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Environmental Impact Assessment Registration Document Commission de services régionaux de Fundy Crane Mountain Landfill Capacity Augmentation and Life Extension Project

Saint John, Nouveau-Brunswick

Projet GEMTEC: 100018.012

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Document envoyé à :

Department of Environment and Local Government
Marysville Place, P.O. Box 6000
Fredericton, NB
E3A 5T8

Environmental Impact Assessment Registration Document Fundy Region Service Commission Crane Mountain Landfill Capacity Augmentation and Life Extension Project

Saint John, Nouveau-Brunswick

June 21, 2023
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expérience • savoir-faire • intégrité

June 21, 2023 Fichier : 100018.012

Department of Environment and Local Government
Marysville Place, P.O. Box 6000
Fredericton, NB
E3A 5T8

À l'attention de Patricia Holland, chef de projet

Objet : Environmental Impact Assessment – Document d'enregistrement
Projet d'augmentation de capacité et de prolongation de la durée de vie du site d'enfouissement de Crane Mountain

La société GEMTEC Consulting Engineers and Scientists Limited (GEMTEC) transmet par les présentes une copie électronique du document d'enregistrement de l'étude d'impacts sur l'environnement (EIE) pour le projet d'augmentation de capacité et de prolongation de la durée de vie du site d'enfouissement de Crane Mountain au nom de la Commission de services régionaux de Fundy (CSRF). Le projet proposé est situé sur le site d'enfouissement sanitaire de la CSRF (site d'enfouissement de Crane Mountain) au 10, chemin Crane Mountain à Saint John, au Nouveau-Brunswick, identifié par Services Nouveau-Brunswick (SNB) sous les numéros d'identification de parcelle (NID) 55087001, 55087027, 55087019, 55043301, 55086987, 55160352 et 55043293. L'emplacement du projet proposé est situé sur des portions des parcelles 55087001, 55087027, 55086987, 55043301 et 55087019.

N'hésitez pas à contacter le soussigné pour toute question ou préoccupation concernant le document d'enregistrement ou les informations qui y sont présentées.

Respectueusement,

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1.0 INTRODUCTION

La Commission de services régionaux de Fundy (CSRF) a retenu les services de GEMTEC Consulting Engineers and Scientists Limited (GEMTEC) pour produire un document d’enregistrement d’une évaluation d’impact sur l’environnement (EIE) d’un projet d’augmentation de capacité et de prolongation de la durée de vie du site d’enfouissement sanitaire de Crane Mountain (ci-après le « projet »), situé au 10, chemin Crane Mountain, à Saint John, au Nouveau-Brunswick (ci-après le « site d’enfouissement »; figure 1). Le site d’enfouissement est aménagé sur un terrain identifié par Services Nouveau-Brunswick (SNB) sous les numéros d’identification de parcelle (NID) 55087001, 55087027, 55086987, 55087019, 55043301, 55043293, 55160352 (ci-après appelé le « site »). L’emplacement du projet proposé est situé sur les parcelles 55087027, 55087001, 55087027, 55086987, 55043301 et 55087019 (ci-après dénommé « aire du projet » ou « AP »; figure 2).

Le site d’enfouissement est exploité conformément à un agrément d’exploitation (I-11079; valable jusqu’au 30 novembre 2025) délivré à la CSRF par le ministère de l’Environnement et des Gouvernements locaux du Nouveau-Brunswick (MEGLNB; annexe A). L’autorisation d’exploitation impose diverses conditions, notamment des protocoles et des procédures que le site d’enfouissement doit mettre en œuvre pour réduire au minimum les incidences sur l’environnement. L’autorisation d’exploitation prévoit l’envoi obligatoire de rapports au MEGLNB afin de démontrer que le site est exploité en toute sécurité et dans le respect des règles.

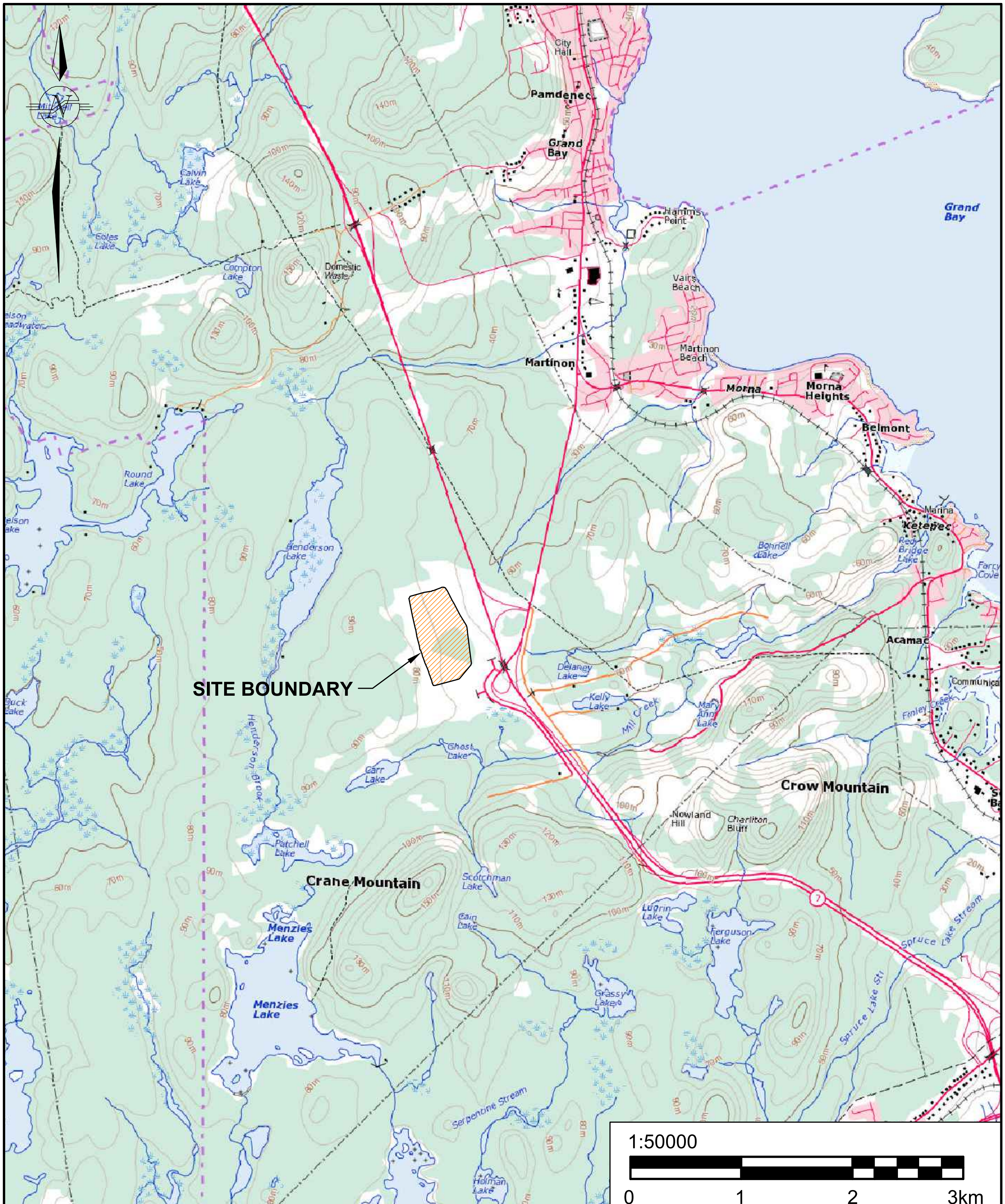
Dans le but d’optimiser l’utilisation efficace du site d’enfouissement et de maximiser l’espace aérien disponible, la CSRF propose d’augmenter la hauteur des déchets solides municipaux (DSM) placés dans les cellules d’enfouissement actuellement opérationnelles ainsi que dans toutes les cellules d’enfouissement futures. Le projet applique les pratiques durables d’élimination des déchets reconnues, dans le but de réduire les impacts environnementaux nécessaire à l’extension de l’empreinte du site d’enfouissement et de réaliser des économies grâce au report de la construction de nouvelles cellules d’enfouissement ou d’un nouveau site d’enfouissement complet, en tenant compte de l’importance sociale de l’implantation d’un nouveau site d’enfouissement pour la région. La CSRF est convaincue que ce projet est la solution la plus pragmatique à la problématique locale de gestion des déchets, conciliant la nécessité de traiter les déchets avec les aspects environnementaux, sociaux et économiques de ce type d’activité. Ce projet devrait prolonger la durée de vie du site d’enfouissement de 22 ans, doublant ainsi sa capacité restante.

GEMTEC a soumis une description du projet au ministère de l’Environnement et des Gouvernements locaux du Nouveau-Brunswick (MEGLNB) le 20 avril 2023 afin de valider les exigences réglementaires de la proposition. Le MEGLNB a émis une lettre datée du 26 avril 2023 indiquant que le projet envisagé constituerait une modification importante d’une installation existante, de sorte qu’il nécessite un enregistrement et un examen d’EIE conformément à l’article (m), « toutes installations ou tous systèmes d’élimination des déchets » de l’annexe A du *Règlement sur les études d’impact sur l’environnement (Loi sur l’assainissement de l’environnement)*, avant de pouvoir être mis en œuvre. Le présent document est soumis pour l’enregistrement de l’EIE du projet proposé. Le document présente en détail les informations nécessaires décrites dans le document du MEGLNB « Guide aux études d’impact sur l’environnement au Nouveau-Brunswick » daté de janvier 2018 ainsi que dans la Ligne directrice sectorielle sur les installations d’élimination des déchets.

Le site d’enfouissement est opérationnel depuis 1997 et reçoit tous les déchets solides des municipalités de la région de Fundy, notamment Saint John, Rothesay, Quispamsis, Hampton, Fundy-St. Martins, Grand Bay-Westfield et le district rural de Fundy. Au cours de la phase de planification des installations, au milieu des années 1990, le tonnage annuel de matériaux à éliminer sur le site d’enfouissement était estimé entre 114 000 et 145 000 tonnes de déchets solides municipaux (Équipe d’action sur les déchets solides de Fundy, 1994). Aujourd’hui, environ 65 000 tonnes de déchets solides sont déposées chaque année sur le site d’enfouissement de Crane Mountain.

La durée de vie restante du site d’enfouissement dans sa configuration actuelle est estimée à environ 25 années et sa fermeture est prévue après 2048. La capacité restante actuelle du site d’enfouissement est estimée à 2,4 millions de mètres cubes. Le projet ajouterait une capacité supplémentaire de 2,4 millions de mètres cubes, doublant ainsi la capacité existante du site d’enfouissement.

Le projet augmenterait l’élévation maximale des cellules d’enfouissement des déchets de +90 mètres à +117,5 mètres d’altitude géodésique. L’augmentation de hauteur est proposée pour l’ensemble du site d’enfouissement, y compris les cellules d’enfouissement déjà remplies et recouvertes, les cellules d’enfouissement de déchets actuellement opérationnelles ainsi que toutes les cellules d’enfouissement futures. La solution proposée de stockage supplémentaire des déchets utilisera les systèmes existants de collecte et de traitement des lixiviats. Le projet ne prévoit pas d’augmentation de l’empreinte globale du site d’enfouissement. Le projet ne pose aucun nouveau problème de santé ou de sécurité pour le personnel ou le public circulant sur le site.



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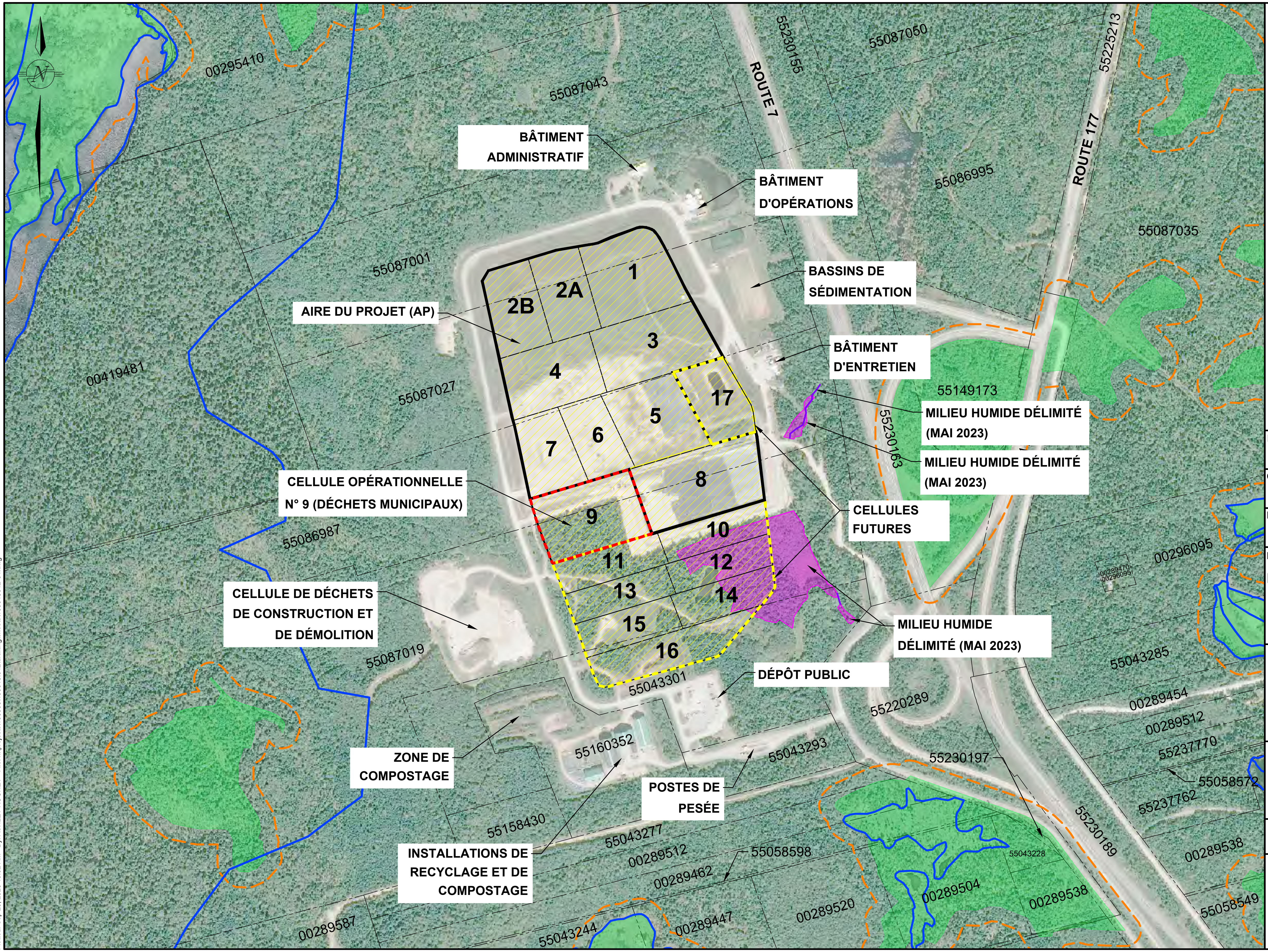
PROJET	ILLUSTRATION	
ÉVALUATION D'IMPACT SUR L'ENVIRONNEMENT D'UNE AUGMENTATION DE LA HAUTEUR DU SITE D'ENFOUISSEMENT DE CRANE MOUNTAIN	PLAN GÉNÉRAL DU SITE	GEMTEC CONSULTING ENGINEERS AND SCIENTISTS

DESSINÉ PAR	DATE	DOSSIER	N° D'ILLUSTRATION	N° DE VERSION
AGSD	JUIN, 2023	100018012-04	FIGURE 1	0



LÉGENDE

- ZONE HUMIDE RÉGLEMENTÉE (GeoNB)
- BANDE TAMPON DE ZONE HUMIDE RÉGLEMENTÉE (GeoNB)
- RÉSEAU HYDROGRAPHIQUE (GeoNB)
- MILIEU HUMIDE DÉLIMITÉ (MAI 2023)
- COURS D'EAU DÉLIMINÉ (MAI 2023)

DESSINÉ PAR AGSD	VÉRIFIÉ PAR MS
CALCULS RÉALISÉS PAR	VÉRIFIÉ PAR
DATE JUIN, 2023	
PROJET ÉVALUATION D'IMPACT SUR L'ENVIRONNEMENT D'UNE AUGMENTATION DE CAPACITÉ ET DE PROLONGATION DE LA DURÉE DE VIE DU SITE D'ENFOUISSEMENT DE CRANE MOUNTAIN	
ILLUSTRATION PLAN DU PROJET	
ÉCHELLE 1:7500 (0 150 300 450m)	
DOSSIER 100018012-04	N° D'ILLUSTRATION FIGURE 2

GEMTEC
CONSULTING ENGINEERS AND SCIENTISTS

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1.1 Nom du projet et du promoteur

1.1.1 Nom du projet

Projet d'augmentation de capacité et de prolongation de la durée de vie du site d'enfouissement de Crane Mountain, Commission de services régionaux de Fundy, Saint John, Nouveau-Brunswick

1.1.2 Promoteur du projet

Tableau 1 Informations sur le promoteur

Nom du promoteur	Commission de services régionaux de Fundy
Adresse du promoteur	10, chemin Crane Mountain Saint John, Nouveau-Brunswick E2M 7T8
Adresse postale du promoteur	C.P. 3032 Grand Bay-Westfield, Nouveau-Brunswick, E5K 4V3
Personne-ressource chez le promoteur	Marc MacLeod, directeur général Commission de services régionaux de Fundy Téléphone : 506-738-1212 Courriel : mmacleod@fundyrecycles.com
Personne-ressource principale pour l'EIE	Marco Sivitilli, ing. GEMTEC Consulting Engineers and Scientists Limited 124, promenade Greenview, Hanwell, Nouveau-Brunswick, E3C 2A5 Téléphone : 506-453-1025 Courriel : marco.sivitilli@gemtec.ca
Propriété du site	Le site appartient à la Commission de services régionaux de Fundy

2.0 DESCRIPTION DU PROJET

2.1 Résumé du projet

La CSRF exploite une installation régionale de gestion et d'élimination des déchets solides, communément appelée site d'enfouissement de Crane Mountain (le site d'enfouissement), située à Saint John près de Grand Bay-Westfield. Le site est situé à environ trois (3) kilomètres au sud-sud-ouest de la déviation de Martinon, juste à l'ouest de la route 7 où elle rejoint la route 177, comme le montre la Figure 1.

Le site d'enfouissement dessert les municipalités de la région de Fundy, notamment Saint John, Rothesay, Quispamsis, Hampton, Fundy-St. Martins, Grand Bay-Westfield et le district rural de Fundy. Le site d'enfouissement est exploité conformément à l'agrément d'exploitation I-11079 (valable jusqu'au 30 novembre 2025) délivrée à la CSRF par le MEGLNB (annexe A) et accepte une variété de flux de déchets, y compris des déchets solides municipaux (DSM), des débris de construction et de démolition, des produits électroniques, des déchets ménagers dangereux et des déchets industriels, commerciaux et institutionnels (ICI). Seuls les DSM et les déchets ICI sont placés dans des cellules d'enfouissement.

Le site d'enfouissement est équipé d'un système de collecte et de contrôle des gaz d'enfouissement (CCGE) qui capte et utilise les gaz d'enfouissement (GE) produits par la décomposition naturelle des déchets. Le gaz est extrait du site d'enfouissement par un réseau de puits et de tuyaux pour être brûlé afin de détruire le méthane et produire du dioxyde de carbone, réduisant ainsi les émissions globales de gaz à effet de serre (GES). La combustion a lieu soit dans une torchère fermée, soit dans le système d'utilisation des gaz d'enfouissement (SUGE), lequel produit de l'électricité à l'aide d'un groupe électrogène Jenbaucher d'une puissance de 1 MW. Les deux systèmes de combustion réduisent les odeurs en détruisant plus de 99 % du méthane. L'électricité générée par le SUGE est d'abord utilisée sur place et tout excédent d'électricité est directement injecté dans le réseau de Saint John Energy ou mise à la disposition des bâtiments du site (Energy Production, 2023) La CSRF est un chef de file dans l'utilisation des gaz d'enfouissement, ayant été le premier site d'enfouissement au Nouveau-Brunswick à avoir un système CCGE en 2007 ainsi que le premier site d'enfouissement au Canada atlantique à utiliser les gaz d'enfouissement pour la production d'énergie en 2010.

