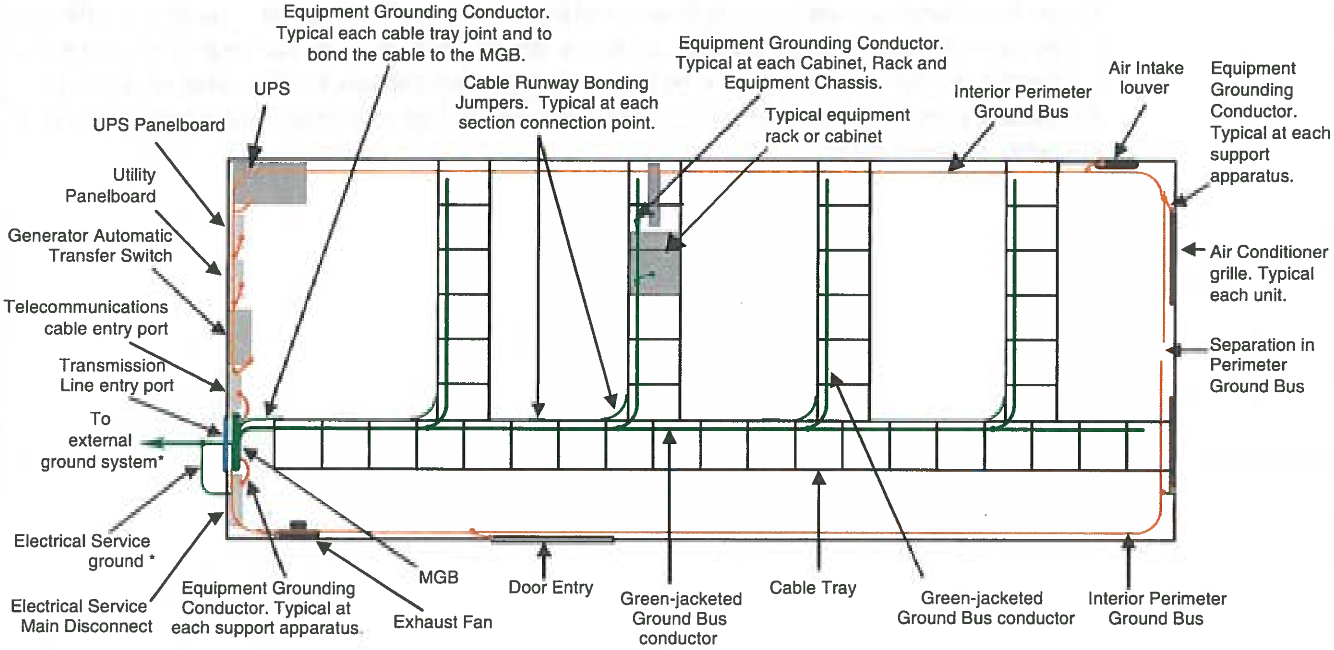
REVISION: –
SCALE: 1/4
SHEET: –

5.3 GROUNDING (EARTHING) SYSTEM COMPONENTS AND INSTALLATION REQUIREMENTS

This chapter provides guidelines and requirements for establishing an internal grounding (earthing) system within a standalone equipment shelter, single-story building and multi-story building. The guidelines described in this chapter **shall** also be utilized for establishing an internal grounding system within an outdoor equipment vault, enclosure, or cabinet.

All new site design, development and construction should have a prime objective of establishing a single point internal ground system for all interconnected communication systems and networking systems located within the facility. To help achieve this objective, all utilities and telecommunication cables should be coordinated to enter the facility through a common wall, room, or area within the facility. The preferred configuration for a stand-alone equipment shelter is to have all utilities enter the structure through a common wall as close as practical to the transmission line entry port location. The main electrical service disconnect must be located on the shelter wall at the service entrance. For additional details on main service disconnect, see "Circuit Protection" on page 6-8.

If it is unavoidable that utilities enter an existing or new stand-alone equipment shelter at different locations, additional grounding is required to adequately dissipate high amounts of electrical energy from a lightning strike or possible power fault. The single point grounding location for this type of structure must be located next to the electrical service entrance location and as close as practical to the transmission line entry port location. See Figure 5-1 for a high level overview of the preferred internal grounding system design.



* NOTE: No exterior ground system conductors shown. Electrical service grounding electrode conductor must be bonded to external site ground system.