Outre la mission d'élimination des déchets, le site d'enfouissement et la CSRF collaborent dans le cadre de plusieurs initiatives de détournement des déchets, notamment pour la collecte des déchets ménagers dangereux, le recyclage et les services de compostage offerts à la population. Le programme de recyclage permet de collecter et de traiter des matériaux tels que le papier, le carton, le plastique et le métal. Le programme actuel de recyclage de la CSRF répond aux exigences du nouveau plan de gouvernance de Recycle NB pour les produits d'emballage et de papier (PEP). Le programme de compostage vise à transformer les déchets de jardin et les déchets alimentaires en un compost riche en nutriments pouvant être utilisé pour le jardinage et l'aménagement paysager. Il est conforme au plan d'action stratégique pour la gestion des déchets 2023-2030 récemment annoncé par le gouvernement du Nouveau-Brunswick. Ces services détournent des déchets qui n'aboutissent pas dans des cellules d'enfouissement de déchets solides, réduisant ainsi activement la quantité de matériaux enfouis et de gaz d'enfouissement produits dans la région.

Neuf (9) cellules de confinement des DSM ont déjà été construites et huit (8) cellules supplémentaires sont prévues jusqu'à la fermeture (soit un total de 17 cellules). Dans le but d'optimiser l'utilisation efficace du site d'enfouissement et de maximiser l'espace aérien disponible, la CSRF propose d'augmenter la hauteur des déchets solides municipaux (DSM) placés dans les cellules d'enfouissement actuellement opérationnelles ainsi que dans toutes les cellules d'enfouissement futures. Les DSM seraient placés jusqu'à une altitude de +117,5 mètres, tout en maintenant les pentes latérales des cellules de confinement à 4 mètres horizontaux pour 1 mètre vertical (4H:1V).

L'augmentation de hauteur permettra de conserver l'empreinte actuelle du site d'enfouissement et les pentes extérieures. Sur la base de la géométrie de conception, seule une petite zone du site d'enfouissement atteindra la nouvelle hauteur vu que les DSM sont placés dans une configuration pyramidale (figure 3). Cette géométrie réduira la surface relativement plate au sommet du site d'enfouissement, ce qui améliorera le drainage de la couverture finale et limitera ainsi les infiltrations d'eau et la production de lixiviats.

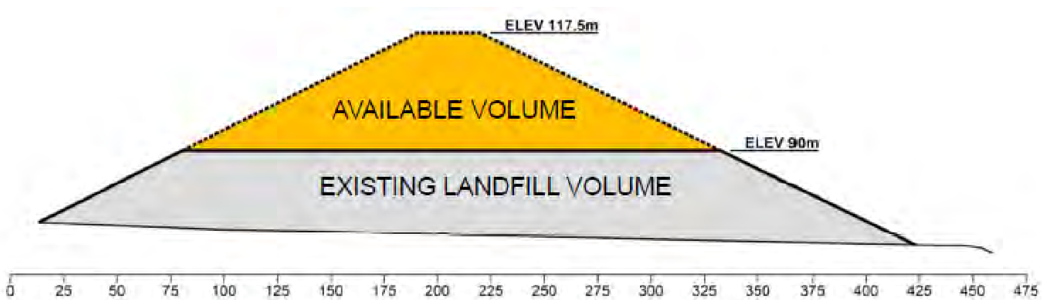


Figure 3 - Vue en coupe de la géométrie proposée pour le site d'enfouissement (d'est en ouest)

Le projet emploiera l'infrastructure existante du site d'enfouissement et aucun matériau nouveau ni aucune activité particulière ne sera nécessaire en dehors des exigences opérationnelles typiques du site d'enfouissement ou des pratiques de construction actuelles. Le projet ne prévoit aucune activité de construction supplémentaire au-delà de la zone d'enfouissement actuellement approuvée et ne nécessite aucune modification du système de collecte des lixiviats existant et prévu ni même de modification technique des cellules d'enfouissement. En tant que telle, l'EIE n'a pas à se prononcer sur une « phase de construction ou de développement du site » et se concentre uniquement sur la « phase opérationnelle » du site d'enfouissement.

Vu que le projet ne prévoit pas d'augmentation de l'empreinte approuvée du site d'enfouissement, il n'entraînera pas de destruction supplémentaire d'habitats naturels au-delà de ce qui avait été envisagé dans l'EIE initiale (Fundy Solid Waste Action Team, 1994). En outre, le projet n'aura d'impact sur aucune zone humide ni aucun cours d'eau réglementé en dehors de l'empreinte du site d'enfouissement tel qu'il a été approuvé en 1997. Les activités et les conditions d'exploitation ne devraient pas différer de façon significative de celles qui ont cours actuellement sur le site d'enfouissement (p. ex. les niveaux de bruit, les émissions, les modèles de circulation, etc.).

Le projet sera accessible par le réseau routier existant conduisant au site et par les chemins à l'intérieur de celui-ci (figure 2). Aucune nouvelle route ni aucun nouveau point d'accès ne sont nécessaires. Le projet n'augmentera pas le type, la densité ou le volume de circulation sur le site d'enfouissement. Les activités du projet se dérouleront pendant les heures d'exploitation habituelles du site d'enfouissement (du lundi au vendredi, en journée, et le samedi matin).

Dans l'ensemble, la décision d'augmenter la hauteur du site d'enfouissement constitue une solution innovante et pragmatique, offrant un bilan coûts-avantages positif qui concilie la nécessité de gérer les déchets tout en tenant compte des préoccupations environnementales et de santé publique, laquelle correspond aux pratiques courantes dans les sites d'enfouissement partout en Amérique du Nord. Elle évite toute augmentation de superficie, toute nouvelle destruction de l'environnement et tout transport de déchets vers de nouveaux sites d'enfouissement et retarde la longue et coûteuse procédure d'autorisation/approbation nécessaire à l'aménagement d'un nouveau site d'enfouissement. Ce projet devrait prolonger la durée de vie du site d'enfouissement de 22 ans et doubler sa capacité restante, tout en optimisant l'infrastructure, les actifs et la zone de service actuels.

L'allongement de la durée de vie du site d'enfouissement n'aura pas d'incidence sur le plan global de fermeture et de remise en état du site, si ce n'est qu'il repoussera la fermeture. Le plan de fermeture et de réhabilitation répond aux exigences de surveillance environnementale, d'inspection technique, d'entretien du recouvrement final, de gestion des lixiviats, de gestion des gaz et d'administration. En outre, le plan précise que toutes les cellules d'enfouissement seront recouvertes conformément aux exigences du MEGLNB.

2.2 But, justification et nécessité du projet

Le site d'enfouissement a été créé en 1997 et sa durée de vie prévue était alors de 40 ans. L'un des principaux objectifs de la CSRF est de gérer le site d'enfouissement de manière à optimiser son infrastructure d'un point de vue fiscal et environnemental, tout en cherchant continuellement des possibilités d'amélioration afin de fournir à la population un service efficace de gestion des déchets. La principale raison d'être du projet est de prolonger la durée de vie du site d'enfouissement de 22 ans et de créer un volume utilisable supplémentaire d'environ 2,4 millions de mètres cubes, ce qui se traduira par une date de fermeture prévue au-delà de 2070.

On s’attend à ce que les municipalités et les districts de services locaux relevant de la compétence de la CSRF en tirent des avantages directs.

Une augmentation de la hauteur du site d’enfouissement permettrait d’utiliser efficacement le système de collecte des lixiviats et les pompes, le bassin d’accumulation des lixiviats, les bassins de traitement des eaux de surface, le système d’utilisation des gaz d’enfouissement, les routes, les bâtiments et les puits de surveillance existants, conduisant ainsi à une réduction des coûts de construction, d’exploitation et d’entretien. En outre, l’augmentation de la hauteur du site d’enfouissement permettrait de réduire considérablement les coûts de construction de nouvelles cellules, qui s’élèvent généralement à environ 4 millions de dollars, pour une durée de vie de trois à quatre ans.

D’après les premières estimations, le projet devrait permettre à la CSRF et aux contribuables d’éviter d’importantes dépenses. Il est prévu que chaque année supplémentaire d’exploitation prolongée se traduise par des économies estimées à 1 million de dollars, soit un total de plus de 22 millions de dollars sur la durée de vie prolongée du site d’enfouissement. Ces économies, calculées de manière prudente en dollars de 2023, profiteront directement aux contribuables.

En outre, la construction de la cellule 10 pourrait être reportée d’au moins 11 ans, grâce au rehaussement du site d’enfouissement à l’intérieur de l’empreinte existante des cellules de DSM 1 à 9. Une utilisation plus efficace de l’espace disponible permettrait de différer la construction prochaine de la cellule 10 et donc d’optimiser les ressources et de réduire les coûts.

La prolongation de la durée de vie du site d’enfouissement existant permettra également d’éviter de nouvelles destructions d’habitats pour la gestion des déchets dans la région et les impacts environnementaux de telles opérations. La maximisation de l’espace aérien utilisable du site d’enfouissement existant est la formule la moins dommageable sur le plan environnemental et la plus viable sur le plan économique pour la gestion des déchets sur le territoire de la CSRF. Il est important de noter que depuis son ouverture en 1997, le site d’enfouissement a respecté ou dépassé toutes les exigences du certificat d’autorisation provincial et de l’agrément d’exploitation en vertu desquels il est réglementé.

2.3 Emplacement et propriété du projet

Le projet sera réalisé sur le site d’enfouissement existant, actuellement détenu et exploité par la CSRF. Les coordonnées GPS du site sont 45.27001°, -66.21203°. Le projet est situé à l’ouest de l’échangeur de l’autoroute Grand Bay à la jonction de la route 7 et de la route 177 (Figure 1).

L’aire du projet devrait comprendre les cellules d’enfouissement de DSM actives, toutes les cellules futures, toutes les voies d’accès/de transport nécessaires et les structures temporaires (c.-à-d. remorques, toilettes portables, remisage de l’équipement, etc.). À l’intérieur du site, la superficie estimée du projet est de 24 hectares (Figure 1).

2.4 Considérations d’implantation

Le projet serait mis en œuvre pour les cellules d’enfouissement des déchets déjà recouvertes, présentement actives et futures, ce qui permettra de maximiser la capacité de stockage de l’empreinte approuvée du site d’enfouissement. On s’attend à ce que le projet entraîne à long terme une réduction des impacts environnementaux en prolongeant la durée de vie du site d’enfouissement existant dans sa configuration actuelle. Une économie de coût pour la collectivité est également envisagée grâce à l’augmentation de capacité des cellules, étant donné que les cellules existantes et futures seraient utilisées pendant une plus longue période (donc moins de travaux de construction, etc.) et que la construction d’un nouveau site d’enfouissement serait reportée.

Le projet n’entraînera pas d’augmentation de l’empreinte globale du site d’enfouissement, donc aucune perturbation/destruction supplémentaire d’habitat ni aucun enlèvement de végétation naturelle ne seraient nécessaires. En outre, le projet n’aura d’impact sur aucune zone humide ni aucun cours d’eau réglementé en dehors de l’empreinte approuvée du site d’enfouissement. L’aire du projet ne touche aucune zone protégée de champ de captage ou de bassin versant (GeoNB I. G., 2023).

Le projet utilisera les systèmes de collecte des lixiviats existants et déjà prévus sur le site d’enfouissement. Les modèles de drainage des eaux pluviales et de gestion des eaux pluviales sur le site resteront inchangés par rapport aux conditions actuelles et prévues sur le site d’enfouissement.

Aucun autre emplacement n’a été envisagé étant donné que le projet, s’il est approuvé, sera mis en œuvre dans l’empreinte du site d’enfouissement existant.

2.5 Composants physiques et dimensions du projet

La figure 2 montre le plan du site d’enfouissement existant où le projet serait réalisé. Le projet ne modifiera pas l’empreinte de développement actuelle ou future ni la zone d’exploitation du site.

2.5.1 Caractéristiques techniques des cellules d’enfouissement

La séquence générale de construction des cellules d’enfouissement du site est présentée à l’annexe B et décrite ci-dessous :

- Les sols naturels in situ sont excavés jusqu’aux élévations des plans ou jusqu’aux sols porteurs stables, afin de maximiser la capacité des cellules tout en favorisant un drainage positif pour permettre au système de collecte des lixiviats de s’écouler par gravité vers les bassins de stockage et de traitement des lixiviats;

- Des systèmes de canalisations de sous-drainage sont installés pour maintenir la hauteur des eaux souterraines en dessous de la face inférieure du revêtement de la cellule, lesquels sont remblayés jusqu'au niveau du sol;
- Le substrat naturel est nivelé et compacté, puis recouvert d'un matériau de sous-couche composée de 300 mm de gravier propre, à drainage libre, provenant d'une fosse. La sous-couche a pour but de fournir une fondation stable pour le revêtement, ainsi qu'une couche de drainage;
- Des matériaux granulaires et des matériaux empruntés sélectionnés sont placés pour construire des talus de retenue;
- Un système de revêtement composite est ensuite mis en place. La sous-couche des cellules 1 à 9 est constituée d'une couche d'argile recompactée à faible perméabilité de 600 mm d'épaisseur recouverte d'une (1) géomembrane en polyéthylène haute densité (PEHD) de 80 millièmes de pouce;
- Des couches de collecte des lixiviats sont aménagées, comprenant une couche de géonet, recouverte d'un géotextile, puis de tuyaux de collecte des lixiviats et d'agrégats de collecte des lixiviats (300 mm de pierres propres arrondies, recouvertes d'un géotextile, puis de 150 mm de roches concassées);
- Les cellules situées sur le côté est du site d'enfouissement nécessitent également la construction d'une station de relevage des lixiviats, afin de pomper les lixiviats vers le bassin de surpression des lixiviats existant;
- Après la construction des systèmes de collecte des lixiviats et leur raccordement aux systèmes de gestion des lixiviats existants, la cellule est prête à être mise en service et peut recevoir des déchets solides municipaux.

Une fois la cellule construite, l'élimination des déchets se fera quotidiennement lorsque la capacité des cellules précédemment actives aura été atteinte. Les déchets solides municipaux sont compactés au fur et à mesure qu'ils sont placés et recouverts régulièrement d'un matériau de couverture (agrégats) afin de réduire les odeurs, de lutter contre les animaux nuisibles et d'éviter que des débris soient emportés par le vent.

La durée de vie prévue de chaque cellule varie en fonction des quantités de déchets déposés et de la taille de la cellule. Actuellement, les cellules du site d'enfouissement sont dimensionnées et construites pour durer de trois (3) à quatre (4) années. Une fois remplie au maximum de sa capacité, la cellule est recouverte d'une couverture intermédiaire, c'est-à-dire d'une couche de matériau granulaire relativement peu perméable (généralement des emprunts excavés de l'empreinte des cellules d'enfouissement).

Et enfin, une couverture finale est installée. En règle générale, la couverture finale du site d'enfouissement de Crane Mountain se compose d'une couche d'évacuation des gaz, de couches de drainage, d'un matériau à faible perméabilité (argile ou sous-couche d'argile géosynthétique), d’un matériau de protection contre le gel et de terre végétale recouverte d’herbe et de plantes pour lutter contre l’érosion. Les plans de construction du programme de recouvrement 2022 sont présentés à l’annexe B.

Des puits de collecte des gaz d’enfouissement (GE) sont installés dans les cellules d’enfouissement, avec une capacité suffisante pour capter et utiliser tous les GE produits. La collecte des gaz d’enfouissement permet d’éviter l’émission incontrôlée de gaz fugitifs susceptibles de produire des odeurs.

Il ne sera pas nécessaire de modifier les cellules existantes ou futures pour augmenter la hauteur finale maximale des DSM. Les pentes latérales extérieures permanentes des DSM peuvent continuer à suivre l’inclinaison actuelle de 4 mètres à l’horizontale pour 1 mètre à la verticale (4H:1V). Le projet ne nécessite pas une augmentation de l’empreinte latérale des cellules d’enfouissement actives ou futures pour en augmenter la hauteur.

Des engins de chantier seront mobilisés dans l’aire du projet, selon les besoins. L’exécution du projet exigera notamment un ou plusieurs bulldozers, une ou plusieurs chargeuses frontales, un ou plusieurs camions à benne, une ou plusieurs excavatrices, un compacteur à déchets et une ou plusieurs camionnettes de chantier. Tout cet équipement est conforme à ce qui est actuellement utilisé pour la mise en place, le compactage et l’enfouissement des déchets solides municipaux. S’il est mis en œuvre, le projet ne nécessitera aucun changement dans les pratiques opérationnelles, à l’exception du placement des DSM à des hauteurs plus élevées.

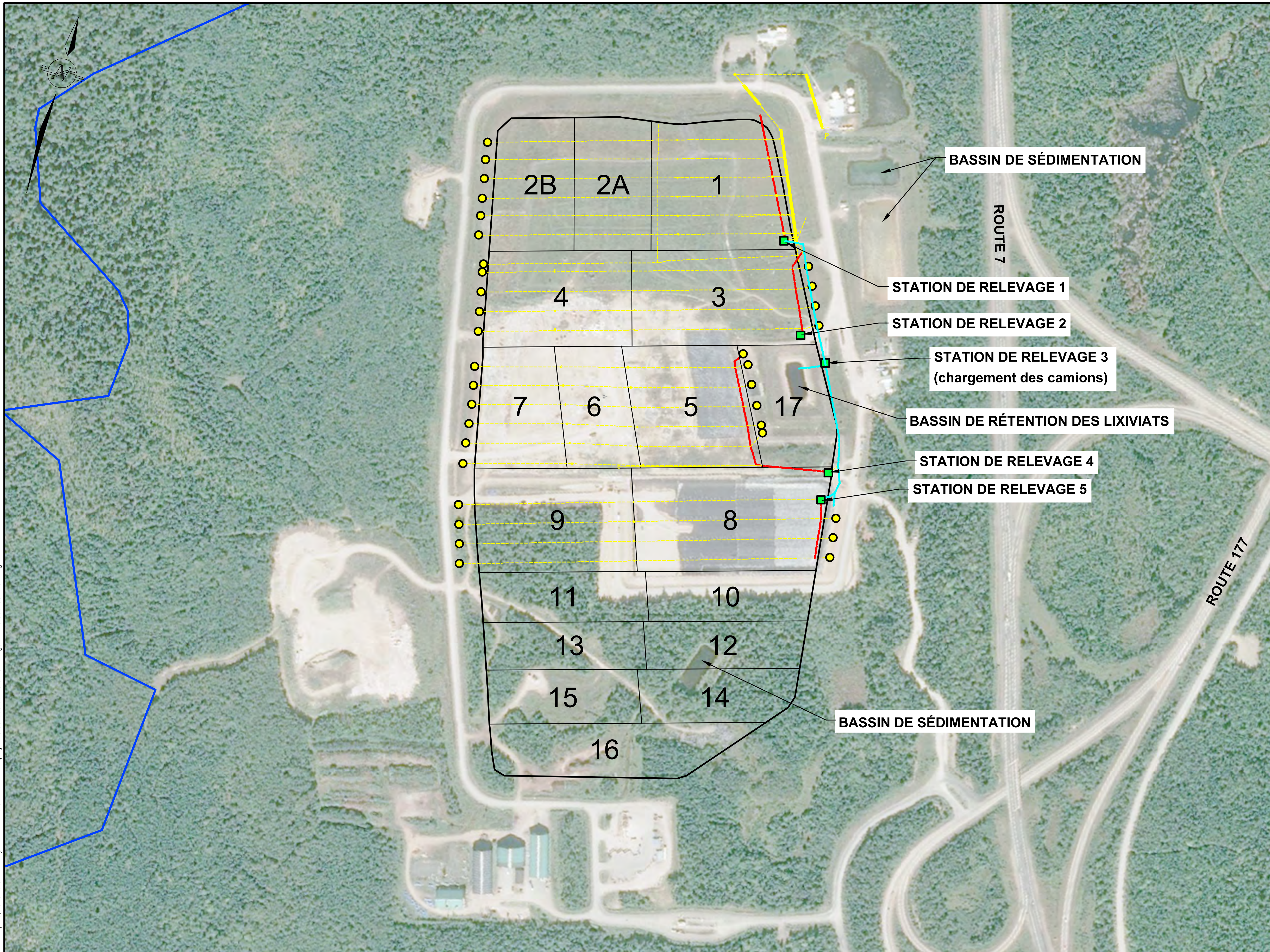
2.5.2 Collecte et traitement des lixiviats

Les lixiviats sont collectés et stockés temporairement sur le site, puis transportés par camions-citernes jusqu’à l’installation de traitement des eaux usées de Lancaster à Saint John. Les lixiviats sont récupérés par une couche de collecte des lixiviats, composée d’un treillis métallique, d’une membrane géotextile, d’une couche continue de pierres propres et arrondies et d’une série de tuyaux perforés, placés au-dessus de la sous-couche composite. Les lixiviats des cellules 2, 4, 6, 7 et 9 s’écoulent par gravité au travers de la couche et des tuyaux de collecte des lixiviats, d’ouest en est, et dans les cellules d’enfouissement adjacentes. Pour les cellules 1, 3, 5 et 8 (toutes les cellules situées le long du talus de retenue est du site d’enfouissement), un tuyau collecteur de lixiviat est installé le long du pied intérieur du talus de retenue pour diriger l’écoulement du lixiviat dans le puisard de la station de relevage de lixiviat correspondante. Les lixiviats sont pompés des cellules d’enfouissement par des stations de relevage et des conduites de refoulement en PEHD (conduites en PEHD à double paroi), puis dirigés vers le bassin de rétention des lixiviats. Les lixiviats sont temporairement stockés dans le bassin de rétention, lequel a été dimensionné pour accueillir les débits de pointe prévus sortant des cellules d’enfouissement (figure 4).

Le système existant de collecte des lixiviats répondra aux exigences du projet. Aucun volume ou stockage supplémentaire dans les bassins de lixiviation n’est jugé nécessaire. L’empreinte de la zone d’élimination active, la plus propice à l’infiltration des eaux de surface (c’est-à-dire à la production de lixiviats), restera similaire aux conditions actuellement observées sur le site.

Le poids supplémentaire résultant de l’augmentation de hauteur proposée des cellules d’enfouissement des déchets ne devrait pas compromettre les éléments existants ou déjà planifiés du système de collecte des lixiviats (section 5.5.1).

De plus, la CSRF évalue régulièrement l’état des conduites de collecte des lixiviats installées sur le site d’enfouissement au moyen d’une inspection vidéo (agrément d’exploitation, annexe A).



LÉGENDE

- RÉSEAU HYDROGRAPHIQUE (GeoNB)
- TUYAU DE COLLECTE DES LIXIVIATS
- TUYAU COLLECTEUR DE LIXIVIAT
- CONDUITE DE REFOULEMENT DES LIXIVIATS
- NETTOYAGE DES LIXIVIATS
- STATION DE RELEVAGE DES LIXIVIATS

DESSINÉ PAR	VÉRIFIÉ PAR
AGSD	MS
CALCULS RÉALISÉS PAR	VÉRIFIÉ PAR

DATE
JUIN, 2023

PROJET
ÉVALUATION D'IMPACT SUR L'ENVIRONNEMENT D'UNE AUGMENTATION DE CAPACITÉ ET DE PROLONGATION DE LA DURÉE DE VIE DU SITE D'ENFOUISSEMENT DE CRANE MOUNTAIN

ILLUSTRATION
SYSTÈME DE COLLECTE DES LIXIVIATS

ÉCHELLE
1:5000
0 100 200 300m

DOSSIER	N° D'ILLUSTRATION
100018012-04	FIGURE 4

GEMTEC
CONSULTING ENGINEERS AND SCIENTISTS

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2.5.3 Système de gestion et d'utilisation des gaz d'enfouissement

Des gaz d'enfouissement (GE) sont générés par la décomposition naturelle de la matière organique dans les sites d'enfouissement. Dans leur état naturel, les gaz d'enfouissement sont composés d'environ 60 % de méthane (CH_4, qui est également le principal composant du gaz naturel) et d'environ 40 % de dioxyde de carbone (CO_2; les deux gammes de concentration sont établies sur une base sèche) ainsi que d'un faible pourcentage de composés organiques non méthaniques (CONM) et de composés inorganiques. De plus, ces gaz sont saturés d'eau. Lorsqu'ils sont collectés, les gaz d'enfouissement présentent des concentrations plus faibles de CH_4 et de CO_2, car ils contiennent alors de l'azote (N_2) et de l'oxygène (O_2) en raison de l'intrusion de l'atmosphère dans les gaz d'enfouissement lors de leur extraction du site d'enfouissement.

En termes de potentiel de gaz à effet de serre (GES), on estime que le méthane est 28 à 36 fois plus efficace que le CO_2 pour piéger la chaleur dans l'atmosphère sur une période de 100 ans. Ces données sont basées sur le dernier rapport d'évaluation (9A5) du Groupe d'experts intergouvernemental sur l'évolution du climat (GIEC) des Nations Unies.

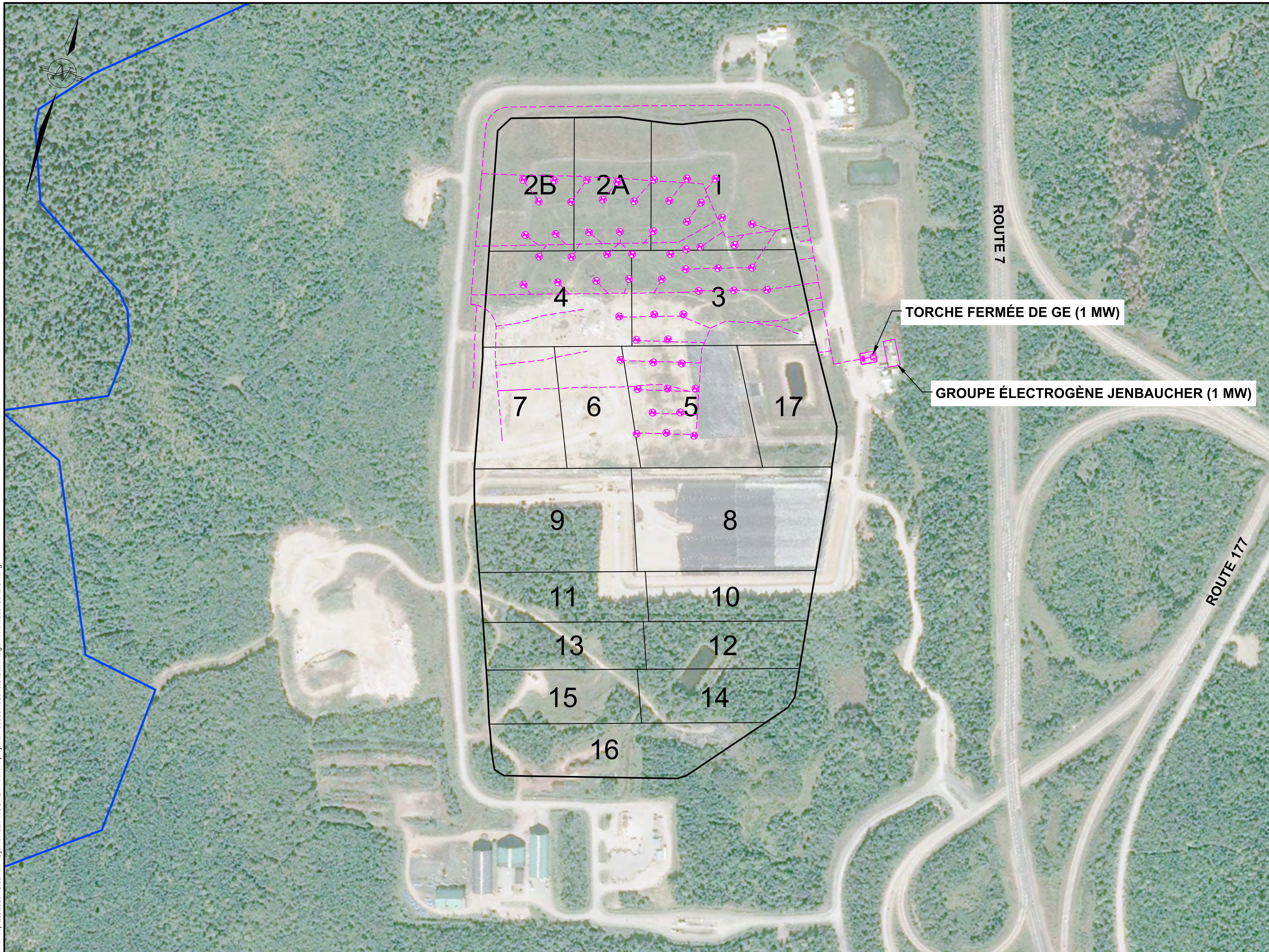
Le CSRF a mis en place un système de collecte et de contrôle des gaz d'enfouissement (SCCGE) et un système d'utilisation des gaz d'enfouissement (SUGE). Les gaz d'enfouissement sont collectés par une série de puits verticaux reliés au système de collecte des lixiviats, à des tuyaux de collecte des gaz d'enfouissement et à des équipements mécaniques (tels que des souffleurs). Le SUGE brûle les gaz d'enfouissement dans un groupe électrogène Jenbaucher de 1 MW pour produire de l'électricité. Lorsqu'il est opérationnel et fonctionne à plein rendement, le SUGE du site d'enfouissement de Crane Mountain est capable de produire environ 7 800 mégawattheures (MWh) d'énergie par an, sur la base d'un temps de fonctionnement de 90 % du groupe électrogène. L'électricité produite sur le site d'enfouissement est d'abord utilisée sur place. Les surplus d'énergie sont vendus directement à Saint John Energy pour être distribués à d'autres clients.

Le SCCGE comprend également une torchère fermée John Zinc pour brûler les gaz d'enfouissement lorsque le groupe électrogène n'est pas en service.

La collecte et la combustion contrôlée des gaz d'enfouissement permettent d'atténuer les émissions fugitives de gaz d'enfouissement et de réduire les émissions odorantes. La combustion des gaz d'enfouissement dans une torchère ou un groupe électrogène permet de convertir le CH_4 en CO_2, ce qui réduit le potentiel de gaz à effet de serre et améliore la qualité de l'air à proximité du site d'enfouissement.

La CSRF exploite le SCCGE et le SUGE conformément aux conditions de son agrément d'exploitation (annexe A). Le SCCGE peut être étendu en fonction des besoins par l'installation de nouveaux puits de collecte des gaz d'enfouissement et de nouvelles conduites. Avant 2023, le site d'enfouissement disposait de 35 collecteurs verticaux de gaz d'enfouissement (puits) et

21 autres puits verticaux ont été aménagés en mai 2023. Ces aménagements récents renforceront considérablement les capacités de collecte et de gestion des gaz d’enfouissement du site. Des gaz d’enfouissement sont également collectés au moyen d’un vide d’aspiration appliqué sur plusieurs tuyaux du système de collecte des lixiviats le long du talus de retenue ouest. La figure 5 illustre l’infrastructure et la configuration du site d’enfouissement avant l’expansion de 2023. Les plans techniques de l’agrandissement du système de gestion des gaz d’enfouissement de 2023 sont présentés à l’annexe B.



LÉGENDE

RÉSEAU HYDROGRAPHIQUE (GeoNB)

TUYAU DE COLLECTE DES GE

PUITS DE GE

DESSINÉ PAR	VÉRIFIÉ PAR
AGSD	MS
CALCULS RÉALISÉS	VÉRIFIÉ PAR

DATE
JUIN, 2023

PROJET ÉVALUATION D'IMPACT SUR L'ENVIRONNEMENT D'UNE AUGMENTATION DE CAPACITÉ ET DE PROLONGATION DE LA DURÉE DE VIE DU SITE D'ENFOUISSEMENT DE CRANE MOUNTAIN

ILLUSTRATION
PLAN GÉNÉRAL DU SYSTÈME DE GESTION DES GAZ D'ENFOUISSEMENT (SCCGE)

ÉCHELLE
1:5000
0 100 200 300m

DOSSIER	N° D'ILLUSTRATION
100018012-04	FIGURE 5

GEMTEC
Consulting Engineers and Scientists

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La société Tetra Tech (leader nord-américain en SCCGE et SUGE) a été retenue pour élaborer un nouveau « plan directeur de gestion des GE » pour le site d'enfouissement de Crane Mountain. Ce plan traitera de la manière dont le SCCGE sera agrandi au fur et à mesure que des déchets supplémentaires seront placés sur les zones du site d'enfouissement au-delà de l'altitude finale actuellement approuvée de +90 mètres (raison d'être du projet) et contiendra une stratégie de gestion des gaz d'enfouissement dans les cellules futures (cellules 10 à 17). Ce plan est en cours d'élaboration et sera soumis au MEGLNB une fois terminé, dans le cadre de la procédure d'examen de cette EIE.

2.6 Documents relatifs au projet

Une copie de l'agrément d'exploitation (I-11079, valide jusqu'au 30 novembre 2025) délivré par le MEGLNB est présentée à l'annexe A.

Il existe une EIE connue (Évaluation de l'impact sur l'environnement - Décharge régionale sur les sites de Crane Mountain ou de Paddy's Hill, 1994) enregistrée auprès du MEGLNB en 1994 pour la construction initiale et l'exploitation du site d'enfouissement (FSAWT, 1994).

Le plan de gestion environnementale du site d'enfouissement est présenté à l'annexe C (Plan de gestion environnementale de la Commission des déchets solides de la région de Fundy, Commission des déchets solides de la région de Fundy, janvier 2008).

3.0 MÉTHODOLOGIE DE L'ÉTUDE D'IMPACT SUR L'ENVIRONNEMENT

Le présent document d'EIE a été rédigé conformément aux exigences du *Règlement sur les études d'impact sur l'environnement du Nouveau-Brunswick 87-83* (tel que décrit à la section 1.0), ce qui signifie qu'on y :

- Documente les conditions existantes du site et la description du projet;
- Évalue les effets environnementaux potentiels du projet (positifs et négatifs);
- Décrit les mesures d'atténuation et de gestion des impacts négatifs prévus pour les réduire le plus possible ou pour les ramener à des niveaux acceptables.

L'EIE se concentre sur les questions directement liées à l'augmentation de hauteur des cellules d'enfouissement au-delà de l'altitude de +90 mètres actuellement imposée. Cette étude se concentre sur les composantes environnementales propres au projet, selon une méthode conforme aux exigences réglementaires des EIE du Nouveau-Brunswick. Toutefois, le projet n'entraînera pas directement une augmentation de l'empreinte du site d'enfouissement ni aucune destruction d'habitat ou suppression de végétation. De plus, le projet n'aura d'impact sur aucune zone humide ni aucun cours d'eau réglementé en dehors de l'empreinte approuvée du site d'enfouissement. Par conséquent, les évaluations se limitent généralement à des études préliminaires et à une délimitation des zones humides dans l'empreinte approuvée du site d'enfouissement.

En ce qui concerne le document d'EIE, les interactions ou répercussions potentielles du projet sur l'environnement ont été recensées et sont discutées ici. Lorsque des effets potentiels sont prévus, le document propose des méthodes pour les atténuer.

L'EIE a été réalisée en fonction de trois limites spatiales :

- L'aire du projet correspond à l'empreinte de perturbation du sol requise pour les activités du projet (parties des parcelles 55087001, 55087027, 55086987, 55043301 et 55087019) (figure 2);
- Le site est défini comme étant le site d'enfouissement situé au 10, chemin Crane Mountain, à Saint John (Nouveau-Brunswick), identifié par Services Nouveau-Brunswick (SNB) sous les numéros d'identification de parcelle 55087001, 55087027, 55087019, 55043301, 55086987, 55160352 et 55043293 (Figure 1);
- La zone d'évaluation de l'EIE englobe les récepteurs sensibles (c'est-à-dire les habitations résidentielles voisines, les zones écologiquement sensibles, etc.) situés dans un rayon raisonnable et susceptibles d'être affectés par le projet.

Les limites temporelles de l'EIE ont été complétées uniquement pour la phase opérationnelle du projet (site d'enfouissement). Aucune préparation du site (phase de construction) n'est requise pour le projet, car le site d’enfouissement existe déjà. Un plan technique de fermeture (phase de réhabilitation) du site d’enfouissement dépasse le cadre de ce projet, comme indiqué ci-dessous.

3.1 Facteurs non pris en compte dans cette EIE

Les ressources archéologiques ne sont pas abordées dans le présent document, car le projet se déroulera uniquement dans l’empreinte actuelle et approuvée d’un site d’enfouissement existant et aucune nouvelle perturbation du sol n’est requise au-delà de ce qui a été établi dans l’EIE initiale (Équipe d’action sur les déchets solides de Fundy, 1994).

Tous les effets potentiels sur l’environnement résultant de l’empreinte actuelle et future du site d’enfouissement, ainsi que de la construction, de l’exploitation et de la réhabilitation du site (fermeture technique) ont été recensés et discutés dans le document de l’EIE initiale (Équipe d’action sur les déchets solides de Fundy, 1994) et sont considérés comme hors du cadre de la présente étude. Cette EIE porte sur un projet d’augmentation de l’élévation finale du site d’enfouissement, ce qui constitue uniquement une modification des activités du site d’enfouissement qui n’augmente pas son empreinte globale.

La prolongation de la durée de vie du site d’enfouissement qui résulterait de l’autorisation de ce projet ne devrait pas avoir d’incidence sur le plan global de fermeture et de réhabilitation du site. La prolongation de la durée de vie du site d’enfouissement entraînera simplement un report des activités de réhabilitation. Le plan de fermeture devrait comprendre des activités annuelles de surveillance environnementale, d’inspection technique, d’entretien du revêtement, de gestion des lixiviats, de gestion des gaz et d’administration. En outre, le plan de fermeture devrait préciser que toutes les cellules d’enfouissement seront recouvertes conformément aux exigences du MEGLNB. Les gaz d’enfouissement constituent une source importante de gaz à effet de serre (GES), mais ils devraient être collectés et utilisés après la fermeture du site, si possible. L’infrastructure de collecte et de traitement des lixiviats sera entretenue selon les besoins. L’augmentation de la hauteur du site d’enfouissement ne devrait pas modifier les fondamentaux du plan de fermeture et de réhabilitation. Les pentes seront établies selon une déclivité finale de 4H:1V. Conformément à l’agrément d’exploitation du site d’enfouissement (I-11079), un plan de fermeture sera soumis au MEGLNB six mois avant sa fermeture.

4.0 DESCRIPTION DE L’ENVIRONNEMENT EXISTANT

4.1 Environnement atmosphérique

Afin d’évaluer les impacts potentiels du projet sur l’environnement atmosphérique, les éléments suivants ont été pris en compte :

- *Les conditions climatiques* à long terme d’une zone sont généralement influencées par la latitude, l’altitude et la proximité des océans. Les conditions climatiques sont mesurées en évaluant les schémas de température, de vent, de précipitations et d’autres paramètres météorologiques.
- *La qualité de l’air* est définie par la concentration de polluants d’origine naturelle ou anthropique dans l’atmosphère. La concentration de ces polluants atmosphériques est influencée par l’emplacement de leur source, par les processus météorologiques (c’est-à-dire, le vent, la pluie, la température de l’air) et par les conditions topographiques.
- *La qualité de l’environnement sonore* est liée au type, à la fréquence, à l’intensité et à la durée du bruit ambiant;
- *Les émissions odorantes* sont des odeurs nauséabondes observées dans l’air ambiant.

4.1.1 Conditions climatiques

Les conditions climatiques de la région sont basées sur les normales climatiques d’Environnement et Changement climatique Canada (ECCC) enregistrées à l’aéroport de Saint John, qui se trouve à environ 16 km au sud-est du site d’enfouissement. Comme il s’agit de la station de surveillance la plus près disposant de données suffisantes, les conditions climatiques mesurées sont supposées être représentatives de celles du site.

Selon ECCC, le site d’enfouissement est exposé à un climat continental humide avec des étés chauds et des hivers froids. La température annuelle moyenne dans la région est de 6,3 °C. Le mois le plus chaud est généralement le mois d’août, avec une température moyenne de 17,9 °C, tandis que le mois le plus froid est celui de janvier, avec une température moyenne de -6,1 °C. Les températures estivales peuvent dépasser les 30 °C, alors que les températures hivernales peuvent descendre en dessous de -25 °C. En été, le taux d’humidité peut atteindre environ 80 %, puis chuter à environ 60 % en hiver.

Les précipitations dans la région sont relativement bien réparties tout au long de l’année. Le mois le plus humide est généralement novembre, avec une moyenne de 142 millimètres de précipitations, tandis que le mois le plus sec est février, avec une moyenne de 79 millimètres de précipitations, pour une moyenne annuelle de 1 098 millimètres de précipitations. La région reçoit également une moyenne de 231 centimètres de neige par an, le mois le plus enneigé étant février, avec une moyenne de 60 centimètres de neige.

Dans la région, le vent souffle en moyenne à environ 17 km/h et varie généralement de 10 km/h à 30 km/h. Les vents dominants soufflent du sud-ouest en été et du nord-ouest en hiver.

4.1.2 Qualité de l'air

Selon les données sur la qualité de l'air fournies par le MEGLNB, la station de surveillance de la qualité de l'air la plus proche du MEGLNB est située à environ 10 km au sud-est du site d'enfouissement (Saint John-West Side). Cette station fournit des données en temps réel sur la qualité de l'air, indiquant les concentrations d'ozone, de particules fines ($PM_{2,5}$), de dioxyde de soufre (SO_2), de soufre réduit total et de dioxyde d'azote (NO_2). Le tableau 2 présente un résumé des mesures de la station Saint John-West Side en 2022 (Environment and Local Government, Air Quality Data Portal, 2023).