FIGURE 5-1 STAND-ALONE SHELTER WITH COMMON ENTRY LOCATION

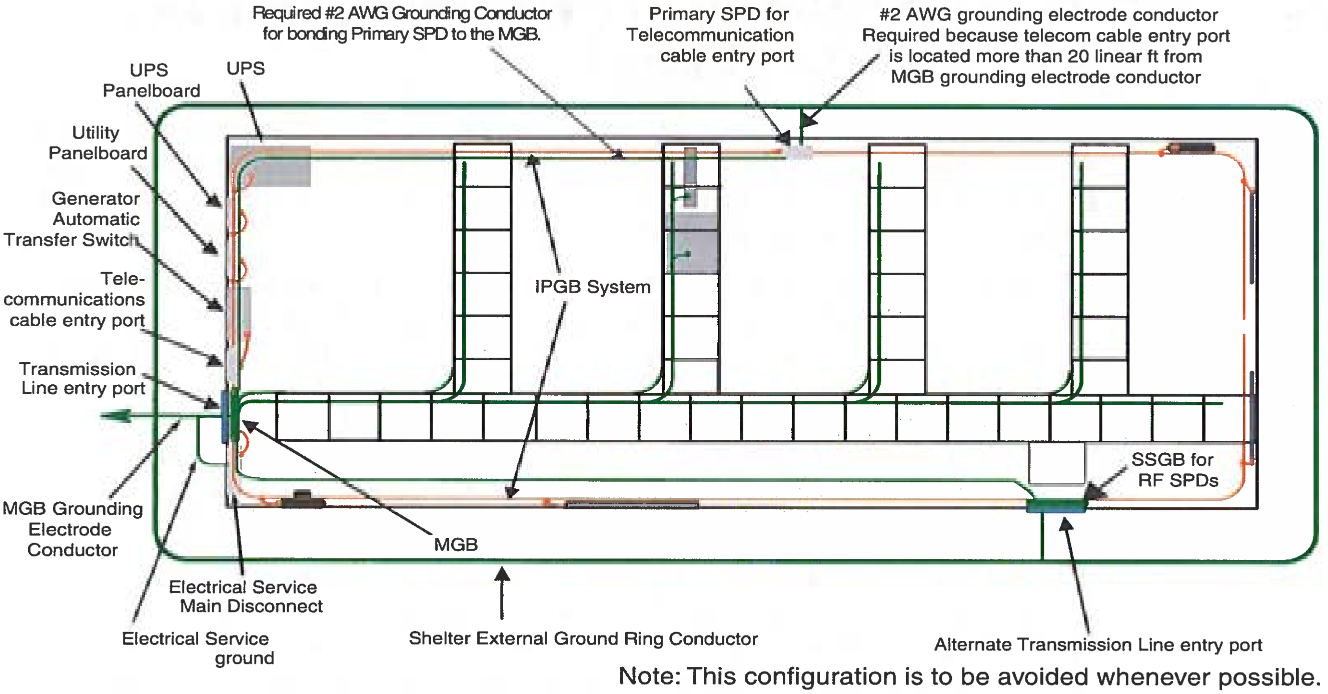


FIGURE 5-2 STAND-ALONE SHELTER WITH DIFFERENT ENTRY LOCATIONS

The preferred configuration for a single-story building is to have all utilities enter the structure through a common wall, room or adjacent rooms as close as practical to each other. The single point grounding location for this type of structure must be located at the utilities entrance location, preferably close to the building's electrical service (power) ground. See Figure 5-3 for an overview of the preferred internal grounding system design.

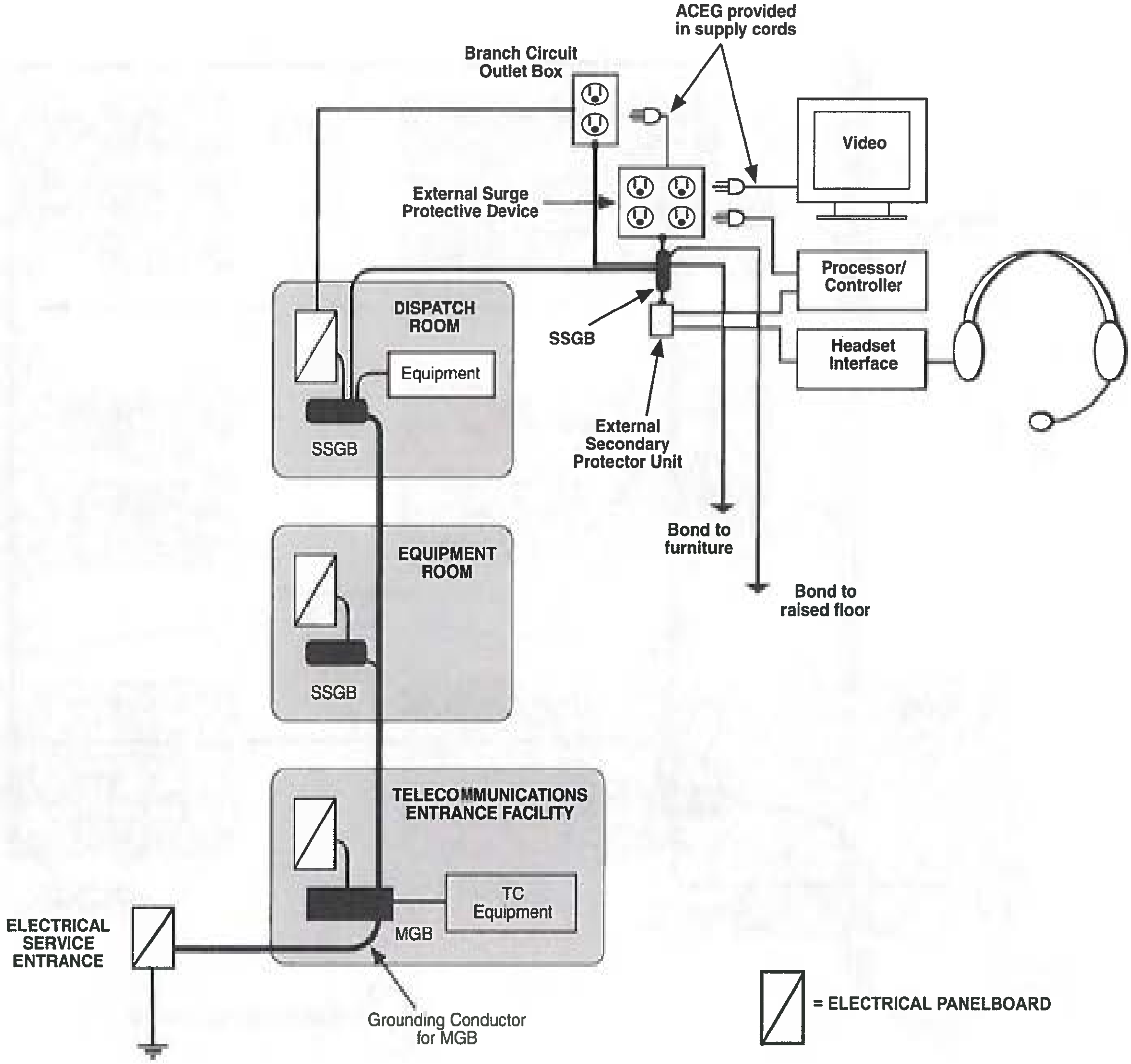


FIGURE 5-3 SINGLE-STORY BUILDING WITH COMMON ENTRY LOCATION

The preferred configuration for a multi-story building is to have all utilities enter the structure through a common wall, room or adjacent rooms as close as practical to each other. The single point grounding location for this type of structure must be located at the utilities entrance location preferably close to the building's electrical service (power) ground. See Figure 5-4 for an overview of the preferred internal grounding system design.