Tableau 2 Concentrations de PM2,5 et de SO2 à la station Saint John-West Side (2022)

Paramètre	Résultats		
	Minimum	Maximum	Moyenne
Ozone	0.5	52.4	26.8
Particules fines (µg/m³)	0.1	66.1	5.5
Dioxyde de soufre (ppb)	0	71.2	0.9
Soufre réduit total (ppb)	0	24.6	0.2
Dioxyde d'azote (ppb)	0	34.9	3.1
Remarque : Résultats établis le 27 avril 2023			

Le Nouveau-Brunswick a des objectifs de qualité de l'air concernant les contaminants atmosphériques réglementés en vertu du *Règlement sur la qualité de l'air* de la *Loi sur l'assainissement de l'air du Nouveau-Brunswick*. Trois des paramètres surveillés à la station de Saint John-West Side correspondent aux objectifs fixés; la moyenne sur un an (2022) pour les $PM_{2,5}$, les NO_2 et les SO_2 se situe à l'intérieur des concentrations acceptables (tableau 3).

Le site d'enfouissement est exploité dans le cadre d'un agrément d'exploitation de classe 4 du MEGLNB (I-11079, valide jusqu'au 30 novembre 2025). Le projet ne devrait pas entraîner d'émissions atmosphériques supplémentaires ou accrues dépassant la capacité du SCCGE du site d'enfouissement.

Tableau 3 Objectifs de qualité de l’air du Nouveau-Brunswick

Polluant	Moyenne par période			
	1 heure	8 heures	24 heures	1 an
Monoxyde de carbone (CO)	35 000 µg/m3 (30 ppm)	15 000 µg/m3 (13 ppm)	-	-
Sulfure d’hydrogène (H_2S)	15 µg/m3 (11 ppb)	-	5 µg/m3 (3,5 ppb)	-
Dioxyde d’azote (NO_2)	400 µg/m3 (210 ppb)	-	200 µg/m3 (105 ppb)	100 µg/m3 (52 ppb)
Dioxyde de soufre (SO_2)	900 µg/m3 (339 ppb)	-	300 µg/m3 (113 ppb)	60 µg/m3 (23 ppb)
Particules totales en suspension (PM 2,5)	-	-	120 µg/m3	70 µg/m3

Remarques :
µg/m3 = microgrammes par mètre cube
ppm = parties par million
ppb = parties par milliard

4.1.3 Qualité de l’environnement sonore

L’exploitation du site d’enfouissement entraîne une circulation d’équipements industriels et lourds, une circulation publique et des activités de déversement, d’excavation et de compactage. Les émissions sonores du site sont encadrées sous conditions dans l’agrément d’exploitation I-11079 du MEGLNB (annexe A). Aucune plainte concernant le bruit n’a été reçue par les responsables du site d’enfouissement.

Le site d’enfouissement est situé dans une zone en grande partie non urbanisée, sauf quelques propriétés résidentielles éparses à proximité (Figure 1). Bien que le site d’enfouissement soit situé à proximité d’un grand axe routier, le paysage environnant est principalement boisé, ce qui peut contribuer à atténuer les nuisances sonores dues aux activités du site.

4.1.4 Émissions odorantes

Les activités d’exploitation du site d’enfouissement comprennent la collecte et le dépôt de grandes quantités de déchets solides municipaux dans un environnement ouvert, ce qui peut générer des émissions odorantes (gaz d’enfouissement produits par la décomposition de ces matériaux). Le SCCGE capture les gaz d'enfouissement avant qu'ils ne soient rejetés dans le milieu ambiant.

Les émissions odorantes du site sont encadrées sous conditions dans l'agrément d'exploitation I-11079 du MEGLNB (annexe A). Deux plaintes relatives à des émissions odorantes ont été reçues par la CSRF en 2022. Le SCCGE n'a pas fonctionné durant toute l'année 2022 en raison de retards de livraison des pièces, ce qui a pu entraîner une augmentation des émissions fugitives de gaz d'enfouissement observées par les personnes vivant en aval. Au moment de la publication du présent rapport, le SCCGE avait été réparé et était généralement opérationnel. Des pièces de rechange ont été stockées sur place afin de réduire les risques d'arrêt du SCCGE à l'avenir. Le SCCGE est décrit dans la section 2.5.3 de la présente EIE. Le projet ne devrait pas dépasser la capacité du SCCGE.

Il convient de noter qu'Environnement et changements climatiques Canada (ECCC) a publié en 2023 un projet de cadre réglementaire pour un règlement sur les émissions de gaz d'enfouissement et de méthane provenant des sites d'enfouissement. Ce règlement et les règlements provinciaux similaires devraient s'appliquer au site d'enfouissement de Crane Mountain, ce qui signifie que la CSRF devra s'y conformer.

4.2 Eaux souterraines

Les sources d'eau souterraine peuvent être affectées par des concentrations de contaminants d'origine naturelle (comme des dépôts minéraux entourant une formation aquifère) et anthropique (notamment en cas de rejet accidentel de polluants). Il est possible que des activités liées au projet (par exemple, l'élimination des déchets, l'utilisation et le stockage de produits pétroliers, etc.) libèrent des contaminants dans les eaux souterraines qui pourraient nuire à la santé des humains et des écosystèmes.

Afin d'évaluer les impacts potentiels du projet sur les sources d'eau souterraine, trois catégories de données ont été étudiées :

- *Les données de drainage et de topographie* décrivent la géographie physique du paysage.
- *Les données géologiques et hydrogéologiques* décrivent les conditions du sol et le drainage souterrain.
- Les données des *mesures connues de qualité et de quantité des eaux souterraines* permettent d'établir des références pour la zone du projet.

4.2.1 Drainage et topographie

Le site est situé près du sommet d'une crête naturelle, le terrain étant en pente descendante vers le sud et l'est en direction du fleuve Saint-Jean. La région environnante est vallonnée et l'altitude peut varier d'environ 20 mètres au-dessus du niveau de la mer dans les zones basses près du fleuve Saint-Jean à plus de 100 mètres au-dessus du niveau de la mer sur certaines collines et crêtes avoisinantes.

En général, les eaux de ruissellement provenant des zones actives du site sont dirigées vers l'infrastructure des eaux pluviales (fossés et ponceaux) puis vers les bassins de sédimentation (figure 2). Toute eau de surface non captée par le système de collecte des eaux pluviales finit par s'écouler vers le sud dans le ruisseau Mill par les fossés de la route 7 (figure 2).

À plus grande échelle, le site est délimité à l'ouest par le lac Henderson et au nord par le ruisseau Henderson, qui draine le lac Henderson (figure 1). Le site occupe huit pour cent (8 %) de l'ensemble des aires de drainage au nord (ruisseau Henderson) et au sud (ruisseau Mill Creek).

Le substrat rocheux de la région est généralement constitué de formations sédimentaires, notamment de grès, de siltite et de schiste. Les eaux souterraines s'écoulent à travers les fractures du substrat rocheux, généralement en direction du fleuve Saint-Jean (Geological Survey of Canada, 2014)

4.2.2 Géologie et hydrogéologie

La région de Grand Bay-Westfield repose sur des roches faisant partie du groupe Meguma, composé de roches sédimentaires et volcaniques datant de l'ère paléozoïque. Le groupe Meguma comprend des grès, des schistes et des roches volcaniques qui se sont formés dans des milieux marins et terrestres. Les roches de la région de Grand Bay-Westfield sont principalement des grès et des schistes, mais on relève aussi quelques roches volcaniques interstratifiées. La topographie de la région est influencée par la géologie sous-jacente, les collines et les vallées ondulantes reflétant l'alternance des couches de grès et de schiste (Commission géologique du Canada, 2014).

Selon la carte géologique du substrat rocheux de la région de Saint John à l'échelle 1:50 000, la formation de substrat rocheux sous le site correspond à la formation de tonalite de Belmont du Néoprotérozoïque tardif au Cambrien précoce faisant partie du groupe de la suite plutonique de Golden Grove. La formation de tonalite de Belmont se compose de tonalite grise, à grain moyen, localement porphyrique, passant à l'état de granodiorite et de diorite quartzique (Johnson S.C. et coll., 2005).

En 2018, dans le cadre d'une étude lancée par Crane Mountain Enhancement Inc., (le groupe de « surveillance » du site d'enfouissement), les sociétés EXP Services Inc. et Matrix Solutions Inc. ont élaboré un modèle numérique complet d'écoulement des eaux souterraines pour le site d'enfouissement de la CSRF (annexe D). Le modèle d'écoulement des eaux souterraines visait à mieux connaître le système hydrogéologique entourant le site d'enfouissement, à aider l'exploitant à optimiser la conception et le fonctionnement du site et à fournir des informations sur les risques hydrologiques associés à l'exploitation et à la fermeture du site.

L’étude s’est concentrée sur divers éléments du modèle, notamment le réseau de drainage des eaux de surface, les puits domestiques de Grand Bay et en aval, la zone d’exfoliation du substrat rocheux supérieur, les unités hydrostratigraphiques structurales (zones de faille), l’unité hydrostratigraphique du substrat ainsi que les débits et les temps de parcours des eaux souterraines. Les principales conclusions sont présentées ci-dessous :

- L’analyse de l’écoulement pour Grand Bay et les puits domestiques n’a révélé aucune incidence prévue sur la qualité de l’eau en raison de particules libérées sous le système de revêtement du site d’enfouissement. Il a été recommandé de continuer à surveiller la qualité de l’eau des puits dans la région de Grand Bay en raison de la présence potentielle d’un réseau de fractures discrètes non détectées qui pourrait servir de voie d’écoulement préférentielle entre le site d’enfouissement et Grand Bay. La CSRF réalise chaque année des prélèvements de puits domestiques à Grand Bay dans le cadre de son agrément d’exploitation.
- Dans la zone d’exfoliation du substrat rocheux supérieur, le temps de propagation le plus rapide des contaminants vers les limites en aval était de 20 à 50 ans (le temps médian était de 200 ans).

Ces résultats indiquent que même en cas de fuite sous le site d’enfouissement, les taux d’infiltration dans les eaux souterraines sont relativement lents, ce qui laisse suffisamment de temps pour surveiller, réagir, concevoir et mettre en œuvre des mesures d’atténuation ou des programmes d’assainissement. Ces conclusions sont conformes à celles des nombreuses autres études sur les eaux souterraines réalisées par divers consultants au sujet du site d’enfouissement depuis les premières études d’implantation dans les années 1990.

4.2.3 Qualité et volume des eaux souterraines

Le système de rapports de forage en ligne du MEGLNB a été consulté pour déterminer si des puits d’extraction d’eau souterraine sont situés dans un rayon de 2 km de l’aire du projet (le rapport du foreur de puits et la carte de localisation des puits sont présentés à l’annexe D). La base de données du système de rapports de forage en ligne est gérée par le MEGLNB et contient des informations sur les puits d’eau construits depuis 1994. Le MEGLNB n’assume aucune responsabilité et ne donne aucune garantie quant à l’exhaustivité, l’exactitude ou l’actualité des données disponibles dans cette base de données. Le système de rapports de forage en ligne contenait treize (13) rapports de puits dans un rayon de 2 km autour du site d’enfouissement.

Conformément à l’agrément d’exploitation en vigueur (I-11079; annexe A), des techniciens qualifiés effectuent régulièrement des contrôles de conformité environnementale, dont les prélèvements sont analysés par un laboratoire homologué par l’Association canadienne d’accréditation des laboratoires (CALA) dans le cadre de son programme de contrôle des laboratoires d’analyses environnementales. Les échantillons saisonniers font l’objet d’analyses en laboratoire visant à mesurer divers paramètres chimiques généraux, les métaux traces et les BTEX/TPH, conformément à l'agrément d'exploitation (annexe A). De plus, des mesures de la conductivité, de l'oxygène dissous, du pH, de la température et de l'élévation des eaux souterraines sont collectées sur le terrain lors de chaque événement d'échantillonnage. Des rapports de conformité environnementale sont établis par un ingénieur conformément à la *Loi sur les professions d'ingénieur et de géoscientifique*, lesquels contiennent des commentaires sur toute menace ou tout impact potentiel sur l'environnement. Ces rapports sont soumis au MEGLNB tous les trois mois. Une copie du rapport environnemental annuel 2022 figure à l'annexe E.

D'après les résultats du rapport environnemental annuel le plus récent (2022, annexe E), rien n'indique que le site d'enfouissement ait un impact immédiat sur l'environnement, les eaux souterraines ou les eaux de surface. Des tendances à la hausse de plusieurs paramètres (alcalinité, bore, calcium, conductivité, magnésium et sulfate) ont été observées dans un puits de surveillance profond situé en aval du site d'élimination des débris de construction et de démolition. Les concentrations ne dépassent pas les normes de qualité environnementale du RBCA de l'Atlantique, mais ces paramètres peuvent indiquer la présence de déchets de construction (p. ex. cloisons sèches). Aucune tendance similaire n'a été observée dans le puits de surveillance peu profond correspondant, où ces paramètres sont restés stables au cours de la même période (2016-2022).

Une tendance à l'augmentation des concentrations de chlorure a été observée au niveau d'un puits de surveillance situé à l'extérieur du site. Des évaluations complémentaires menées en 2015-2017 ont révélé que ces impacts sont dus aux activités de salage de la route 7.

Les échantillons d'eau prélevés dans les puits du site présentent des concentrations d'arsenic supérieures aux Recommandations pour la qualité de l'eau potable au Canada (RQEPC). L'eau du site n'est pas consommée et de l'eau en bouteille est fournie pour la consommation du personnel. Selon l'Atlas de la chimie des eaux souterraines du Nouveau-Brunswick (1994-2007), il n'est pas rare que les eaux souterraines de la région de Saint John présentent des concentrations naturelles d'arsenic supérieures aux RQEPC.

GEMTEC n'a pas réalisé d'étude quantitative des eaux souterraines (c.-à-d. programme d'échantillonnage, analyse des données ou interprétation du gradient/écoulement, etc.) dans le cadre de la présente EIE, car le projet ne devrait pas affecter la qualité ou la quantité des eaux souterraines au-delà de ce qui est déjà associé au développement global du site d'enfouissement.

4.3 Environnement écologique

L'aire de projet proposée est sujette à des perturbations continues du terrain causées par les activités d'enfouissement qui ont déjà altéré et altéreront encore considérablement l'environnement naturel, la topographie, le réseau hydrographique, la végétation et la géologie de surface. L’aire du projet n’est pas à moins de 30 mètres d’une zone humide ou d’un cours d’eau réglementé à l’extérieur de la zone de confinement approuvée du site d’enfouissement.

Afin d’évaluer toute influence du projet sur l’environnement écologique, les quatre catégories d’informations suivantes ont été étudiées :

- *Les informations sur l’environnement terrestre* décrivent les conditions environnementales observées autour du site (les types d’habitats terrestres présents sur le site ont été identifiés par l’examen des images aériennes facilement accessibles, dont Google Earth et GeoNB, et selon les connaissances de l’évaluateur concernant le site et la région en général);
- *Les zones humides et les cours d’eau* abritent des écosystèmes biologiquement diversifiés comprenant une grande variété de végétaux et d’animaux sauvages :
    - *Les zones humides* sont des terres où la nappe phréatique est en surface, près de la surface ou au-dessus de la surface du sol, ou qui sont saturées d’eau pendant des périodes assez longues pour favoriser des processus humides ou aquatiques, où l’on peut notamment observer des sols hydriques, une végétation hydrophytique et divers types d’activités biologiques adaptées à un environnement humide (MEGLNB, 2021) [au Nouveau-Brunswick, les zones humides sont réglementées en vertu du *Règlement sur la modification des cours d’eau et des terres humides (90-80) - Loi sur l’assainissement de l’eau*, administré par le MEGLNB];
    - *Les cours d’eau* sont des éléments de l’environnement dont la fonction principale est le transport ou l’accumulation d’eau, ce qui peut notamment s’appliquer au lit, aux berges et aux côtés de tout canal incisé de plus de 0,5 mètre de largeur présentant un lit de roche ou de sol. L’eau/l’écoulement n’a pas besoin d’être continu et peut être absent à n’importe quel moment de l’année. L’expression peut également désigner un bassin naturel ou artificiel (MEGLNB, 2021) [au Nouveau-Brunswick, les cours d’eau sont réglementés en vertu du *Règlement sur la modification des cours d’eau et des terres humides (90-80) - Loi sur l’assainissement de l’eau*, administré par le MEGLNB];
- *La flore* comprend notamment et surtout les espèces végétales protégées en vertu de l’annexe 1 de la *Loi sur les espèces en péril (LEP)* du Canada ou en vertu de la *Loi sur les espèces en péril du Nouveau-Brunswick* (*LEPNB)*;
- *La faune et l’avifaune* comprend aux fins de cette évaluation toute espèce sauvage en péril et les oiseaux migrateurs protégés en vertu de la *Loi fédérale sur la convention concernant les oiseaux migrateurs* (*LCCOM*) [la faune en péril comprend les espèces qui ont un statut de protection en vertu de l’annexe 1 de la *LEP* fédérale ou qui sont protégées en vertu de la loi provinciale (*LEPNB*)].

Les études sur le terrain de la flore et de la faune (y compris l'avifaune) ont été exclues de l'objet de cette évaluation, car l'aire du projet est située dans une empreinte approuvée pour un site d'enfouissement.

4.3.1 Environnement terrestre

Le site d'enfouissement est situé dans l'écorégion des Appalaches, qui couvre une vaste zone de l'est de l'Amérique du Nord. Cette écorégion englobe une grande variété de milieux, notamment des montagnes, des collines, des forêts et des zones humides. Elle couvre une superficie d'environ 427 000 kilomètres carrés et se caractérise par un paysage accidenté et diversifié, avec de hauts sommets, des vallées profondes et de vastes forêts abritant une grande variété d'habitats, notamment des forêts mixtes, des forêts de feuillus, des forêts de conifères et des zones humides (Ministère des Ressources naturelles du Nouveau-Brunswick, 2007).

L'environnement terrestre dans les environs immédiats du site d'enfouissement est principalement composé de forêts mixtes, dominées par des arbres à feuilles caduques tels que l'érable, le bouleau et le chêne, ainsi que par des conifères tels que l'épinette et le sapin. Le tapis forestier se caractérise par une grande diversité d'arbustes, d'herbes et de fougères, qui fournissent nourriture et abri à une grande variété d'animaux sauvages (New Brunswick Department of Natural Resources, 2007).

D'une superficie d'environ 24 hectares, le terrain est utilisé pour exploiter un site d'enfouissement opérationnel comprenant : des cellules d'enfouissement fermées et actives (photo 1), des stations de relevage des lixiviats, un bassin de rétention des lixiviats, des bassins de sédimentation, un site d'élimination des déchets de construction et de démolition, un dépôt public, des installations de recyclage, des installations de compostage, un dépôt de déchets ménagers dangereux, un bâtiment administratif, un SUGE comprenant un groupe électrogène, une torchère fermée pour les gaz d'enfouissement et des voies d'accès. Le périmètre du site est en grande partie constitué d'espaces non aménagés, de végétation, de zones humides et de cours d'eau (GeoNB, 2023).

La couverture finale recouvrant les cellules d'enfouissement du site se compose d'une couche d'évacuation des gaz, de couches de drainage, d'un matériau à faible perméabilité (argile ou sous-couche d'argile géosynthétique), d'un matériau de protection contre le gel et de terre végétale recouverte d'herbe pour lutter contre l'érosion. La couverture finale est en pente légère pour favoriser le drainage tout en réduisant au minimum l'érosion et l'infiltration (photo 2). Les plans de construction du programme de recouvrement 2022 sont présentés à l'annexe B.

4.3.2 Aires écologiques significatives (AES)

Une demande de données a été soumise au Centre de données sur la conservation du Canada atlantique (CDC CA) pour un rayon de 5 km autour du site. Le rapport du CDC CA contient des informations (dont l'emplacement) sur les aires naturelles significatives ou gérées situées dans ce rayon. Une aire gérée (AG) est un espace doté d'un certain niveau de protection de la faune et de la flore à l'intérieur de limites établies. Les aires écologiques significatives (AES) sont des espaces qui peuvent ou non bénéficier d'une protection juridique. Le rapport du CDC CA est présenté à l'annexe D.

Le rapport du CDC CA recense trois (3) aires gérées dans un rayon de 5 km autour du site, mais aucune AES dans ce même rayon (CDC CA, 2023, annexe D) :

- L'aire naturelle protégée Loch Alva est une AG de classe II située à environ 400 mètres à l'ouest de l'aire du projet et a une superficie d'environ 22 000 hectares. Cette AG est officiellement protégée par le ministère des Ressources naturelles et du Développement énergétique du Nouveau-Brunswick (MRNDE) en vertu de la *Loi sur le poisson et la faune du Nouveau-Brunswick*.
- La réserve naturelle de Blueberry Hill est située à environ 4 km au nord-est de l'aire du projet et s'étend sur environ 50 hectares. Cette AG est une zone écologiquement sensible longeant la rive du fleuve Saint-Jean. Le terrain a été acheté au gouvernement du Nouveau-Brunswick en 2010 par la Fondation pour la protection des sites naturels du Nouveau-Brunswick. L'accès au terrain se fait par la promenade River Valley à l'angle de la rue Station à Grand Bay-Westfield. Cette AG est gérée par un groupe de bénévoles, constitué en 2009 sous le nom de Friends of Blueberry Hill. Elle a été officiellement inaugurée le 14 juin 2014.
- La réserve naturelle de l'habitat Noremac est située à environ 2 km au sud-est de l'aire du projet et s'étend sur une superficie d'environ 8 hectares. Cette AG a été donnée à la Fondation pour la protection des sites naturels du Nouveau-Brunswick en 2019 par Marion Cameron.

Aucune réserve nationale faunique, aucun refuge d'oiseaux migrateurs, ni aucun site Ramsar ne sont situés dans la zone d'évaluation (Réseau des aires protégées d'Environnement Canada, 2022; Service d'information sur les sites Ramsar, 2022; aires naturelles protégées du MRNENB, 2022).

Photo 1 : Vue des cellules d'enfouissement recouvertes et actives (2023).

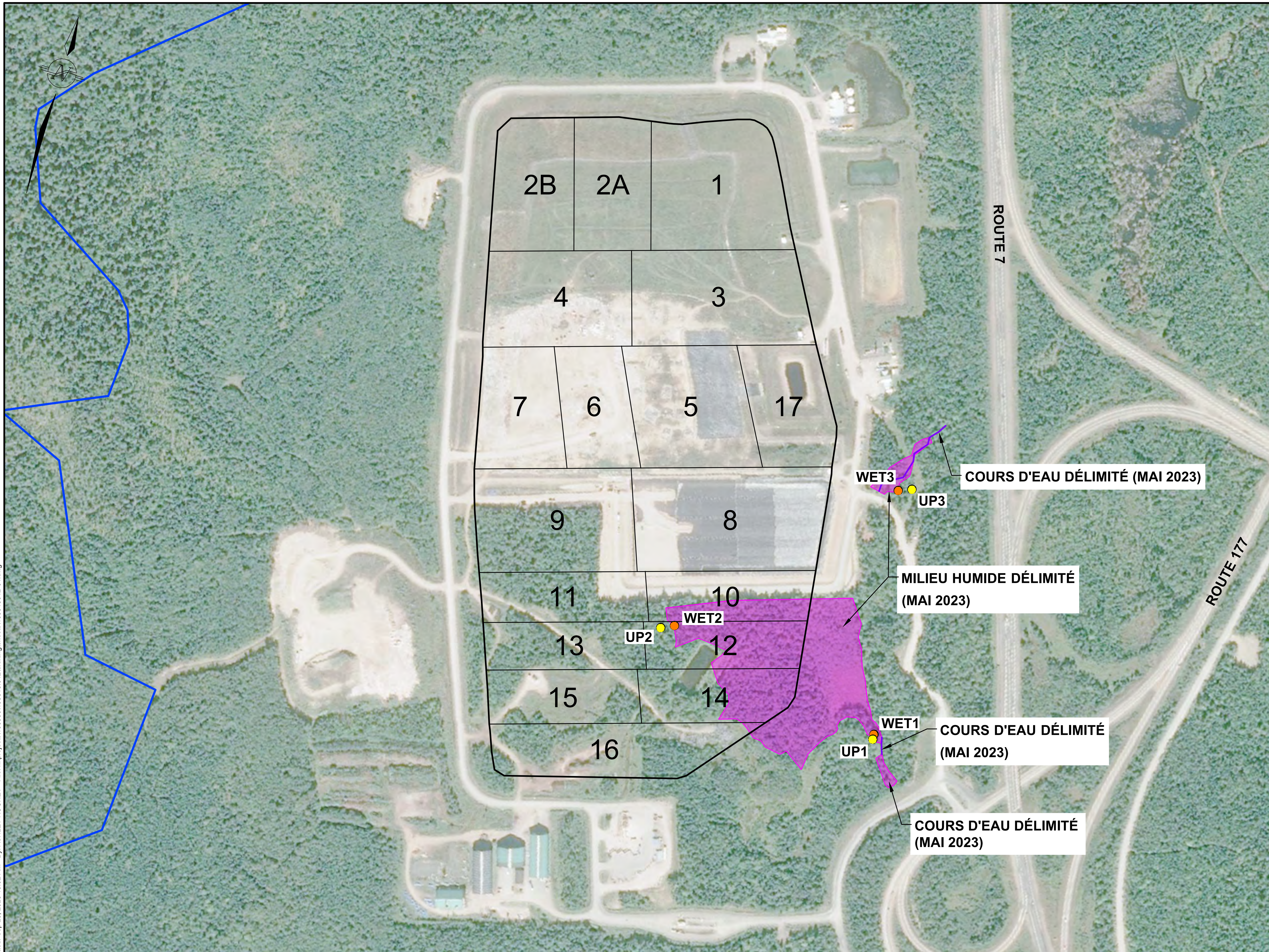
Photo 2 : Vue des cellules d'enfouissement revêtues d'une couverture finale (2023).

4.3.3 Terres humides et cours d’eau

D’après les relevés cartographiques de GeoNB, le cours d’eau le plus proche, le ruisseau Mill, est situé à environ 500 mètres au sud de l’aire du projet (figure 2; relevés cartographiques de GeoNB, annexe D). Le ruisseau Mill coule généralement au sud-est du site et finit par se jeter dans le fleuve Saint-Jean, à 4,5 km au nord-est du site.

Des biologistes mandatés par GEMTEC se sont rendus sur place le 17 mai 2023 pour délimiter la zone humide dans l’aire du projet. Pour délimiter la zone humide, les évaluateurs ont utilisé le protocole de la Direction de la gestion des eaux de source et de surface du MEGLNB pour la délimitation des zones humides au Nouveau-Brunswick, ainsi que les normes industrielles acceptées décrites dans le *Corps of Engineers Wetlands Delineation Manual – Technical Report Y-87-1*, U.S. Army Corps of Engineers (1987) et dans le *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Northcentral and Northeast Region*, U.S. Army Corps of Engineers (2012). Ils ont notamment recensé les végétations hydrophytes dominantes, les sols hydriques et tous les indicateurs hydrologiques tels que les eaux de surface, la saturation des sols, les schémas de drainage, etc. Un point de données apparié (milieu humide et milieu sec) a été enregistré pour chaque type de milieu humide rencontré afin de montrer les trois déterminations de paramètres. Un GPS portable a été utilisé pour saisir les coordonnées des limites des milieux humides et des points de données.

Un complexe humide a été mesuré à l’intérieur de l’empreinte approuvée du site d’enfouissement, lequel s’étend vers l’est sur le site. Dans l’aire du projet, une zone humide boisée est occupée principalement par des cèdres de l’Est (*Thuja occidentalis*), des sapins baumiers (*Abies balsamea*) et des trientales boréales (*Trientalis borealis*), poussant sur des sols saturés d’épipédon histique. Les limites des milieux humides circonscrits sont indiquées sur la figure 6. Les deux milieux sont reliés par un fossé de drainage des eaux pluviales pourvu d’un ponceau et sont hydrologiquement connectés. Le tableau 4 détaille les caractéristiques des milieux humides et secs à chaque point de données. Les caractéristiques générales des milieux humides sont illustrées dans les photos 3 et 4.



LEGEND

- RÉSEAU HYDROGRAPHIQUE (GeoNB)
- EMPLACEMENT D'ÉCHANTILLON (ZONE HUMIDE)
- EMPLACEMENT D'ÉCHANTILLON (ZONE SÈCHE)
- MILIEU HUMIDE DÉLIMITÉ (MAI 2023)
- COURS D'EAU DÉLIMITÉ (MAI 2023)

DESSINÉ PAR AGSD	VÉRIFIÉ PAR MS
CALCULS RÉALISÉS PAR	VÉRIFIÉ PAR
DATE JUIN, 2023	
PROJET ÉVALUATION D'IMPACT SUR L'ENVIRONNEMENT D'UNE AUGMENTATION DE CAPACITÉ ET DE PROLONGATION DE LA DURÉE DE VIE DU SITE D'ENFOUISSEMENT DE CRANE MOUNTAIN	
ILLUSTRATION MILIEU HUMIDE DÉLIMITÉ	
ÉCHELLE 1:5000 (0 100 200 300m)	
DOSSIER 100018012-04	N° D'ILLUSTRATION FIGURE 6

GEMTEC
CONSULTING ENGINEERS AND SCIENTISTS

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Tableau 4 Limites des milieux humides et résumé des observations dans ces milieux

Type de milieu humide	Description générale	Espèces végétales dominantes	Caractéristiques hydrologiques	Types de sols
Humide 1	• Étang à ciel ouvert. • Caractérisé par la présence d'un apport d'eau de surface provenant d'une infrastructure d'eaux pluviales adjacente.	• *Betula papyrifera* • *Betula populifolia* • *Onoclea sensibilis* • *Osmunda cinnamomea* • *Athyrium sp.* • *Equisetum sp.*	• Eau de surface (A1) • Saturation (A3) • Feuilles tachées d'eau (B9) • Nappe aquifère à 2 cm	Matrice appauvrie (F3)
Sec 1	• Remblai abrupt jouxtant une zone humide d'eau libre.	• *Populus trumula* • *Betula papyrifera* • *Lonicera* sp.	• Aucune	• Organique de 0 à 1 cm. • Particules de limon sablonneux de 1 à 30 cm.
Humide 2	• Milieu humide boisé.	• *Thuja occidentalis* • *Abies balsamea* • *Trientalis borealis*	• Eau de surface (A1) • Saturation (A3) • Eau d'une profondeur de 25 cm	Épipédon histique (A2)
Sec 2	• Zone boisée adjacente à une voie d'accès.	• *Betula papyrifera* • *Betula alleghaniensis* • *Abies balsamea* • *Trientalis borealis*	• Aucune	• Principalement organique de 0 à 10 cm. • Particules sablonneuses de 10 à 25 cm
Humide 3	• Milieu humide boisé. • Situé en aval de l'aire du projet, le long d'un cours d'eau s'écoulant vers l'emprise de l'autoroute 2.	• *Thuja occidentalis* • *Abies balsamea*	• Eau de surface (A1) • Saturation (A3) • Bordures en mousse (B16) • Plantes rabougries ou stressées (D1)	Épipédon histique (A2)
Sec 3	• Cet espace a déjà été perturbé; il est contigu à une ancienne voie d'accès à proximité.	• *Betula alleghaniensis* • *Amelanchier canadensis* • *Trientalis borealis* • *Solidago* sp.	• Aucune	• Organique de 0 à 3 cm. • Particules de sable limoneux de 3 à 10 cm • Organique de 10 à 30 cm. • Particules de sable limoneux de 15 à 25 cm

Photo 3 : Vue de milieu humide avec eau libre (17 mai 2023).

Photo 4 : Vue de milieu humide boisé (17 mai 2023).

4.3.4 Flore

Le rapport du CDC CA relève une (1) espèce végétale en péril selon l'annexe 1 de la *LEP* fédérale ou protégée en vertu de la loi provinciale (*LEPNB*)] (tableau 5).

Tableau 5 Résumé des espèces végétales en péril dans un rayon de 5 km du site

Nom scientifique	Nom commun	COSEPAC[1]	LEP[2]	Protection juridique provinciale	Classement S[3]	Statut général MRNDENB[4]	Habitat préféré
Symphyotrichum anticostense	Aster d'Anticosti	Espèce préoccupante	Espèce préoccupante	En voie de disparition	S3	Vulnérable	Zones humides, rocailleuses et ombragées dans des boisés de conifères, ainsi que le long des ruisseaux et des rivières.

Remarques :

1. Comité sur la situation des espèces en péril au Canada
2. *Loi sur les espèces en péril*
3. Classement sous-national (provincial)
4. Statut général d'espèce sauvage du MRNDENB

L'aster d'Anticosti (*Symphyotrichum anticostense*) est inscrit sur la liste des espèces menacées au titre de la *LEP* et sur la liste des espèces en voie de disparition au titre de la protection juridique provinciale au Nouveau-Brunswick. Cette espèce pousse principalement dans les falaises et les corniches calcaires près de la côte. L'aster d'Anticosti fait partie des espèces en voie de disparition au Nouveau-Brunswick en raison de plusieurs menaces, notamment la perte et la dégradation de l'habitat causées par le développement côtier et l'exploitation de carrières. Cette espèce est également menacée par des végétaux envahissants et par le surpâturage du bétail. L'aster d'Anticosti est rare et pousse seulement dans quelques endroits de l'est du Canada. La taille et la répartition de sa population sont mal connues, mais on estime qu'il existe moins de 10 000 individus dans le monde (Environment and Natural Resource, 2023) Aucune étude de la flore vasculaire rare n'a été réalisée dans le cadre de ce projet.

4.3.5 Faune et habitat faunique

Le rapport du CDC CA relève sept (7) espèces fauniques en péril selon l'annexe 1 de la *LEP fédérale ou* protégée en vertu de la loi provinciale (*LEPNB)*] (tableau 6).

Tableau 6 Résumé des espèces fauniques en péril dans un rayon de 5 km du site

Nom scientifique	Nom commun	COSEPAC[1]	LEP[2]	Protection juridique provinciale	Classement S[3]	Statut général MRNDENB[4]	Habitat préféré
Hylocichla mustelina	Grive des bois	Espèce menacée	Espèce menacée	Espèce menacée	S1S2B	Gravement en péril	Forêt mature avec un tapis dense d'arbustes et de feuilles mortes.
Hirundo rustica	Hirondelle rustique	Espèce préoccupante	Espèce menacée	Espèce menacée	S2B	En péril	Habitats ouverts (champs, prairies, terres agricoles) ayant des accès à des plans d'eau pour se nourrir.
Contopus virens	Pioui de l'Est	Espèce préoccupante	Espèce préoccupante	Espèce préoccupante	S3B	Vulnérable	Se reproduit dans les forêts de feuillus et les forêts mixtes, avec une préférence pour les lisières de forêts, les clairières et les jeunes forêts de deuxième génération.
Contopus cooperi	Moucherolle à côtés olive	Espèce préoccupante	Espèce menacée	Espèce menacée	S3B	Vulnérable	Habite les forêts subalpines et les forêts de conifères de haute altitude; préfère les forêts matures riches en chicots pour se percher et en clairières pour se nourrir.
Coccothraustes vespertinus	Gros-bec errant	Espèce préoccupante	Espèce préoccupante	-	S3B, S3S4N, SUM	Vulnérable	Habite les forêts de conifères et les forêts mixtes, avec une préférence pour les forêts matures ayant une variété d'espèces d'arbres et de graines pour se nourrir.
Cardellina canadensis	Paruline du Canada	Espèce préoccupante	Espèce menacée	Espèce menacée	S3S4B	Vulnérable	Se reproduit dans les forêts humides de feuillus et les forêts mixtes, avec une préférence pour les zones humides boisées et les zones arbustives avec un tapis végétal dense.
Danaus plexippus	Monarque	En voie de disparition	Espèce préoccupante	Espèce préoccupante	S2S3B	En péril	Vit dans une grande variété d'habitats (prairies, champs, jardins et forêts claires), mais préfère les zones où poussent des asclépiades pour se nourrir et pondre.

Remarques :

1. Comité sur la situation des espèces en péril au Canada
2. *Loi sur les espèces en péril*
3. Classement sous-national (provincial)
4. Statut général d'espèce sauvage du MRNDENB

La grive des bois est un oiseau de taille moyenne qui migre depuis les régions néotropicales. Sa population a connu un déclin marqué à long et à court terme en raison de la perte et de la fragmentation de son habitat sur ses lieux de reproduction et d'hivernage, ainsi que des taux élevés de prédation des nids et de parasitisme des vachers. La population canadienne est estimée entre 260 000 et 665 000 individus matures [Environnement et Ressources naturelles, « Grive des bois (Hylocichla mustelina) : évaluation et rapport de situation du COSEPAC » (2012)].

L'hirondelle rustique est un passereau de taille moyenne dont les parties supérieures sont bleu métallique, les parties inférieures couleur cannelle et la gorge et le front bruns. Malgré un déclin démographique important en Amérique du Nord depuis plus de deux décennies, la population canadienne est restée largement stable au cours de la dernière décennie, grâce à une augmentation substantielle en Saskatchewan qui compense les déclins en cours dans les autres provinces. Les principales menaces sont le déclin des populations d'insectes proies, les fortes fluctuations de température pendant la migration et la reproduction ainsi que la diminution des sites de nidification appropriés. La population canadienne est estimée à environ 6,4 millions d'individus matures (Environment and Natural Resources, Barn Swallow (Hirundo rustica): COSEWIC assessment and status report 2021, 2023).

Le pioui de l'Est est un petit oiseau forestier faisant partie des oiseaux chanteurs les plus communs et les plus répandus dans les forêts de l'Est de l'Amérique du Nord. Bien que ces oiseaux puissent résister à de nombreux types de modifications de leur habitat, ils ont connu un déclin persistant au cours des 40 dernières années au Canada et aux États-Unis, avec un taux de déclin sur 10 ans approchant les critères de la catégorie « menacée ». Les causes de ce déclin ne sont pas entièrement connues, mais elles pourraient être liées à la perte ou à la dégradation de l'habitat dans ses zones d'hivernage en Amérique du Sud ou à des variations de disponibilité des insectes dont il se nourrit. La population canadienne est estimée à environ 217 500 couples reproducteurs ou 435 000 individus matures (Environment and Natural Resources, Eastern wood-pewee (Contopus virens): COSEWIC assessment and status report 2012, 2023).

Le moucherolle à côtés olive est un oiseau chanteur de taille moyenne dont la population canadienne connaît un déclin substantiel prolongé, bien que cette diminution se soit ralentie au cours de la dernière décennie. Cette espèce est surtout menacée par la perte de son habitat d'hivernage dans le nord de l'Amérique du Sud, mais elle peut aussi être affectée par des transformations de ses aires de reproduction (modification du régime des incendies, changements climatiques, etc.). La population canadienne est menacée en raison de menaces persistantes que les changements climatiques risquent d'aggraver (Environment and Natural Resources, Olive-sided Flycatcher (Contopus cooperi): COSEWIC assessment and status report 2018, 2023).

Le gros-bec errant est un oiseau chanteur trapu aux couleurs vives que l’on trouve dans toutes les forêts du Canada, mais il a connu d’importants déclins prolongés dans la majeure partie de son aire de répartition depuis 1970 et certaines données suggèrent un déclin récent de près de 40 %. Cette espèce est notamment menacée par la réduction de la disponibilité des forêts mixtes et de conifères matures et anciens, par les collisions avec les vitres et par l’ingestion de gravillons et de sel le long des routes en hiver. La population canadienne est estimée à environ 2 200 000 individus matures (Environment and Natural Resources, Evening grosbeak (Coccothraustes vespertinus): COSEWIC assessment and status report 2016, 2023).

La paruline du Canada est un petit oiseau chanteur qui se reproduit au Canada et hiverne dans le nord de la cordillère des Andes. Le déclin prolongé de la population canadienne s’est ralenti depuis 2003, au point où sa population n’a cessé d’augmenter depuis 2012, avec une croissance globale de 46 % au cours de la dernière décennie. Des menaces importantes persistent cependant, notamment le défrichement des forêts en Amérique du Sud pour l’agriculture. La population canadienne est estimée entre 2 et 10,4 millions d’individus (Environment and Natural Resources, Canada Warbler (Cardellina canadensis): COSEWIC assessment and status report 2020, 2023).

Le monarque est un grand papillon orange et noir, très voyant, dont la population se chiffre à plusieurs millions, voire plus d’un milliard d’individus. L’étape la plus sensible de son cycle annuel est l’hivernage et l’exploitation des forêts de sapins d’Oyamel dans le centre du Mexique, où 90 % de la population passe l’hiver, pourrait faire que l’espèce devienne prochainement menacée (Environment and Natural Resources, Monarch (Danaus plexippus): COSEWIC assessment and status report 2016, 2023).

Aucune étude des oiseaux (p. ex., comptage de points) n’a été effectuée dans le cadre de cette évaluation.

Selon le rapport du CDC CA, quatre (4) espèces « sensibles à l’emplacement » vivent également dans un rayon de 5 km autour du site (tableau 7).