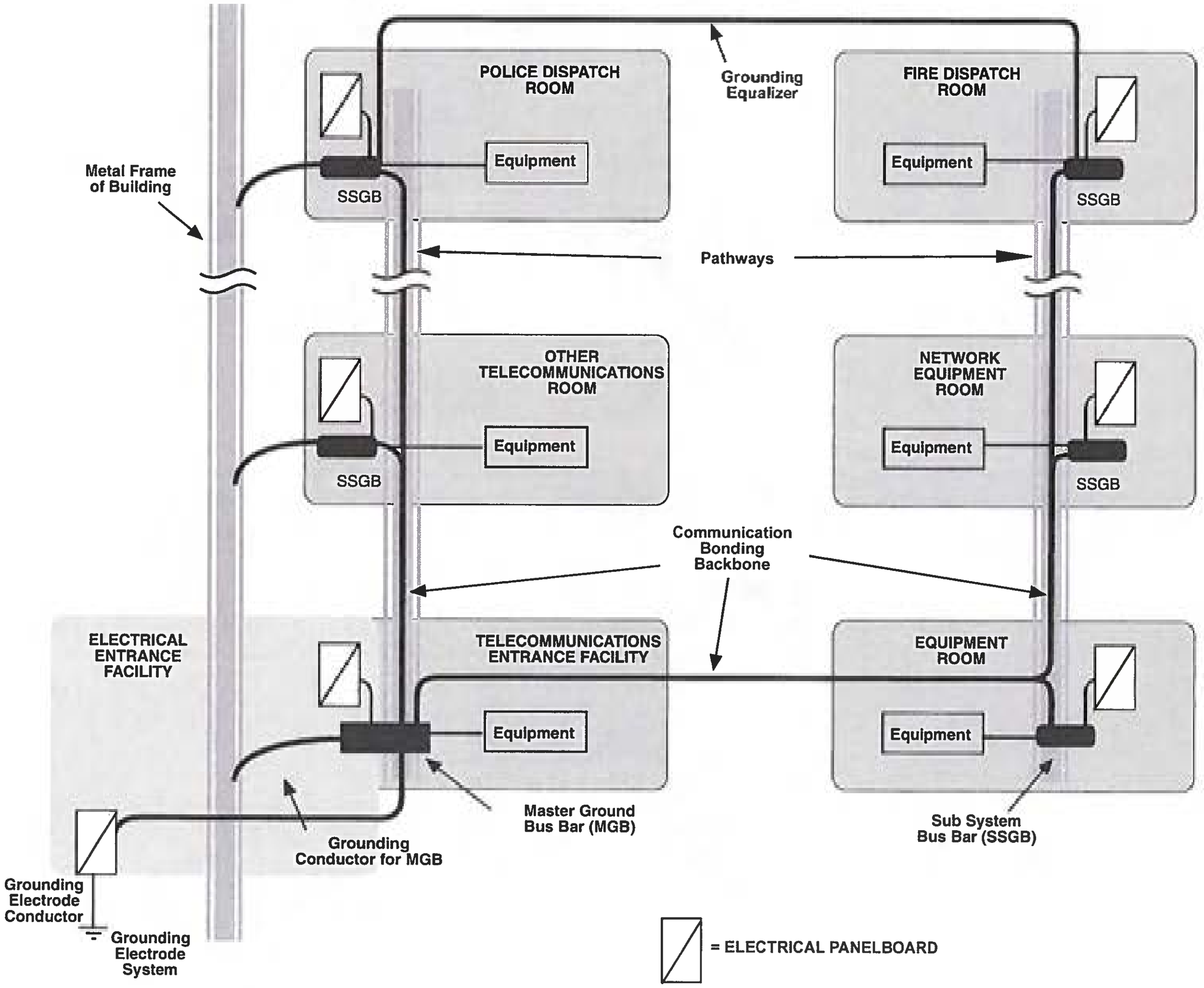


FIGURE 5-4 MULTI-STORY BUILDING WITH COMMON ENTRY LOCATION

An effective low-impedance internal grounding system can be achieved through the use of the components listed below, all of which must be effectively bonded together so that there is minimal difference in potential among them. Figure 5-5 shows the major components of a typical internal grounding system.

- Master Ground Bus Bar (MGB)
- Sub System Ground Bus Bar (SSGB)
- Rack Ground Bus Bar (RGB)
- Grounding conductors

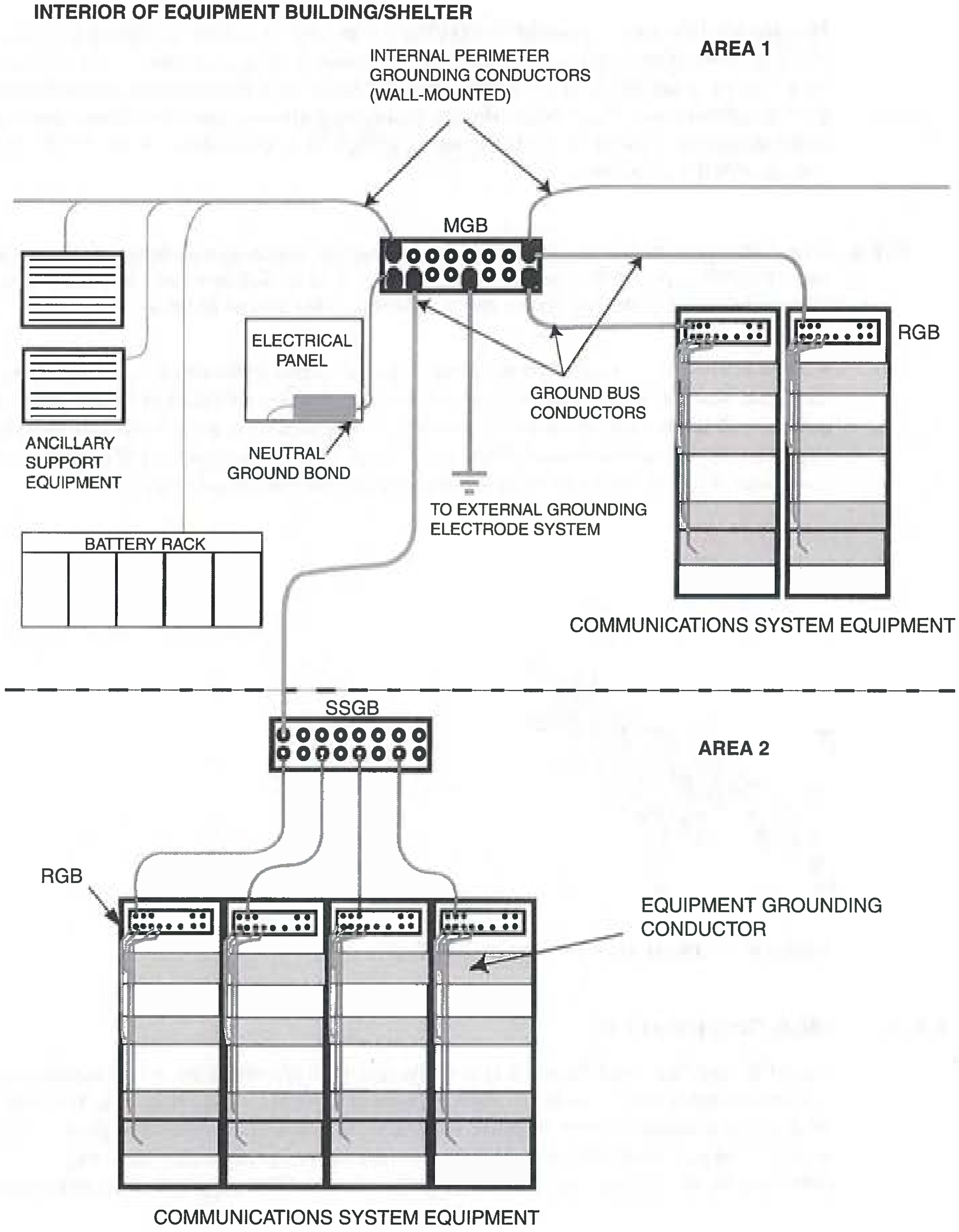


FIGURE 5-5 TYPICAL SINGLE-POINT INTERNAL GROUNDING SYSTEM

5.3.1 MASTER GROUND (EARTH) BUS BAR

The purpose of the master ground bus bar (MGB) is to provided a convenient internal grounding (earthing) termination point for the communication system and to serve as a dedicated extension of the site's common grounding electrode system. The MGB functions as the primary internal earth reference point for all equipment ground bus conductors, grounding conductors and communications equipment within the facility. Typically, there should only be a single MGB per building (ANSI-J-STD-607-A-2002 and ANSI T1.334-2002).

NOTE: Large buildings or campuses with multiple power feeds may require special design considerations that are beyond the scope of this document. Consultation with Motorola Engineering or with an engineering firm specializing in grounding system design is recommended in these instances.

A single MGB **shall** be installed for the communications system within a shelter, building, room or equipment area. The MGB should be located in close proximity to the electrical service entrance and installed with insulated mounting hardware. It may also be installed in an assembly of communications equipment cabinets as deemed necessary to ensure an effective bonding point for all equipment earthing conductors. A typical MGB with insulated mounting hardware is shown in Figure 5-6.

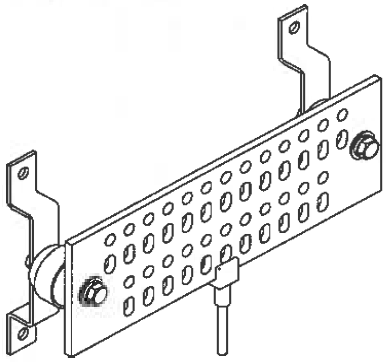


FIGURE 5-6 TYPICAL MASTER GROUND BUS BAR

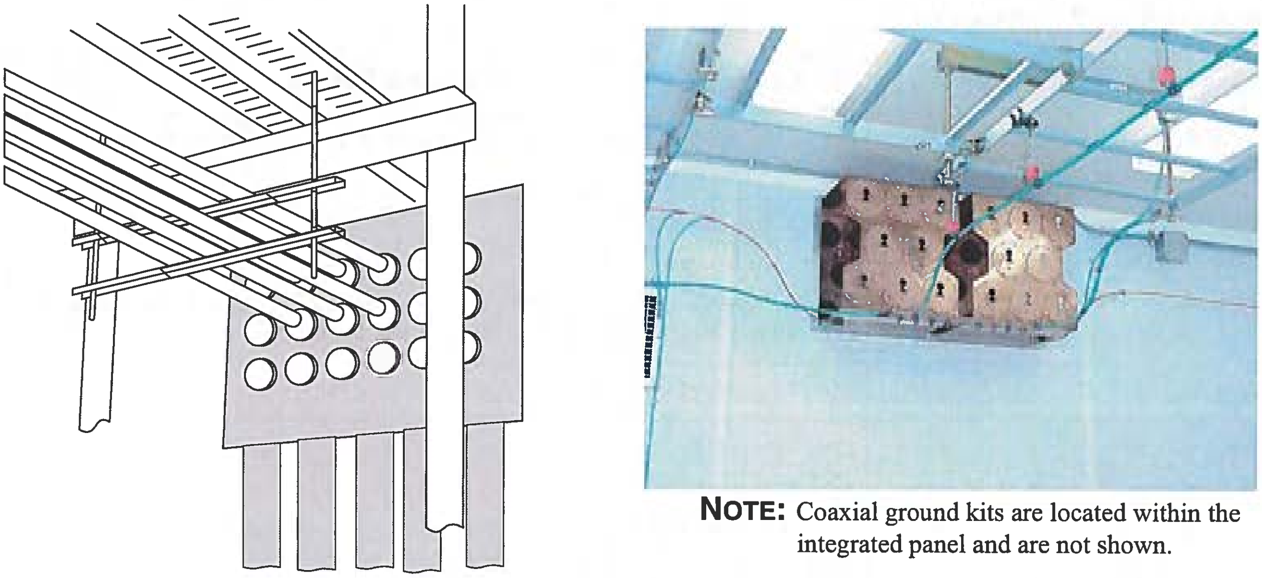
5.3.1.1 MGB SPECIFICATIONS

The MGB **shall** be a copper bus bar with predrilled holes that provide for the use of standard-sized lugs. It is recommended that the bus bar be electrotin plated for reduced contact resistance. The MGB **shall** be sized in accordance with the immediate application and consideration should be given to future growth of the site. The MGB **shall** be listed by a nationally recognized testing laboratory (ANSI-J-STD-607-A-2002). See Table 5-1 on page 5-10 for additional specifications and requirements.

TABLE 5-1 MGB SPECIFICATIONS

Item	Specification
Material	Bare, solid Alloy 110 (99.9%) copper bus bar or plate of one piece construction. May be electrotin-plated.
Minimum Dimensions NFPA 70-2005, Article 250.64)	Height: 50.8 mm (2 in.) Thickness: 6.35 mm (0.25 in.) Length: Variable to meet the application requirements and allow for future growth. 305 mm (12 in.) is recommended as the minimum length.
Mounting brackets	Must be suitable for the application.
Insulators	Polyester Fiberglass 15 kV minimum dielectric strength Flame resistant per UL 94 VO classification
Conductor mounting hole: Number and Dimensions	Dependent on number of conductors to be attached Holes should be 11 mm (0.4375 in.) minimum on 19 mm (0.75 in.) centers to permit the convenient use of two-hole lugs
Method of attachment of grounding electrode conductor.	Exothermic welding Irreversible crimp connection Other suitable irreversible crimp connection process

NOTE: A single properly installed integrated cable entry port of solid copper construction, electrically continuous between the interior and exterior of the structure through which it is mounted and with adequate surface area for proper termination of the internal grounding conductors, may be used as the MGB and external ground bus bar **only** if the site is properly designed for such a configuration. See "Grounding (Earthing) Electrode System Component and Installation Requirements" on page 4-7 for additional information on the external ground bus bar (EGB). Figure 5-7 shows an integrated cable entry port.



NOTE: Coaxial ground kits are located within the integrated panel and are not shown.

FIGURE 5-7 INTEGRATED CABLE ENTRY PORT BULKHEAD (OUTSIDE AND INSIDE VIEWS)

5.3.1.2 MGB LOCATION

Whenever practical, the MGB should be located within 610 mm (24 in.) of the transmission line entry into the building, equipment shelter, room, vault, enclosure or cabinet, preferably on the same wall or at the same entry location as the electrical service and the telecommunications cables. This configuration allows for a single point ground window to be established for the internal grounding (earthing) system. Figure 5-8 shows an example of this configuration for a stand-alone equipment shelter.