Tableau 7 Espèces fauniques sensibles à l’emplacement présentes dans l’aire du projet

<table>
<tr><th>Nom scientifique</th><th>Nom commun</th><th>COSEPAC[1]</th><th>LEP[2]</th><th>Protection juridique provinciale</th><th>Habitat préféré</th></tr>
<tr><td>Chrysemys picta picta</td><td>Tortue peinte de l’Est</td><td>Espèce préoccupante</td><td>Espèce préoccupante</td><td>-</td><td>Zones humides peu profondes et bien végétalisées (marécages, marais, étangs, fens, tourbières et bras morts) et plans d’eau (lacs, rivières et ruisseaux) dotés de nombreux sites de repos et d’un substrat organique.</td></tr>
<tr><td>Glyptemys insculpta</td><td>Tortue des bois</td><td>Espèce menacée</td><td>Espèce menacée</td><td>Espèce menacée</td><td>Rivières et ruisseaux sinueux ayant un courant modéré et des substrats de sable ou de gravier.</td></tr>
<tr><td>Haliaeetus leucocephalus</td><td>Aigle à tête blanche</td><td>Non en péril</td><td>-</td><td>En voie de disparition</td><td>Les habitats humides tels que les côtes maritimes, les rivières, les grands lacs ou marais ou d’autres grandes étendues d’eau libre riches en poissons.</td></tr>
<tr><td>Myotis lucifugus</td><td>Petite chauve-souris brune</td><td rowspan="3">En voie de disparition</td><td rowspan="3">En voie de disparition</td><td rowspan="3">En voie de disparition</td><td rowspan="3">Hibernacles froids et humides (grottes/mines).</td></tr>
<tr><td>Myotis septentrionalis</td><td>Vespertilion à longues oreilles</td></tr>
<tr><td>Perimyotis subflavus</td><td>Pipistrelle de l’Est</td></tr>
</table>

Remarques :
1. Comité sur la situation des espèces en péril au Canada
2. Loi sur les espèces en péril

La tortue peinte de l’Est est confrontée à plusieurs menaces permanentes qui ne semblent pas vouloir diminuer, telles que la dégradation et la perte d’habitat, la mortalité routière, les espèces envahissantes et les prédateurs favorisés par l’activité humaine. En raison de son cycle biologique « lent », caractérisé par une maturation tardive, une longue durée de vie et un long temps de génération, cette espèce est vulnérable à ces menaces face auxquelles elle dispose d’une résilience limitée (Environment and Natural Resources, Midland and Eastern Painted Turtle (Chrysemys picta marginata): COSEWIC assessment and status report 2018, 2023)

La tortue des bois est en déclin dans la majeure partie de son aire de répartition. Ses sous-populations sont petites et de plus en plus disjointes, séparées par des distances supérieures à la capacité de dispersion de l'espèce. Elle a besoin d'habitats aquatiques et terrestres, mais étant plus terrestre que les autres tortues d'eau douce, elle est vulnérable aux accidents de la route, aux pratiques d'utilisation des sols et à la collecte pour le commerce des animaux de compagnie. En raison de son cycle biologique « lent », caractérisé par une maturation tardive et une longévité extrême, le taux de survie des adultes doit être extrêmement élevé pour maintenir des populations stables. L'espèce serait rapidement menacée de déstabilisation et de non-durabilité en cas d'augmentation chronique de la mortalité des adultes ou des juvéniles ou d'événements catastrophiques de mortalité des adultes. L'exposition accrue à la circulation sur les routes asphaltées et de gravier, les activités agricoles, l'expansion des populations de prédateurs subventionnés et l'évolution des régimes de précipitations dans les bassins versants augmentent la mortalité et mettent en péril plusieurs sous-populations. La taille totale estimée de la population de tortue des bois au Canada est de 13 650 à 31 790 adultes, selon des estimations de précision variables de chercheurs pour l'ensemble de son aire de répartition au Canada (Environment and Natural Resources, Wood Turtle (Glyptemys insculpta): COSEWIC assessment and status report 2018, 2023).

L'aigle à tête blanche est peu commun, mais présent presque partout au Canada, principalement sur la côte ouest. La menace actuelle la plus importante pour l'espèce est l'aménagement humain des côtes et des littoraux, qui modifie et perturbe les principaux habitats de nidification, d'alimentation et de repos. La population canadienne est estimée entre 50 000 et 500 000 individus matures (Government of Canada, 2023)

La petite chauve-souris brune, le vespertilion à longues oreilles et la pipistrelle de l'Est sont de petites espèces insectivores à pelage brun de la famille des *Vespertilionidae*. La petite chauve-souris brune est probablement l'espèce de chauve-souris la plus répandue au Canada. Les inquiétudes du public concernant les zoonoses (telles que la rage et l'histoplasmose), le bruit et l'hygiène ont conduit à l'extermination périodique de nombreuses colonies de maternité et à l'élimination de leurs perchoirs. Les chauves-souris sont des prédateurs d'insectes, dont certains sont nuisibles dans l'agriculture et la sylviculture, et fournissent un service écologique essentiel. Les trois espèces ont été inscrites d'urgence sur la liste des espèces en voie de disparition de l'annexe 1 de la LEP en 2014 en raison des déclins soudains et spectaculaires dans les parties orientales des aires de répartition de la petite chauve-souris brune et de la chauve-souris nordique ainsi que dans l'ensemble de l'aire de répartition canadienne de la pipistrelle de l'Est (Environment and Natural Resources, Little Brown Myotis (Myotis lucifugus), the Northern Myotis (Myotis septentrionalis), and the Tri-colored Bat (Perimyotis subflavus): recovery strategy 2018, 2023).

4.4 Environnement culturel

Aucun parc national ou provincial n'est situé dans un rayon de 5 km du site. Il n'y a pas d'aires patrimoniales reconnues par les autorités fédérales, provinciales ou locales dans un rayon de 5 km autour du site.

Les communautés des Premières Nations les plus proches du site sont les suivantes :

- Première Nation de Bilijk (Kingsclear), située à environ 85 km au nord-ouest du site et à environ 20 km à l'ouest de Fredericton. Cette communauté d'environ 1 300 personnes vit dans un village qui occupe une superficie de 3,4 kilomètres carrés. La Première Nation Kingsclear possède un solide patrimoine culturel et offre une gamme de services aux membres de sa communauté, notamment en matière de soins de santé, d'éducation et de services sociaux.
- La Première Nation d'Oromocto (Welamukotuk) est établie à Oromocto, à environ 70 km au nord-est du site. Cette communauté d'environ 2 100 personnes vit dans un village qui occupe une superficie de 5,1 kilomètres carrés. La Première Nation d'Oromocto met fortement l'accent sur le développement économique, de sorte qu'on y a lancé plusieurs entreprises et initiatives visant à créer des emplois pour les membres de la communauté.
- La Première Nation de Saint Mary's (Sitansisk) est établie à Fredericton, à environ 85 km au nord-ouest du site. Cette communauté d'environ 2 000 personnes vit dans un village qui occupe une superficie de 3,9 kilomètres carrés. La Première Nation de Saint Mary possède un riche patrimoine culturel et offre de nombreux programmes et services aux membres de sa communauté, notamment dans les domaines de l'éducation, de la santé et des services sociaux. Cette communauté met fortement l'accent sur le développement économique. On y recense plusieurs entreprises et initiatives visant à créer des emplois.
- La réserve indienne Brother's numéro 18 est située à environ 6,5 km à l'est du site du projet. Elle occupe trois îles à la convergence du fleuve Saint-Jean et de la rivière Kennebecasis, près de Ragged Point, à Saint John. La réserve indienne Brother's est affiliée à la Première Nation de Kingsclear, à la Première Nation malécite du Madawaska, aux Premières Nations de Tobique et à la Première Nation de Woodstock.

4.5 Environnement socioéconomique

Les trois catégories d'informations environnementales suivantes ont été sélectionnées pour évaluer l'influence éventuelle du projet sur l'utilisation du territoire et sur l'économie locale :

- *Les informations sur l'utilisation actuelle du territoire* décrivent les installations résidentielles, industrielles et commerciales actuelles à proximité du projet, ainsi que la compatibilité du projet avec l'utilisation du sol;
- *Les informations de paysage visuel* mesurent l'impact possible du projet sur les panoramas locaux environnants à partir de divers points de vue accessibles au public;
- *Les informations sur l'économie locale et la structure socioéconomique* décrivent le contexte économique de la région.

4.5.1 Utilisation actuelle du territoire

Le site est implanté dans une zone rurale du comté de Saint John, à l'intérieur des limites de la municipalité de Saint John, plus précisément dans sa partie nord-ouest, à environ 15 km du centre-ville. Le site d'enfouissement dessert les municipalités de la région de Fundy, notamment Saint John, Rothesay, Quispamsis, Grand Bay-Westfield, Fundy-St. Martins et le district rural de Fundy. Il est exploité conformément à l'agrément d'exploitation I-11079 (valable jusqu'au 30 novembre 2025) délivrée à la CSRF par le MEGLNB (annexe A). On y accepte divers types de déchets, notamment les déchets solides municipaux (DSM), les débris de construction et de démolition, les déchets industriels et les déchets dangereux. Les déchets sont déposés dans des cellules qui sont recouvertes d'un système de revêtement composite afin d'éviter toute contamination du milieu environnant. Outre les déchets, le site d'enfouissement accepte et traite également une variété de matériaux recyclables et de matières organiques triées.

Les terrains environnants sont généralement des terres publiques boisées et des terrains occupés par des résidences rurales (Figure 1). Le tableau 8 présente un résumé de toutes les parcelles (NID) adjacentes et des classifications de zonage correspondantes de la municipalité de Saint John (Service New Brunswick, 2023)

Tableau 8 Utilisation actuelle des parcelles adjacentes

Emplacement par rapport au site	NID	Zonage
Nord	55087043	Rural (RU)
Ouest	00419481	Rural (RU)
	55230551	Rural (RU)
Sud-ouest	00289587	Rural (RU)
Sud	55043277	Rural (RU)
Est/sud-ouest	55230163	Rural (RU)
	55220289	Rural (RU)
Nord-est	55230155	Rural (RU)

Tous les terrains adjacents au site sont zonés pour un usage rural (ou RU). Le plan municipal de la Ville de Saint John (PlanSJ) mentionne que les terrains zonés RU accueillent généralement des activités liées aux ressources naturelles, telles que l'agriculture, la pêche et la sylviculture, ainsi que d'autres activités foncières adaptées au secteur. La construction de résidences est autorisée, mais de manière très limitée et ne doit pas interférer avec les activités liées aux ressources naturelles (PlanSJ, 2023).

Le Secrétariat du Conseil du Trésor du Canada tient un inventaire des sites contaminés fédéraux. Cet inventaire a été examiné, conjointement avec le système SNB Planet, afin de déterminer l'étendue des sites commerciaux et industriels actuels ou anciens qui jouxtent le site. Ni le site ni les terrains adjacents ne sont répertoriés comme des sites contaminés fédéraux. L'annexe D présente la cartographie des sites contaminés fédéraux par rapport au site.

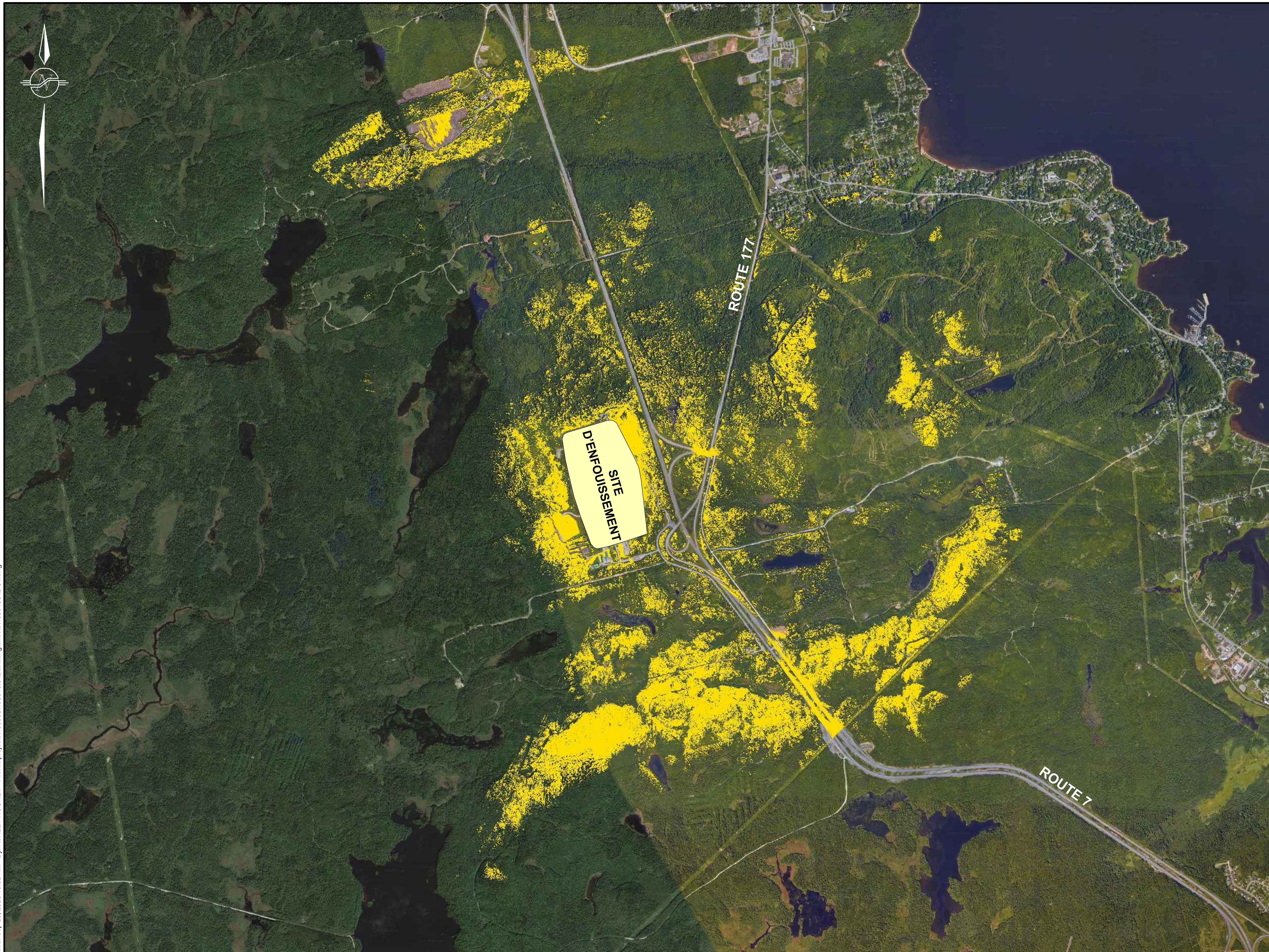
Le site et les terrains environnants ont fait l'objet d'une recherche auprès des Services d'enregistrement et de cartographie de SNB pour vérifier la Gazette foncière de chaque terrain. La Gazette foncière est un dépôt d'informations sur les avis, les restrictions et autres informations relatives aux parcelles de terrain (c'est-à-dire les NID). D'après un examen des informations en ligne de la Gazette foncière, il n'existe aucun dossier de contamination ou de remise en état pour le site ou les terrains adjacents. Cependant, un terrain adjacent (NID 00419481) est répertorié comme zone protégée d'un bassin versant (bassin versant du lac Musquash Est et du lac Musquash Ouest, annexe D). La zone est gérée par la Saint John Water Utility et est protégée par le *Décret de désignation du secteur protégé du bassins hydrographiques* conformément à la *Loi sur l'assainissement de l'eau* du Nouveau-Brunswick.

4.5.2 Paysage visuel

Le site jouxte la Route 7, sur laquelle on enregistre des volumes de trafic élevés, en particulier aux heures de pointe. Des parties du site et des activités d'enfouissement en cours sont actuellement visibles depuis diverses voies publiques (photo 5 et photo 6; figure 7). D'après l'analyse de l'évaluateur et sa connaissance générale de la région, le site d'enfouissement actuel n'est pas reconnu comme étant visible depuis des résidences, compte tenu de l'état actuel de la végétation.

Photo 5 : Vue du site d'enfouissement en direction du nord sur la Route 7 (Google)

Photo 6 : Vue du site d'enfouissement depuis le contournement de Martinon au niveau de la bretelle d'accès à la Route 7 en direction nord (Google)



LÉGENDE

SECTEURS DU BASSIN VISUEL

NOTE: Analyse basée sur les conditions de végétation actuelles.

DESSINÉ PAR	VÉRIFIÉ PAR
AGSD	MS
CALCULS RÉALISÉS PAR	VÉRIFIÉ PAR

DATE
JUIN, 2023

PROJET
ÉVALUATION D'IMPACT SUR L'ENVIRONNEMENT D'UNE AUGMENTATION DE CAPACITÉ ET DE PROLONGATION DE LA DURÉE DE VIE DU SITE D'ENFOUISSEMENT DE CRANE MOUNTAIN

ILLUSTRATION
ANALYSE DU BASSIN VISUEL +90 MÈTRES D'ALTITUDE

ÉCHELLE
1:30000
0 1.0 2.0km

DOSSIER	N° D'ILLUSTRATION
100018012-04	FIGURE 7

GEMTEC
CONSULTING ENGINEERS AND SCIENTISTS

4.5.3 Économie locale et structure socioéconomique

Le site d'enfouissement est situé à Saint John, au Nouveau-Brunswick, et dessert plusieurs municipalités de la région sous la gestion de La CSRF, qui est chargée de fournir des services de gestion des déchets à la population locale.

Selon Statistique Canada, Saint John est la plus grande ville du Nouveau-Brunswick, avec une population d'environ 70 000 habitants. La population totale de la région desservie par le site d'enfouissement est d'environ 125 000 personnes.

Le site est conçu pour traiter une grande variété de déchets, notamment les déchets solides municipaux (DSM), les débris de construction et de démolition et les déchets dangereux. Tel qu'il est actuellement approuvé, le site d'enfouissement a une capacité d'environ 4,9 millions de mètres cubes et reçoit environ 70 000 tonnes de déchets solides municipaux chaque année.

Le tissu économique régional est diversifié. La région accueille plusieurs grandes entreprises, notamment de pâte à papier et de papier, de raffinage du pétrole et de fabrication de produits manufacturés. C'est aussi à Saint John qu'Irving Oil a construit la plus grande raffinerie de pétrole du Canada, qui est un employeur important de la région. La région abrite également plusieurs petites et moyennes entreprises dans différents secteurs, notamment le commerce de détail, l'hôtellerie et les services professionnels.

Outre ses entreprises manufacturières et ses commerces, la région est également connue pour ses ressources naturelles, notamment dans les domaines de la sylviculture, de la pêche et de l'agriculture. La baie de Fundy est une attraction touristique majeure et une plaque tournante pour l'observation des baleines, la pêche et d'autres activités de plein air.

Bien que le modèle de financement de la CSRF soit basé sur l'assiette fiscale et la population de chaque communauté, le site d'enfouissement est financé uniquement par les redevances de déversement. Ce projet est financé par le budget de fonctionnement général du site d'enfouissement.

5.0 RÉSUMÉ DES EFFETS POTENTIELS

5.1 Effets potentiels sur l'environnement atmosphérique

Le projet ne devrait pas affecter l'environnement atmosphérique au-delà de ce qui est actuellement observé sur le site. Le projet prévoit le respect des pratiques générales d'enfouissement dans l'empreinte existante du site d'enfouissement. On ne s'attend pas à une augmentation des contaminants atmosphériques à l'intérieur de l'aire du projet ni sur le site et leur concentration ne dépassera pas les conditions réglementaires décrites dans l'agrément d'exploitation actuel (I-11079, annexe A) ni les objectifs de qualité de l'air du Nouveau-Brunswick.

5.1.1 Effets potentiels sur les conditions climatiques

On ne s'attend pas à ce que le projet affecte les conditions climatiques telles que les températures ambiantes, les quantités de précipitations et les régimes de vent. Par conséquent, les conditions climatiques ne sont pas analysées davantage dans cette EIE.

5.1.2 Effets potentiels sur la qualité de l'air

On observera une augmentation à court terme des particules et de la poussière dans l'aire du projet pendant les activités de perturbation du sol telles que le défrichage et le terrassement du site et l'ajout d'un système de revêtement des cellules. Il est également normal de trouver des débris d'ordures dispersés dans n'importe quel site d'enfouissement.

On s'attend à ce que des émissions gazeuses soient produites dans l'aire du projet par les machines et l'équipement du projet (p. ex. excavatrice, concasseur, camions à benne, camions à ordures, camions de transport de personnel, etc.).

Le site d'enfouissement met actuellement en œuvre plusieurs mesures d'atténuation afin de réduire la quantité de poussière et de débris emportés par le vent à l'intérieur et à l'extérieur du site, mesures qui continueront d'être appliquées pendant la durée du projet :

- Le site utilise une technique de compactage mécanique pour réduire les dispersions de débris dans les environs. Cette technique de compactage sera utilisée tout au long du projet, aux moments opportuns, afin de limiter les dispersions de débris par le vent à une hauteur plus élevée.
- Un matériau de couverture du sol (communément appelé « couverture journalière ») est appliqué sur la zone d'enfouissement en fonction des besoins, au moins une fois par semaine.
- Le recouvrement séquentiel des cellules d'enfouissement pleines ou inactives est requis tout au long de l'exploitation du site d'enfouissement (voir la section 2.5.1), conformément à l'agrément d'exploitation (I-11079). L'application d'un matériau de

couverture intermédiaire ou finale sur les cellules de DSM inactives et pleines empêchera les dispersions de débris.