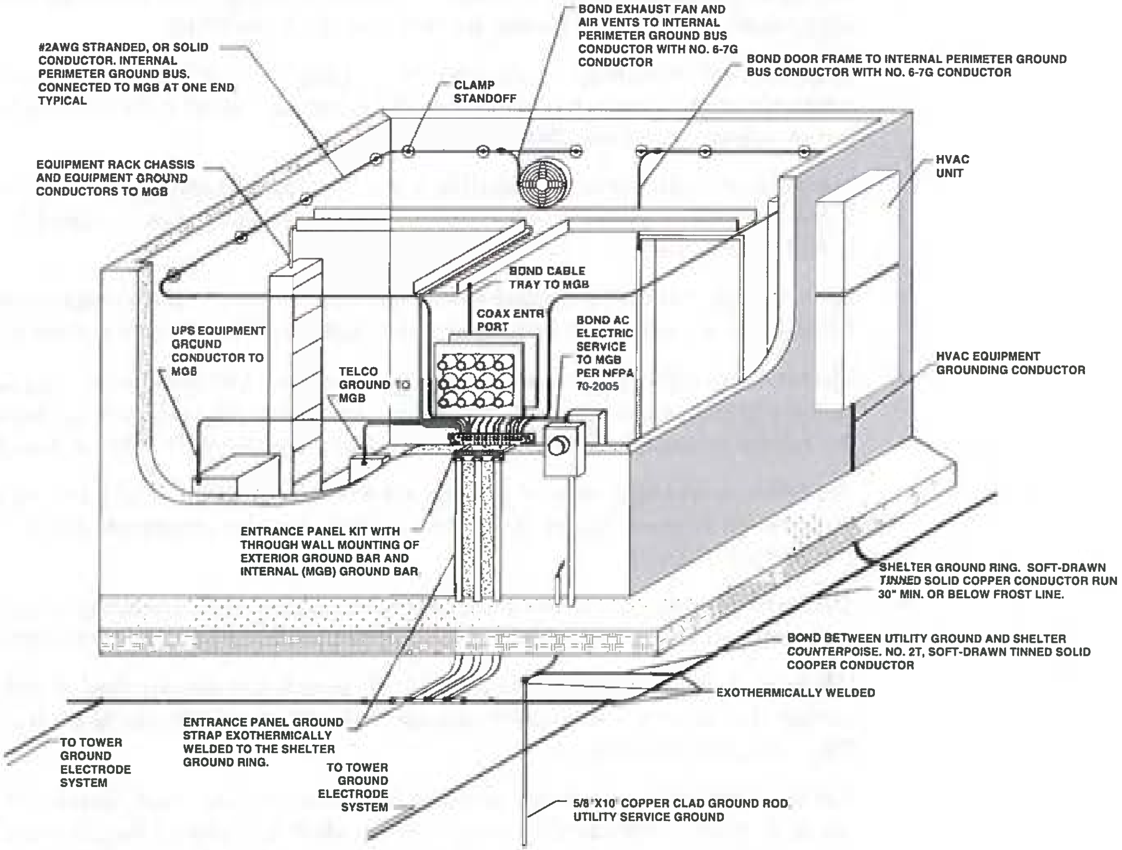


FIGURE 5-8 STAND-ALONE SHELTER WITH COMMON ENTRY LOCATION

The MGB must be insulated from its support structure just below the point where the transmission lines enter the facility, shelter or enclosure. In facilities or shelters where the transmission lines enter through a wall at floor level or through conduits within the floor or ceiling, the MGB should be located on the wall or floor immediately adjacent to the transmission lines entry point. In all cases, the MGB must located in a position that provides the shortest and straightest routing of the grounding conductors to the grounding electrode system.

In facilities where the transmission lines, the electrical service and the telecommunication cables enter at different locations, the MGB must be located as described within this chapter. In all cases the transmission lines, the telecommunication cables and the electrical service **shall** be effectively bonded back to the MGB, and the MGB **shall** be effectively bonded back to the grounding electrode system as described within this chapter.

5.3.1.3 BONDING: MGB-TO-GROUNDING (EARTHING) ELECTRODE SYSTEM

The installation specifications of the MGB and the acceptable methods for bonding the MGB to the site's grounding (earthing) electrode system are listed below. The following requirements are from ANSI-J-STD-607-A-2002 and other standards as noted.

- The MGB **shall** be insulated from its support structure. A minimum 51 mm (2 in.) separation from the supporting surface is recommended to allow access to the rear of the bus bar.

- The MGB grounding conductor **shall** extend from the MGB to the grounding electrode system with the shortest and straightest routing possible (ANSI T1.334-2002).
- When the communications system is located in a large or multi-story building, the MGB grounding conductor **shall** extend from the MGB to the service equipment (power) ground with the shortest and straightest routing possible.
- The MGB grounding conductor **shall** be of a copper material and may be insulated. If the conductor is insulated, the jacket **shall** be listed for the application as described within this chapter (ANSI T1.334-2002).
- When bonding back to an external grounding electrode system, it is strongly recommended that the MGB grounding conductor be multi-stranded, bare, individually tinned, copper.
- The MGB grounding conductor **shall** be 35 mm^2 csa (#2 AWG) minimum, and **shall not** be smaller than the largest ground bus conductor or equipment grounding electrode conductor installed within the internal grounding system (ANSI T1.334-2002, and NFPA 70-2005, Article 250.64(F)).
- The MGB grounding conductor **shall** be secured to the MGB by exothermic welding, listed compression two-hole lug, or irreversible compression-type connection device (ANSI T1.334-2002).
- The MGB grounding conductor **shall** be bonded to the external grounding electrode system with an exothermic weld or a listed irreversible compression device (ANSI T1.334-2002).
- Where exposed to physical damage, the MGB grounding conductor **shall** be protected and the conductor or its enclosure **shall** be securely fastened to the surface on which it is carried (NFPA 70-2005, Article 250.64(B)).
- The MGB grounding conductor should be free of any splices. Should a splice in the grounding electrode conductor become necessary, splicing **shall** be permitted only by listed irreversible compression-type connectors or by the exothermic welding process (NFPA 70-2005, Article 250.64(C)).
- The MGB grounding conductor **shall** be run to the grounding electrode system in a direct manner with no sharp bends or narrow loops. The grounding conductor bend angles (included angle) **shall not** be less than 90 degrees nor have a bending radius of less than 203 mm (8 in.) (ANSI T1.313-2003). When routing the MGB grounding conductor through a perimeter wall to the external grounding electrode system, the grounding conductor should be routed through the wall in a PVC or flexible non-metallic conduit sleeve at a 45 degree angle towards the grounding electrode system. See Figure 5-9 for an example of MGB grounding electrode conductor routing.

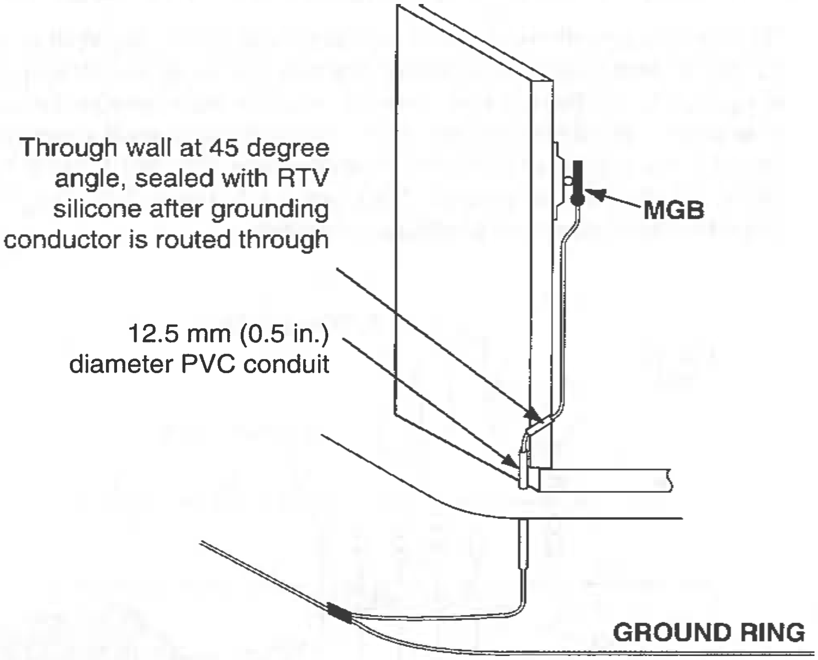


FIGURE 5-9 ROUTING OF MGB GROUNDING ELECTRODE CONDUCTOR

- The MGB grounding conductor should not be placed in ferrous metallic conduit. If local building codes require metallic conduit or sleeves, the grounding conductor **shall** be bonded to each end of the conduit using a listed grounding bushing or a bonding jumper of the same size, or coarser than, the required enclosed grounding electrode conductor (ANSI T1.334-2002, ANSI T1.313-2003 and NFPA 70-2005, Article 250.64(E)).
- Unless both ends of the grounding conductor are clearly visible, the conductor must be clearly labeled on both ends (ANSI T1.333-2001). In large and multi-story commercial buildings, each communication grounding and bonding conductor should be labeled as close as practicable to its point of termination in a readable location. The label **shall** be nonmetallic and should include the following information shown below (ANSI-J-STD-607-A-2002).

IF THIS CONNECTOR OR CABLE IS LOOSE OR MUST BE
REMOVED, PLEASE CALL THE BUILDING
TELECOMMUNICATIONS MANAGER

5.3.1.4 ACCEPTABLE GROUNDING (EARTHING) OF THE MGB

The following are considered acceptable for use as a grounding (earthing) electrode system at a communications system facility:

- In stand-alone building or equipment shelter, the MGB **shall** be bonded back to the common external grounding electrode system ground ring conductor (ANSI T1.334-2002 and ANSI T1.313-2003). See Chapter 4, "External Grounding (Earthing)," for external grounding electrode system requirements.

- In a small, large or multi-story building, the MGB grounding conductor **shall** extend from the MGB to the service equipment (power) grounding electrode system (ANSI-J-STD-607-A-2002).
- Where any of the following exist at a building or structure, they **shall** be effectively bonded together to form a common grounding electrode system and the MGB may bond to any point on this grounding electrode system: a metallic underground water pipe, the metal frame of the building or structure, concrete-encased electrodes, a ground ring conductor encircling the building or structure, rod or pipe electrodes and plate electrodes. (See NFPA 70-2005, Article 250.50 and 250.52 for additional information.) See Chapter 4, "External Grounding (Earthing)," for external grounding electrode system bonding requirements.