- L'agrément d'exploitation (I-11079) stipule que le site d'enfouissement doit veiller à ce que les débris emportés par le vent ne quittent pas le périmètre du site, ce qui peut exiger l'installation de barrières ou de clôtures. Les débris et détritus trouvés à l'extérieur des cellules d'enfermement doivent être systématiquement ramassés.

- Le site d'enfouissement maintient une zone tampon de végétation mature entre les cellules d'enfouissement et le périmètre du site. Cette zone tampon végétalisée, composée d'arbres matures, contribue à éviter que des débris et des poussières emportés par le vent ne quittent le site.

L'efficacité des mesures ci-dessus ne devrait pas être réduite par l'augmentation proposée de la hauteur du site d'enfouissement. Tous les effets susmentionnés sont déjà observés dans l'aire du projet et sur le site dans le cadre des opérations d'enfouissement en cours et approuvées dans l'actuel agrément d'exploitation (I-11079, annexe A). Les activités du projet ne devraient pas entraîner une augmentation notable des impacts négatifs sur la qualité de l'air.

5.1.3 Effets potentiels sur l'environnement sonore

On s'attend à ce que du bruit soit produit à l'intérieur de l'aire du projet en raison du fonctionnement des machines et de l'équipement du projet (p. ex. excavatrice, concasseur, camions à benne, camions à ordures, camions de transport de personnel, etc.). Toutefois, on ne s'attend pas à ce que le projet entraîne une augmentation importante des impacts sur l'environnement sonore au-delà de ce qui est déjà observé dans le cadre des activités d'exploitation du site d'enfouissement et approuvé dans le permis d'exploitation actuel (I-11079, annexe A).

Les vents dominants dans la région soufflent généralement du sud-ouest vers le nord-est. Les bruits risquent principalement d'affecter les résidences rurales situées au nord-est du site d'enfouissement, de l'autre côté de la Route 7. L'altitude du site varie d'environ 65 mètres au-dessus du niveau de la mer en son point le plus bas à environ 90 mètres au-dessus du niveau de la mer en son point le plus haut. À titre de comparaison, la zone résidentielle située au nord-est du site d'enfouissement se trouve à une altitude plus basse, en moyenne à environ 24 mètres au-dessus du niveau de la mer. Ces résidences sont situées à une altitude plus basse que le lieu du projet et une zone naturelle végétalisée fournit une barrière sonore entre les deux zones.

Deux facteurs sont susceptibles d'affecter le bruit généré par le site d'enfouissement, à savoir la pression atmosphérique et le vent, lesquels ont été pris en compte lors de l'examen de ce projet. Les variations de pression atmosphérique sont influencées par un large éventail de facteurs, notamment la température, l'humidité, la vitesse du vent et les systèmes météorologiques présents dans la région. La différence de pression atmosphérique entre +90 mètres (altitude actuelle) et +117 mètres (figure 8) est considérée comme négligeable.

Sur la base de la loi de puissance du profil du vent, la vitesse du vent à une altitude de +117 mètres serait supérieure d'environ 4 % à la vitesse du vent à une altitude de +90 mètres, en supposant que tous les autres facteurs soient constants, ce qui ne devrait pas avoir d'effet appréciable sur la propagation du bruit hors du site d'enfouissement.

ÉLÉVATION FINALE +90m

ÉLÉVATION FINALE +117.5m

DESSINÉ PAR AGSD	VÉRIFIÉ PAR MS
CALCULS RÉALISÉS PAR	VÉRIFIÉ PAR
DATE JUIN, 2023	
PROJET ÉVALUATION D'IMPACT SUR L'ENVIRONNEMENT D'UNE AUGMENTATION DE LA HAUTEUR DU SITE D'ENFOUISSEMENT DE CRANE MOUNTAIN	
ILLUSTRATION RENDUS D'ÉLÉVATION DE LA DÉCHARGE À +90m ET +117,5m	
ÉCHELLE NOT TO SCALE	
DOSSIER 100018012-04	N° D'ILLUSTRATION FIGURE 8

GEMTEC
CONSULTING ENGINEERS AND SCIENTISTS

Le site d’enfouissement met actuellement en œuvre plusieurs mesures d’atténuation des émissions sonores, qui seront toutes maintenues tout au long de la réalisation du projet :

- Une zone tampon végétale dense et mature est maintenue autour du site. La zone tampon sert de barrière naturelle entre le site d’enfouissement et le voisinage pour contrôler le bruit du site.
- Les équipements du site sont entretenus conformément aux normes d’émission et en bon état de fonctionnement. Ils sont équipés de silencieux lorsque c’est possible.
- En général, les activités sur le site se déroulent pendant la journée, à raison de 8 heures par jour du lundi au vendredi et de 4 heures le samedi (il n’y a habituellement aucune activité le dimanche ou les jours fériés).
- En outre, l’autorisation d’exploitation du site d’enfouissement (I-11079) prévoit que les émissions sonores du site doivent être contrôlées afin d’éviter toute nuisance à l’extérieur du site. En cas d’événements particulièrement bruyants, la CSRF peut être tenue d’élaborer, de soumettre et de mettre en œuvre un plan de contrôle pour en atténuer les effets de manière à ce qu’ils ne constituent plus une nuisance pour les récepteurs hors site.

L’efficacité des mesures énumérées ci-dessus ne devrait pas être réduite par l’augmentation proposée de hauteur du site d’enfouissement, de sorte que le projet ne devrait pas avoir d’incidences significatives sur les émissions sonores.

5.1.4 Effets potentiels sur les émissions odorantes

Le système de collecte et de contrôle des gaz d’enfouissement (SCCGE) émet actuellement des gaz d’enfouissement brûlés collectés sur le site d’enfouissement. Le projet ne devrait pas produire de gaz d’enfouissement supplémentaires dépassant les capacités du SCCGE, lequel peut être agrandi au besoin par l’installation de puits collecteurs de gaz d’enfouissement supplémentaires.

Étant donné que les méthodes opérationnelles demeureront similaires à ce qui se fait actuellement, les émissions odorantes du projet ne devraient pas dépasser les émissions ambiantes actuellement observées dans le cadre des activités d’exploitation du site d’enfouissement et approuvées dans l’actuel agrément d’exploitation (I-11079, valable jusqu’au 30 novembre 2025; annexe A).

Les vents dominants dans la région soufflent généralement du sud-ouest vers le nord-est. Les odeurs risquent principalement d’affecter les résidences rurales situées au nord-est du site d’enfouissement, de l’autre côté de la Route 7. L’altitude du site varie d’environ 65 mètres au-dessus du niveau de la mer en son point le plus bas à environ 90 mètres au-dessus du niveau de la mer en son point le plus haut. À titre de comparaison, la zone résidentielle située au nord-est du site d’enfouissement se trouve à une altitude plus basse, en moyenne à environ 24 mètres au-dessus du niveau de la mer. Ces résidences sont situées à une altitude plus basse que le lieu du projet et une zone naturelle végétalisée fournit une barrière d’odeurs entre les deux zones.

Le vent est le principal facteur susceptible d’affecter la transmission d’odeurs générées par le site d’enfouissement, lequel a été pris en compte lors de l’examen de ce projet. La vitesse du vent à une altitude de +117 mètres est normalement supérieure d’environ 4 % à la vitesse du vent à une altitude de +90 mètres, en supposant que tous les autres facteurs soient constants, ce qui signifie que le projet ne devrait pas avoir d’effet appréciable sur la propagation des odeurs hors du site d’enfouissement.

Le site d’enfouissement met actuellement en œuvre plusieurs mesures d’atténuation des odeurs à l’intérieur et à l’extérieur de son périmètre, notamment :

- Le recouvrement séquentiel des cellules d’enfouissement terminées ou inactives est requis tout au long de l’exploitation du site d’enfouissement, conformément à l’agrément d’exploitation (I-11079) du MEGLNB. L’application d’une couverture intermédiaire et éventuellement d’une couverture finale atténuera les émissions odorantes provenant des cellules d’enfouissement inactives.
- Le site utilise un SCCGE qui collecte et convertit les gaz odorants produits par les activités d’enfouissement en énergie électrique, lequel agit également comme un agent réducteur d’odeurs avec un taux de destruction supérieur à 99 %. On ne s’attend pas à ce que le projet produise des gaz odorants supplémentaires excédant les capacités du SCCGE.
- En outre, l’autorisation d’exploitation du site d’enfouissement (I-11079) prévoit que les émissions odorantes du site doivent être contrôlées afin d’éviter toute nuisance à l’extérieur du site. En cas d’événements particulièrement générateurs d’odeurs, la CSRF peut être tenue d’élaborer, de soumettre et de mettre en œuvre un plan de contrôle pour en atténuer les effets de manière à ce qu’elles ne constituent plus une nuisance pour les récepteurs hors site.

L’efficacité des mesures ci-dessus ne devrait pas être réduite par l’augmentation proposée de la hauteur du site d’enfouissement. Par ailleurs, afin de maintenir la pente latérale réglementaire de 4H:1V pendant l’augmentation de hauteur proposée, la surface ouverte des cellules d’enfouissement actives sera graduellement réduite, selon un assemblage en forme de pyramide (figure 3), ce qui réduit les superficies propices aux émissions odorantes dans les zones les plus élevées.

En raison de problèmes de chaîne d’approvisionnement pour les pièces de rechange des torchères fermées, le SCCGE n’a pas été pleinement opérationnel en 2022. Ces problèmes de chaîne d'approvisionnement ont depuis été résolus, de sorte que lors de la rédaction du présent rapport, en mars 2023, le SCCGE était opérationnel et fonctionnait régulièrement.

Il convient de noter qu'Environnement et changements climatiques Canada (ECCC) a publié en 2023 un projet de cadre réglementaire pour un règlement sur les émissions de gaz d'enfouissement et de méthane provenant des sites d'enfouissement (le règlement final doit être publié plus tard en 2023). Ce règlement et les règlements provinciaux similaires devraient s'appliquer au site d'enfouissement de Crane Mountain.

Qui plus est, la société Tetra Tech Canada Inc. a récemment été chargée d'élaborer un plan global de gestion des gaz afin d'augmenter encore plus l'efficacité de la collecte des gaz d'enfouissement, ce qui permettra de réduire d'autant les émissions odorantes provenant du site d'enfouissement. Le plan directeur de gestion des gaz d'enfouissement prendra en compte les changements que le projet apportera au SCCGE. Les recommandations de ce plan peuvent être mises en œuvre séparément du projet. Les conclusions du rapport de Tetra Tech Canada Inc. n'étaient pas disponibles pour être annexées à la présente EIE, mais elles seront incluses dans les rapports ultérieurs du comité d'examen technique (CET).

5.2 Effets potentiels sur les eaux souterraines

Les activités du projet ne devraient pas avoir d'effets sur les ressources régionales d'eau souterraine. On s'attend à ce que le projet modifie quelque peu la topographie à l'intérieur de l'aire du projet. Cependant, l'écoulement des eaux de surface et les schémas de drainage généraux devraient rester similaires aux conditions régnant avant le projet (poursuite de l'utilisation des drains souterrains, des bassins de rétention et de traitement des lixiviats et de l'infrastructure de gestion des eaux pluviales déjà en place).

5.2.1 Effets potentiels sur le drainage et la topographie

On s'attend à quelques modifications de la topographie de l'aire du projet qui se limiteraient à l'augmentation de la hauteur verticale du site d'enfouissement (de 90 mètres à 117 mètres d'altitude). Les pentes latérales de 4H:1V seront maintenues et toutes les nouvelles cellules d'enfouissement recouvertes seront intégrées dans l'empreinte actuelle et future du site d'enfouissement.

Les schémas et volumes de drainage globaux resteront cohérents ou similaires aux conditions existantes (les eaux de ruissellement continueront d'être dirigées vers l'infrastructure actuelle de gestion des eaux pluviales). Les patrons de drainage ne devraient pas interagir avec les nappes d'eau souterraines. Le drainage et la topographie ne sont pas examinés de façon plus approfondie dans cette EIE.

5.2.2 Effets potentiels sur la géologie et l'hydrogéologie

Les activités du projet pourraient avoir des effets sur la géologie de surface, notamment les perturbations du sol lors des travaux d'excavation et lors de l'application de remblais sur le site d'enfouissement existant. Ces activités dans l'aire du projet ne devraient pas interagir avec les ressources d'eau souterraine et ne font donc pas l'objet d'une discussion plus approfondie dans cette EIE.

5.2.2.1 Effets potentiels sur la qualité et le volume des eaux souterraines

Les travaux du projet peuvent avoir des effets sur la qualité des eaux souterraines, notamment le risque de rejet de contaminants par le biais de déversements de carburants et de lubrifiants provenant de l'équipement sur place ainsi que le rejet de lixiviats, avec infiltration subséquente dans les eaux souterraines. Le projet se limite aux activités déjà programmées sur le site d'enfouissement. Aucune activité nouvelle ou singulière ne sera entreprise dans le cadre du projet.

On ne s'attend pas à ce que les volumes de lixiviats augmentent, car les superficies exposées sujettes à des infiltrations d'eau de surface (cellules d'enfouissement actives) resteront similaires aux conditions actuellement observées sur le site. Par ailleurs, afin de maintenir la pente latérale réglementaire de 4 H:1V pendant l'augmentation de hauteur proposée, la surface exposée des cellules d'enfouissement actives sera graduellement réduite, selon un assemblage en forme de pyramide.

La surveillance routinière de la qualité des eaux de surface, des eaux souterraines et de certains paramètres du système de traitement est coordonnée par la CSRF, conformément à l'agrément d'exploitation (I-11079, annexe A et annexe E). Le programme de surveillance de la conformité vise à évaluer les répercussions environnementales éventuelles du site d'enfouissement sur les systèmes d'eaux souterraines et d'eaux de surface à proximité du site. En conséquence, la qualité et le volume des eaux souterraines ne font pas l'objet d'une discussion plus approfondie dans cette EIE.

5.3 Effets potentiels sur l'environnement écologique

Le projet ne devrait pas affecter l'habitat terrestre, les terres humides, les cours d'eau, la flore et la faune au-delà de ce qui est actuellement observé sur le site. Le projet ne prévoit aucune activité nouvelle ou singulière autre que les pratiques générales d'enfouissement dans l'empreinte actuelle approuvée du site.

5.3.1 Effets potentiels sur l'environnement terrestre

Le projet ne devrait pas entraîner de nouvelles perturbations du sol ou de nouvelles activités opérationnelles sur le site. Le projet prévoit simplement une augmentation de hauteur des cellules d'enfouissement de DSM réglementées. Aucune autre discussion sur l'environnement terrestre n'est présentée dans cette EIE.

5.3.2 Effets potentiels sur les terres humides et les cours d’eau

Le projet prévoit l’augmentation de la hauteur des cellules d’enfouissement de déchets solides municipaux actives et futures, ce qui n’affectera aucune zone humide réglementée en dehors du périmètre du site d’enfouissement, tel qu’il a été approuvé à l’origine en 1997. Une zone humide est présente dans l’empreinte approuvée du site d’enfouissement et toute opération susceptible de l’affecter doit respecter le *Règlement sur la modification des cours d’eau et des terres humides (90-80), relevant de la Loi sur l’assainissement de l’eau*.

Les effets potentiels de l’empreinte du site et des activités d’enfouissement sur les terres humides et les cours d’eau de la région ont été discutés dans la première EIE (Fundy Solid Waste Action Team, 1994) et ne sont pas abordés dans la présente évaluation.

5.3.3 Effets potentiels sur la flore

Le rapport du CDC CA signale la présence d’aster d’Anticosti (*Symphyotrichum anticostense*) dans un rayon de 5 km du site, une espèce préoccupante selon la *Loi sur les espèces en péril* (LEP) fédérale. Toutefois, comme le projet proposé consiste à augmenter la hauteur des cellules contaminées par les déchets du site d’enfouissement, il ne devrait pas avoir d’impact significatif sur l’environnement naturel entourant le site d’enfouissement. Par conséquent, il est peu probable que les populations d’aster d’Anticosti ou toute autre espèce de flore indigène des environs soient affectées par le projet. La situation de la flore n’est pas plus approfondie dans cette EIE.

5.3.4 Effets potentiels sur l’habitant des oiseaux et de la faune sauvage

Les effets potentiels directs du projet sur l’habitant des oiseaux et de la faune sauvage sont minimes :

- Le bruit provenant des activités du projet pourrait perturber la faune et les oiseaux, mais ce bruit n’est pas nouveau, car de l’équipement lourd est actuellement utilisé dans l’aire du projet et sur le site.
- Le projet engendrera une circulation de véhicules qui pourraient blesser ou tuer des animaux et des oiseaux en cas de collision. Il ne s’agit cependant pas de nouvelles activités liées au projet, car des véhicules circulent déjà dans l’aire du projet et sur le site.
- Il existe une possibilité d’interaction humaine avec la faune en raison du personnel présent sur le site. En outre, il est possible que des animaux sauvages soient attirés par les déchets, les ordures et les matériaux stockés sur le site. Il ne s’agit cependant pas de nouvelles activités liées au projet, car des humains sont déjà présents dans l’aire du projet et sur le site.
- Il y a un faible risque que des oiseaux migrateurs se posent dans l’aire du projet en raison des perturbations fréquentes du sol et de la présence humaine. Le projet est peu

susceptible d’altérer ou de détruire l’habitat d’oiseaux migrateurs tel que décrit dans la *Loi sur la Convention concernant les oiseaux migrateurs*, à quelques exceptions près :

- L’attraction vers les zones défrichées et les tas de déchets peut entraîner une augmentation des blessures et des décès d’oiseaux ainsi que des destructions de nids. Il ne s’agit cependant pas de nouvelles activités liées au projet, car des tas de déchets sont déjà présents dans l’aire du projet et sur le site.
- L’utilisation de lumière artificielle durant la nuit peut attirer certaines espèces d’oiseaux. Les activités du projet se dérouleront en général pendant la journée. Cs perturbations ne constituent cependant pas de nouvelles activités liées au projet, car de la lumière artificielle est déjà utilisée dans l’aire du projet et sur le site.
- L’augmentation de la hauteur du site d’enfouissement peut inciter les oiseaux en quête de nourriture à voler à une altitude plus élevée qu’actuellement, ce qui est considéré comme négligeable et ne devrait pas avoir d’impact sur l’accessibilité du site ni sur les habitudes migratoires de quelque espèce d’oiseau que ce soit.

Les sites d’enfouissement peuvent attirer certaines espèces d’oiseaux susceptibles de se nourrir des déchets. ce qui peut entraîner une augmentation de certaines populations d’oiseaux autour du site d’enfouissement et avoir un impact potentiel sur d’autres espèces d’oiseaux, comme le martinet ramoneur (*Hylocichla mustelina*) et l’aigle à tête blanche (*Haliaeetus leucocephalus*), qui dépendent des mêmes sources d’alimentation. Toutefois, comme le projet vise seulement à augmenter la hauteur des cellules d’enfouissement et ne modifie pas les pratiques actuelles de gestion des déchets, il est peu probable qu’il y ait une augmentation significative des populations d’oiseaux autour du site d’enfouissement.

En outre, les sites d’enfouissement peuvent également constituer des lieux de nidification intéressants pour certaines espèces d’oiseaux, comme l’hirondelle rustique (*Hirundo rustica*), qui construisent des nids de boue sur des surfaces verticales, notamment sur les bâtiments et les ponts. Toutefois, comme le projet ne prévoit pas de modifier les structures physiques autour du site d’enfouissement, il ne devrait pas avoir d’impact significatif sur les sites de nidification des oiseaux.

Le projet ne devrait pas avoir d’impact significatif sur les espèces en péril dont il est question à la section 4.3.5 ni sur l’habitat faunique environnant, principalement parce que le projet ne prévoit aucune modification des pratiques de gestion des déchets du site d’enfouissement et que l’augmentation de hauteur des cellules d’enfouissement ne devrait pas modifier la disponibilité de nourriture ou de sites de nidification pour les oiseaux et les autres animaux sauvages.

5.4 Effets potentiels sur l'environnement culturel

Le site est actuellement utilisé comme site d'enfouissement actif et le projet n'entraînera pas de nouvelle empreinte écologique au-delà de ce qui est actuellement approuvé pour les cellules d'enfouissement futures. Une invitation à formuler des commentaires et des préoccupations sera envoyée aux Premières Nations voisines dans le cadre du processus d'EIE. Les commentaires et préoccupations que nous recevrons seront présentés au MEGLNB dans un document distinct sur les consultations du public et des Premières Nations.

5.5 Effets potentiels sur l'environnement socioéconomique

Le projet prévoit l'utilisation de l'infrastructure routière existante pour le transport de déchets et l'utilisation du site d'enfouissement désigné pour leur élimination de manière appropriée. On ne prévoit aucun changement important aux émissions et aux déversements de déchets générés par l'enfouissement en comparaison avec l'exploitation actuelle du site. La CSRF continuera à exploiter le site conformément aux exigences de l'agrément d'exploitation (I-11079; annexe A). Par conséquent, on ne prévoit aucun impact socioéconomique négatif sur les terrains environnants.