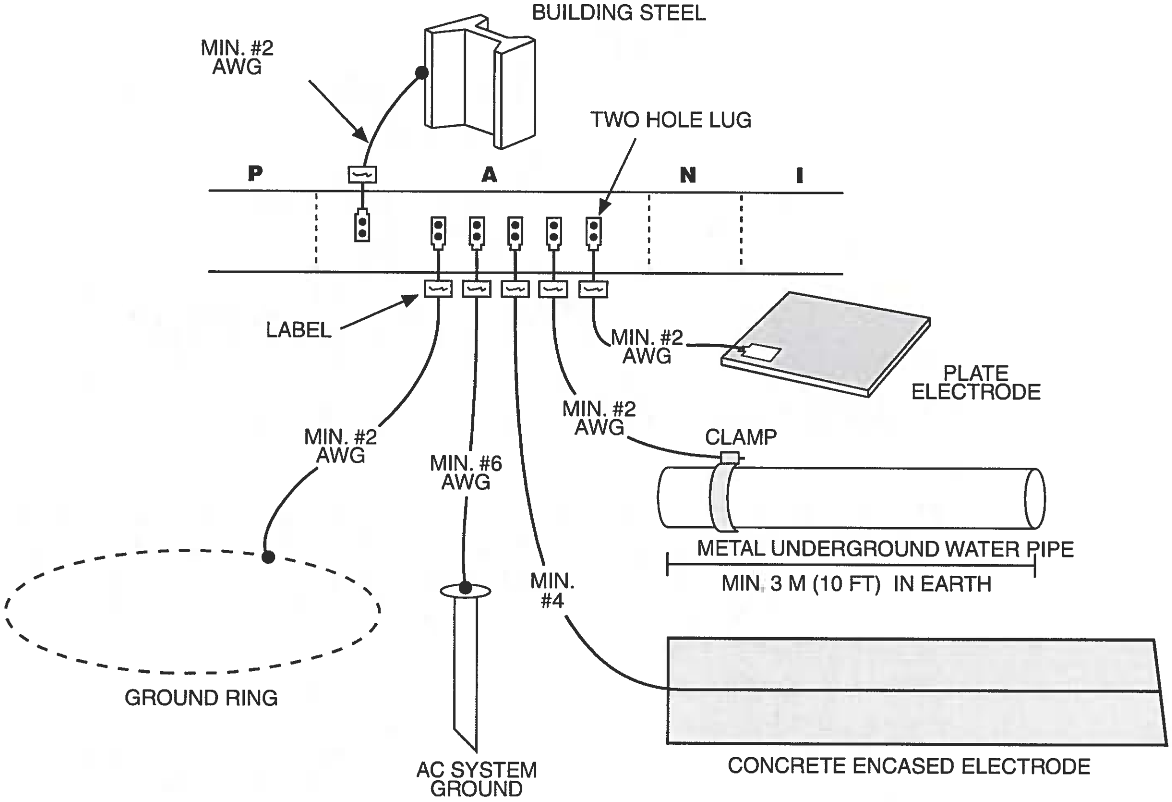


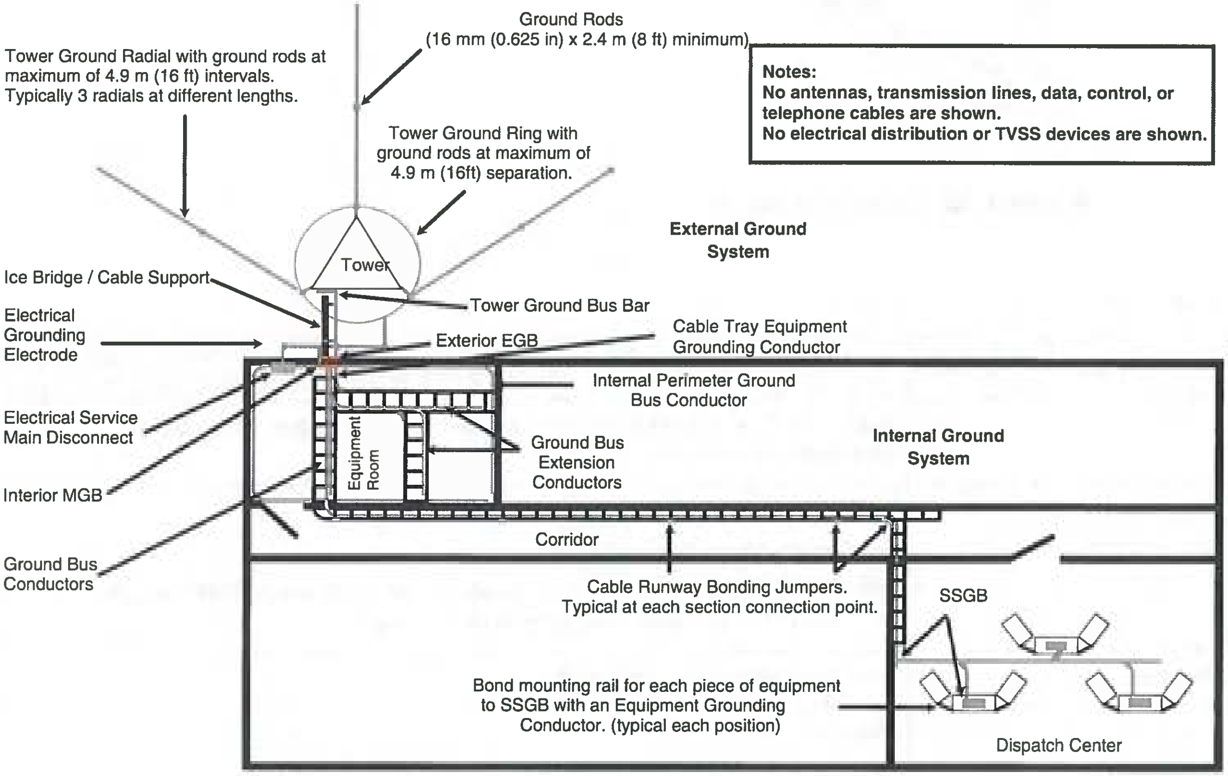
FIGURE 5-10 TYPES OF ACCEPTABLE GROUNDING ELECTRODE SYSTEMS

5.3.2 SUB SYSTEM GROUND (EARTH) BUS BAR

A Sub System Ground Bus Bar (SSGB) may be installed within a generator or power distribution room, a communications subsystem equipment room or area separate from, but associated with, the main communications equipment room or area and located within the same building as the MGB. In some applications the SSGB may be referred to as a telecommunications ground bus bar (TCGB), an isolated zone ground bus bar (IZGB), an ancillary ground bus bar (AGB), a logic ground bus bar (LGB), a frame ground bus bar (FGB), a telephone cable ground bus bar (TCGB), or an equipment reference ground bus bar (ERGB).

The SSGB provides a single termination point for all internal ground bus conductors, internal perimeter ground bus conductors, or equipment grounding conductors within a communications subsystem equipment room or area as defined herein. By having all equipment and ancillary support apparatus within the communications system equipment area bonded to a SSGB, differences in potential between communications system components are minimized and the probability of personal injury, system failure, or equipment damage greatly reduced.

A SSGB **shall not** be used when the associated equipment is located in a separate shelter or building, even if the shelter or buildings are adjacent to one another. A shelter added as a permanent attachment to an original building or shelter, which receives AC power from the same electrical service as the original building or shelter, is not considered a separate shelter or building for the purpose of this paragraph. See Figure 5-11 for an example of some acceptable SSGB configurations.



Notes:
No antennas, transmission lines, data, control, or telephone cables are shown.
No electrical distribution or TVSS devices are shown.

FIGURE 5-11 EXAMPLE OF SSGB CONFIGURATION

A SSGB may be installed in an assembly of communications equipment cabinets or at a network operator position as necessary to provide an effective bonding point for all equipment grounding conductors. Installation of a single rack, cabinet or chassis within a room or area does not require the installation of a SSGB as defined in this section, though one may be installed if desired.

5.3.2.1 SSGB SPECIFICATIONS

The SSGB **shall** be a copper bus bar with predrilled holes that provide for the use of standard sized lugs. It is recommended that the bus bar be electrotin plated for reduced contact resistance. The SSGB **shall** be sized in accordance with the immediate application and consideration should be given to future growth of the site. The SSGB **shall** be listed by a nationally recognized testing laboratory when it is placed within a building facility (ANSI-J-STD-607-A-2002) and it should be listed when placed within other type equipment locations. See Figure 5-12 for a typical layout of conductor mounting holes and see Table 5-2 for additional specifications and requirements.

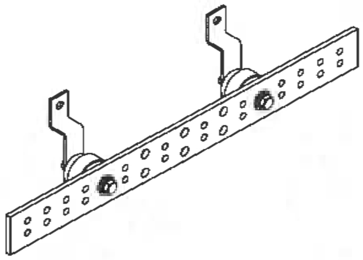


FIGURE 5-12 EXAMPLE OF SSGB

TABLE 5-2 SSGB Specifications

Item	Specification
Material	Bare, solid Alloy 110 (99.9%) copper bus bar or plate of one piece construction. May be electrotin-plated.
Minimum Dimensions (ANSI-STD-J-607-A-2002)	Height: 50.8 mm (2 in.) Thickness: 6.35 mm (0.25 in.) Length: Variable to meet the application requirements and allow for future growth. 305 mm (12 in) is recommended as the minimum length.
Mounting brackets	Must be suitable for the application.
Insulators	Polyester Fiberglass 15 kV minimum dielectric strength Flame resistant per UL 94 VO classification
Conductor mounting holes	Dependent on number of conductors to be attached. Holes should be 11 mm (0.4375 in.) minimum on 19 mm (0.75 in.) centers to permit the convenient use of two-hole lugs.
Method of attachment of grounding conductor.	Exothermic welding Irreversible crimp connection Other suitable irreversible crimped 2-hole lug

5.3.2.2 LOCATION

When used, the SSGB **shall** be located within the communications equipment room or area at the point where it is most convenient to terminate all ground (earth) bus conductors.

Although not recommended, and not a good design practice, occasionally exterior transmission lines and other telecommunication cables must enter an area served with a SSGB (i.e., not served by the MGB). In these instances special design criteria must be considered to ensure that potential differences between the location of the SSGB and the MGB are minimized. For these applications, additional surge suppression devices may be required on any interconnecting power, data, audio, telephone or telephone type circuits, even though they are routed within the same building. If the SSGB serving a transmission line or other communication cable entry point is located more than 6.1 linear metres (20 linear feet) from the MGB's grounding electrode system (the point where the MGB grounding electrode conductor enters the earth), the SSGB **shall** have a properly sized grounding electrode conductor installed directly to the site's common grounding electrode system with the shortest and straightest routing possible (NFPA 70-2005, Articles 800.100, 810.21, 820.100 and 830.100). Consultation with Motorola Engineering or other engineering firm is suggested in these instances.

For communication sites installed in large or multi-story commercial buildings, a SSGB **shall** be located inside each communications equipment room. A SSGB **shall** be installed as close to the panelboard as is practicable, with adequate clearance around it to comply with applicable local electrical codes. Where a panelboard for the communications equipment is not installed within the room, the SSGB should be located near the communication bonding backbone conductor at a location that allows the shortest routing of the grounding conductors. Multiple SSGBs may also be installed within the same room to aid in minimizing bonding conductor length and terminating space. Multiple SSGBs within a room **shall** be bonded together with a conductor of the same size as the communication bonding backbone conductor, with splice bars, or as described within this chapter. (See ANSI-J-STD-607-A-2002 for additional information.) See Figure 5-41 on page 5-67.

5.3.2.3 BONDING THE SSGB TO THE GROUNDING (EARTHING) SYSTEM

The installation specifications for the SSGB and the acceptable methods for bonding the SSGB back to the site's grounding system are listed below. The following requirements come from ANSI-J-STD-607-A-2002 and other standards as noted.

- The SSGB **shall** be insulated from its support structure. A minimum 51 mm (2 in.) separation from the supporting surface is recommended to allow access to the rear of the bus bar.
- The SSGB grounding conductor **shall** be of a copper material and may be insulated. If the conductor is insulated, the jacket **shall** be listed for the application as described within this chapter (ANSI T1.334-2002).
- The SSGB grounding conductor **shall** be 35 mm^2 csa (#2 AWG) or coarser, and **shall not** be smaller than the largest ground bus conductor or equipment grounding conductor bonded to it (ANSI T1.334-2002 and NFPA 70-2005, Article 250.64(F)).
- The SSGB grounding conductor **shall** be secured to the SSGB by exothermic welding, listed compression two-hole lug, or irreversible compression-type connection device (ANSI T1.334-2002).
- The SSGB grounding conductor should be free of any splices. Should a splice in the grounding conductor become necessary, splicing is be permitted only by listed irreversible compression-type connectors or by exothermic welding (NFPA 70-2005, Article 250.64(C)).

- The SSGB grounding conductor **shall** be bonded to the MGB, a collocated SSGB, or to a communication bonding backbone conductor as described within this chapter.
- When its required that the SSGB be bonded back to the external grounding electrode system, it is strongly recommended that the SSGB grounding electrode conductor be multi-stranded, bare, individually tinned, copper.
- The SSGB grounding electrode conductor **shall** be bonded back to the external grounding electrode system with an exothermic weld or a listed irreversible compression device (ANSI T1.334-2002).
- SSGB grounding electrode conductors located in areas with the potential for physical damage **shall** be protected and the conductor or its enclosure **shall** be securely fastened to the surface on which it is carried (NFPA 70-2005, Article 250.64(B)).
- The SSGB grounding electrode conductor **shall** be run to the grounding electrode system in a direct manner with no sharp bends or narrow loops. The grounding conductor bend angles (included angle) **shall not** be less than 90 degrees nor have a bending radius of less than 203 mm (8 in.) (ANSI T1.313-2003). See Figure 5-13.

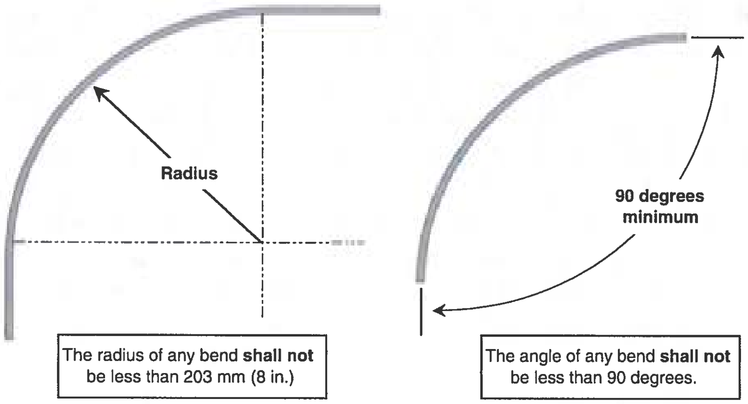


FIGURE 5-13 ACCEPTABLE GROUND CONDUCTOR BENDING

- When routing the SSGB grounding conductor through a perimeter wall to the external grounding electrode system, the grounding conductor should be routed through the wall in a PVC or flexible non-metallic conduit sleeve at a 45 degree angle towards the grounding electrode system.
- The SSGB grounding conductor should not be placed in ferrous metallic conduit. If local building codes require metallic conduit or sleeves, the grounding electrode conductor **shall** be bonded to each end of the conduit using a listed grounding bushing or a bonding jumper of the same size, or coarser than, the required enclosed grounding electrode conductor (ANSI-J-STD-607-A-2002, ANSI T1.334-2002, ANSI T1.313-2003 and NFPA 70-2005, Article 250.64(E)).
- Unless both ends of the grounding conductor are clearly visible, the conductor **shall** be clearly labeled on both ends (ANSI T1.333-2001). In large and multi-story commercial buildings, each communication grounding and bonding conductor should be labeled as close as practicable to its point of termination in a readable location. The label **shall** be nonmetallic and should include the information shown below (ANSI-J-STD-607-A-2002).

IF THIS CONNECTOR OR CABLE IS LOOSE OR MUST BE
REMOVED, PLEASE CALL THE BUILDING
TELECOMMUNICATIONS MANAGER