5.5.1 Effets potentiels sur les infrastructures en place

L'aire du projet se trouve dans les cellules d'enfouissement des déchets solides municipaux existantes et futures déjà approuvées, qui se composent de talus de retenue, de sous-drains, de sous-couches d'enfouissement et de couches de collecte des lixiviats. Les systèmes de sous-couches et de collecte des lixiviats sont décrits dans la section 2.5 du présent document.

L'augmentation de la hauteur des déchets solides municipaux dans les cellules d'enfouissement créera un poids ou une pression supplémentaire sur l'infrastructure existante, dont les effets méritent d'être examinés. Une augmentation de hauteur d'environ 27 mètres exercera une pression supplémentaire de 325 kPa sur l'infrastructure sous-jacente.

Lors de la conception d'un système de tuyauterie de collecte des lixiviats pour un site d'enfouissement, il est important de vérifier que la tuyauterie ne subira pas de déflexion excessive ni de défaillance locale par flambage. Tous les tuyaux de collecte des lixiviats des cellules 1 à 9 sont des tuyaux PEHD perforés, de 200 millimètres (mm) de diamètre ayant un rapport dimensionnel standard (RDS) de 17. On présume que des tuyaux semblables seront également utilisés lors de l'aménagement de toutes les cellules futures.

En se basant sur une épaisseur/hauteur totale de 50 mètres de déchets solides municipaux (hypothèse envisagée), le ratio de déflexion (déflexion du tuyau/diamètre du tuyau) des tuyaux de collecte des lixiviats devrait être inférieur à 1 %, ce qui est inférieur au ratio de déflexion admissible de 2,7 % pour un tuyau PEHD RDS 11 (tableau 9.4, Geotechnical Aspects of Landfill Design and Construction, Quian, Koerner, Gray, 2002).

De plus, sur la base d'une épaisseur/hauteur maximale de 50 mètres de déchets solides municipaux recouvrant les tuyaux de lixiviats, le facteur de sécurité (FDS) contre une défaillance locale par flambage a été calculé, lequel dépasse 6, ce qui est supérieur au minimum de 2 qui est généralement requis (Geotechnical Aspects of Landfill Design and Construction, Quian, Koerner, Gray, 2002).

Comme le démontrent les calculs ci-dessus, l'infrastructure existante de collecte des lixiviats peut supporter les pressions supplémentaires qui résulteront des 27 mètres supplémentaires de déchets solides municipaux.

Selon la première étude d'impact sur l'environnement, les sols *in situ* du site consistent généralement en 1,2 à 13 mètres de matériau moyennement dense à dense de till glaciaire, reposant sur un substrat rocheux. Les 27 mètres supplémentaires de déchets solides municipaux ne dépasseront pas la capacité de charge des sols sous-jacents. Durant la construction de nouvelles cellules d'enfouissement, tous les sols inadéquats ou perturbés sont enlevés et remplacés par un matériau granulaire bien compacté.

Le système d'étanchéité composite, constitué d'une géomembrane PEHD et d'une sous-couche d'argile recompactée, ne sera pas affecté par les 27 mètres supplémentaires de déchets solides municipaux ajoutés sur place dans les cellules d'enfouissement. La pression exercée par les déchets supplémentaires ne réduira pas la perméabilité de la sous-couche d'argile recompactée. Le poids supplémentaire pourrait en fait aider à compacter/consolider le revêtement de sol et à réduire (améliorer) sa perméabilité. Le revêtement géomembranaire en PEHD ne devrait pas être affecté par l'augmentation de poids des déchets solides municipaux supplémentaires.

5.5.2 Effets potentiels sur l'utilisation actuelle du territoire

Compte tenu de la distance entre le site d'enfouissement et les habitations existantes et des prévisions d'évolution du paysage présentées dans le présent document (plans de vue et prévisions d'évolution du paysage, annexe F), aucun nouveau point de vue sur le site depuis les zones résidentielles existantes ne sera créé par le projet, sur la base de la couverture végétale actuelle. Les effets potentiels sur le paysage visuel sont examinés plus en détail dans la section 5.5.3.

La capacité de stockage supplémentaire du site d'enfouissement n'augmentera pas le type ou le volume de circulation le long des voies de transport établies (Route 7). On observera des volumes de circulation similaires à ceux observés dans les conditions actuelles.

Des activités opérationnelles d'enfouissement (utilisation d'équipement lourd, séquençage de construction, élimination des déchets, production de bruit et d'odeurs, etc.) ont actuellement lieu sur le site d'enfouissement et aucune nouvelle activité et aucun nouvel impact sur des zones résidentielles n'est prévu en raison du projet. En conséquence, les effets potentiels du projet sur les terrains déjà aménagés ne sont pas plus approfondis dans cette EIE.

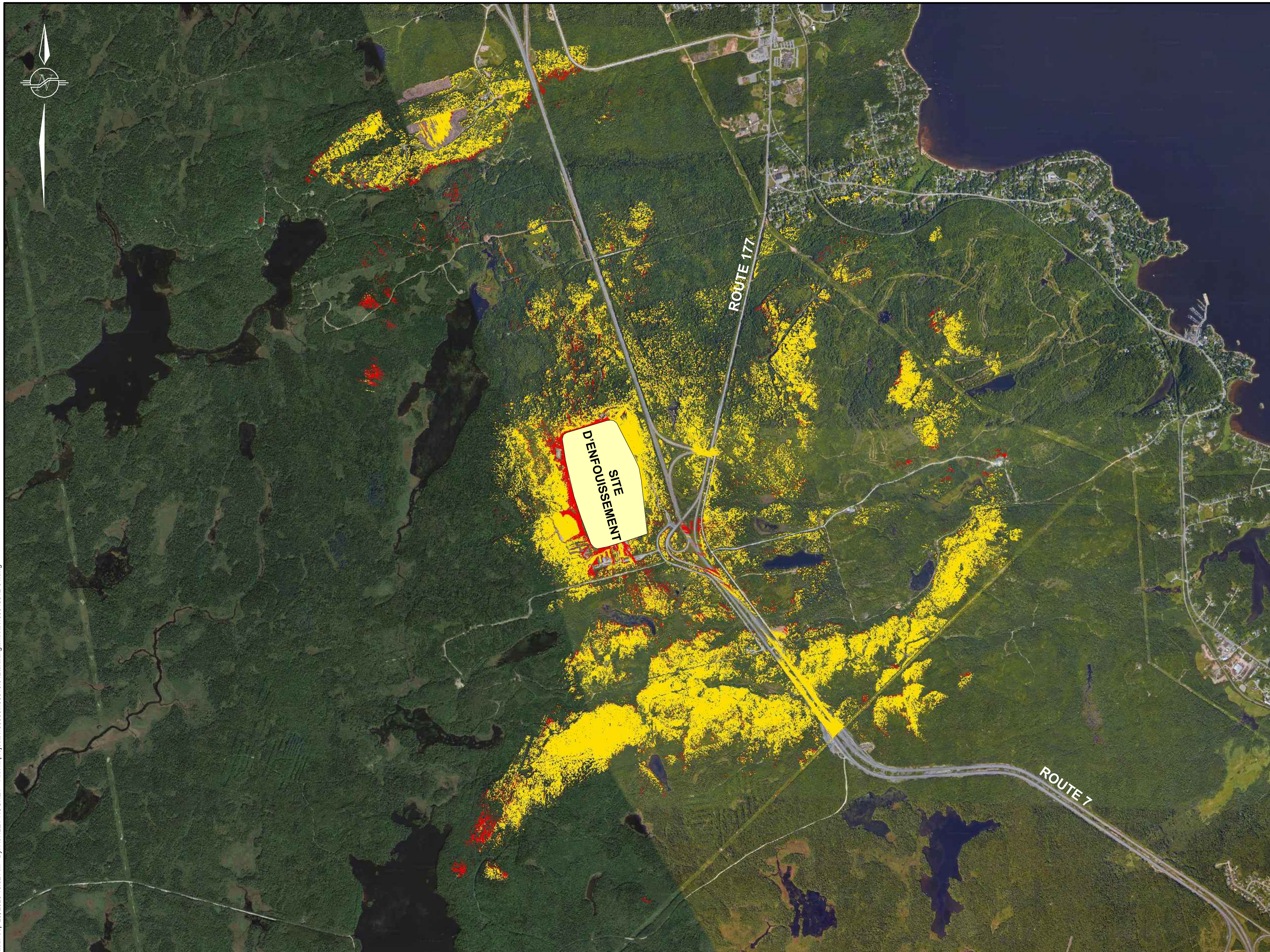
5.5.3 Effets potentiels sur le paysage visuel

Un modèle numérique de surface (MNS) et un modèle numérique de terrain (MNT) de GeoNB et de RNCan ont été utilisés pour créer un modèle 3D Autodesk Infraworks de la zone d'enfouissement environnante, permettant la création d'une vue 3D de la réalisation du projet à partir de plusieurs points d'observation. Les points d'observation ont été sélectionnés en exécutant d'abord des analyses QGIS Viewshed à partir de la hauteur du site d'enfouissement proposé comme emplacement de l'observateur, les cibles ayant une hauteur de 1,75 mètre au-dessus du MNT. L'utilisation du MNT a permis d'exclure l'effet de la végétation et des arbres lors de la numérisation initiale. Les zones résultantes chevauchant des routes ou des clairières existantes ont ensuite été utilisées comme emplacements d'observation, de façon à inverser le processus et à fournir un panorama visuel du site proposé depuis chaque emplacement. Deux analyses QGIS Viewshed ont été effectuées par lieu d'observation à titre de contrôle de qualité. Une analyse a utilisé le MNS comme surface d'entrée et une autre a utilisé le MNT. Nous avons également utilisé Google Earth, ainsi qu'un modèle 3D de la conception proposée, pour aider à confirmer ou à ajuster le modèle Infraworks. Les zones arborées le long des lignes de vue ont été évaluées par peuplement, avec des hauteurs moyennes dérivées des sections transversales du MNS et du MNT.

D'après le modèle 3D et l'analyse, nous avons déterminé qu'il est peu probable que le site d'enfouissement soit visible depuis le sol d'une habitation ou d'une zone commerciale existante située à proximité (coupes des plans de vue, annexe F). Des points de vue sont attendus le long de la Route 7, à proximité du carrefour du contournement de Martinon, mais le site est déjà visible depuis les véhicules circulant sur cette route (photo 3 et photo 4). Il est possible que de nouveaux points de vue s'offrent à la circulation sur certaines parties de Yellow Gate Road (Acamac Backland Road), Round Lake Road, Timmy Road et Colonel Nase Road (figure 9), selon la végétation et la topographie actuelles.

Une analyse des plans de vue montre également que le site d'enfouissement pourrait être visible depuis le dernier étage du bâtiment du Centre de réadaptation des travailleurs situé au 3700 chemin Westfield, mais qu'il ne sera pas visible depuis le sol dans ce secteur (annexe F). Il est aussi possible que le site d'enfouissement soit visible depuis l'anse de Ragged Point, mais ce lieu est distant de 8 000 mètres (annexe F).

Une zone tampon végétalisée sera maintenue autour du site d'enfouissement afin de limiter la vue sur l'aire du projet.



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LÉGENDE

SECTEURS DU BASSIN VISUEL (90 M)

SECTEURS DU BASSIN VISUEL (117 M)

NOTE: Analyse basée sur les conditions de végétation actuelles.

DESSINÉ PAR AGSD	VÉRIFIÉ PAR MS
CALCULS RÉALISÉS PAR	VÉRIFIÉ PAR
DATE JUIN, 2023	
PROJET ÉVALUATION D'IMPACT SUR L'ENVIRONNEMENT D'UNE AUGMENTATION DE LA HAUTEUR DU SITE D'ENFOUISSEMENT DE CRANE MOUNTAIN	
ILLUSTRATION ANALYSE DU BASSIN VISUEL À +90 m ET +117 m D'ALTITUDE	
ÉCHELLE 1:30000 (0 — 1.0 — 2.0km)	
DOSSIER 100018012-04	N° D'ILLUSTRATION FIGURE 9

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5.5.4 Effets potentiels sur l'économie locale et la structure socioéconomique

Le projet devrait prolonger la durée de vie du site d'enfouissement de 22 ans, ce qui signifie que les municipalités de la CSRF disposeraient d'un site d'enfouissement des DSM sûr et fiable au moins jusqu'en 2070. Ce projet permettra d'éviter de considérables coûts de construction d'un plus grand nombre de cellules d'enfouissement et de réduire les coûts de construction/exploitation et les incertitudes à l'approche de la fin de vie estimée originale du site d'enfouissement (accumulation de DSM jusqu'à une altitude de +90 mètres).

La prolongation de la durée de vie du site d'enfouissement existant profiterait en fin de compte à tous ses utilisateurs (payeurs de redevances de déversement), y compris les municipalités et les districts de services locaux inclus dans la zone, avec des estimations préliminaires prudentes d'environ 22 millions de dollars d'économies sur les 22 années de prolongation de la durée de vie du site d'enfouissement. La seule solution économiquement réalisable et durable pouvant être envisagée au lieu de ce projet serait de trouver un lieu approprié sur le territoire de la CSRF pour y aménager un autre site d'enfouissement avant que le site de Crane Mountain n'atteigne sa capacité maximale. L'implantation d'un nouveau site d'enfouissement prend du temps (des années) et les coûts préliminaires de la phase de construction sont estimés à plus de 30 millions $ en dollars de 2023.

Le projet ne devrait avoir aucune incidence sur les entrepreneurs locaux. Les activités de construction, d'exploitation et d'enfouissement resteront conformes aux pratiques existantes. La CSRF continuera à respecter la *Loi sur la passation des marchés publics* pour l'obtention de matériaux de construction et la construction, le cas échéant.

Le site du projet est un site d'enfouissement actif et, à ce titre, le projet prévoit une utilisation du sol existant considérée comme compatible avec les autres utilisations du sol dans la région. Le site est actuellement zoné USL (Utility Service Landfill/site d'enfouissement d'utilité publique) par la municipalité de Saint John et répond à toutes les exigences d'utilisation du territoire figurant dans le plan municipal de Saint John (PlanSJ, 2023).

6.0 RÉSUMÉ DES MESURES PROPOSÉES D'ATTÉNUATION DES RISQUES ENVIRONNEMENTAUX

Le tableau 9 résume les effets négatifs potentiels du projet sur l'environnement et les mesures d'atténuation proposées pour les réduire le plus possible. Un plan de gestion environnementale (PGE) a été établi pour les activités actuelles du site d'enfouissement, lequel est mentionné à quelques reprises ci-dessous (voir l'annexe C).

Tableau 9 Résumé des mesures proposées d’atténuation des risques environnementaux

Élément du projet	Résumé des interactions potentielles	Mesures d’atténuation
Qualité de l’air	Possibilité de production de particules et de poussières.	Des dépoussiérants peuvent être utilisés pendant les périodes de temps sec. Les tas de déchets secs peuvent être recouverts ou mis en andains afin d’éviter le soufflage de poussières ou de débris. De même, les matériaux poussiéreux peuvent être transportés dans des véhicules à benne couverte. Les activités générant de la poussière seront limitées pendant les périodes de temps sec ou venteux. Les zones exposées au vent seront stabilisées en temps voulu. Des procédures de contrôle de la poussière et des détritus sont en place, décrites dans le PGE (annexe C).
	Possibilité d’émissions gazeuses provenant des équipements et de la circulation des camions.	Tous les moteurs à combustion interne non essentiels seront éteints entre les périodes d’utilisation et les engins lourds ne resteront pas au ralenti pendant plus de 15 minutes continues (pratiques exemplaires de gestion). Les équipements seront entretenus conformément aux normes d’émission et maintenus en bon état de fonctionnement.
Qualité de l’environnement sonore	Possibilité de bruits et de vibrations provenant des équipements et de la circulation des camions.	Les équipements seront entretenus conformément aux normes d’émission et maintenus en bon état de fonctionnement. Les équipements seront munis de dispositifs d’assourdissement, dans la mesure du possible. Une zone tampon végétale dense et mature est maintenue autour du site afin de réduire les impacts sonores sur les récepteurs environnants. En règle générale, les activités sur le site se dérouleront pendant la journée (environ 10 heures par jour du lundi au vendredi et environ 5 heures le samedi). L’agrément d’exploitation (I-11079; annexe A) exige que les émissions sonores provenant du site d’enfouissement soient contrôlées afin de prévenir les impacts sur les récepteurs hors site. En cas d’événements particulièrement bruyants, la CSRF peut être tenue d’élaborer, de soumettre

Élément du projet	Résumé des interactions potentielles	Mesures d'atténuation
		et de mettre en œuvre un plan de contrôle pour en atténuer les effets de manière à ce qu'ils ne constituent plus une nuisance pour les récepteurs hors site. Des procédures de contrôle des bruits sont déjà en place, décrites dans le PGE (annexe C).
Émissions odorantes	Odeurs provenant de l'élimination des déchets et des gaz d'enfouissement.	Les cellules d'enfouissement de DSM pleines ou inactives sont recouvertes successivement d'une couverture intermédiaire, puis d'une couverture finale, conformément à l'autorisation d'exploitation (I-11079; annexe A), tout au long de l'exploitation du site d'enfouissement. Le SCCGE collecte et brûle des gaz d'enfouissement qui contiennent certains gaz odorants produits par les activités d'enfouissement. Le SCCGE sert également d'agent réducteur d'odeurs à un taux de destruction supérieur à 99 %. On ne s'attend pas à ce que le projet produise des gaz odorants supplémentaires excédant les capacités du SCCGE. L'agrément d'exploitation (I-11079; annexe A) exige que les émissions odorantes provenant du site d'enfouissement soient contrôlées afin de prévenir les impacts sur les récepteurs hors site. S'il survient un événement générateur d'odeurs, la CSRF peut être tenue d'élaborer, de soumettre et de mettre en œuvre un plan de contrôle pour en atténuer les effets de manière à ce qu'ils ne constituent plus une nuisance pour les récepteurs hors site. Des procédures de contrôle des odeurs sont déjà en place, décrites dans le PGE (annexe C). Des mesures d'atténuation supplémentaires peuvent être mises en œuvre sur la base des recommandations du rapport du plan directeur de gestion des gaz d'enfouissement de Tetra Tech, qui doit être reçu par la CSRF en 2023.

Élément du projet	Résumé des interactions potentielles	Mesures d'atténuation
Faune sauvage et oiseaux	Il est possible que le bruit des activités du projet perturbe la faune et les oiseaux. Possibilité d'interaction humaine en raison de la présence de personnel sur le site; possibilité que des animaux soient attirés par les déchets/détritus stockés sur le site. L'attraction vers les zones défrichées et les tas de déchets peut entraîner une augmentation des blessures et des décès d'oiseaux ainsi que des destructions de nids.	Les animaux sauvages vivant à proximité seront probablement dissuadés de s'approcher du site par le bruit des activités du projet et les habitats appropriés sont nombreux sur les terrains adjacents. Les équipements seront maintenus en bon état de fonctionnement. Les équipements seront munis de dispositifs d'assourdissement, dans la mesure du possible. Une zone tampon végétale sera maintenue autour du site afin de réduire les impacts sonores sur les récepteurs environnants. Si une espèce d'oiseau nicheur est observée, des mesures seront prises pour éviter tout contact et toute perturbation de l'espèce et de son habitat. Une zone tampon appropriée de végétation sera établie autour de tous les nids rencontrés pour les protéger de toute perturbation et les travaux dans cette zone seront évités jusqu'à ce que les oiseaux aient pris leur envol ou soient partis.
Accidents, dysfonctionnements et événements imprévus		
Accidents de véhicules	Possibilité de blessures, de décès ou de destruction d'infrastructures à la suite d'accidents de véhicules sur le site.	Les véhicules circuleront à des vitesses appropriées à l'intérieur du site. Les véhicules seront maintenus en bon état de fonctionnement. Des protocoles d'accès restreint seront mis en œuvre. Des procédures d'urgence et d'intervention en cas de déversement seront mises en œuvre comme indiqué dans le PGE (annexe C).

Élément du projet	Résumé des interactions potentielles	Mesures d'atténuation
Risque d'incendie	Possibilité de destruction d'infrastructures, d'habitats et d'animaux sauvages par le feu.	Aucun nouveau stockage de produits chimiques ou pétroliers ne se fera à moins de 30 mètres d'une zone écologiquement sensible (p. ex. terre humide, cours d'eau). Les équipements seront maintenus en bon état de fonctionnement. Des procédures d'urgence et d'intervention en cas de déversement seront mises en œuvre comme indiqué dans le PGE (annexe C).
Déversement accidentel de contaminants	Possibilité que des contaminants soient répandus dans l'environnement par le rejet accidentel de carburants et de lubrifiants provenant des équipements.	Aucun nouveau stockage de produits chimiques ou pétroliers ne se fera à moins de 30 mètres d'une zone écologiquement sensible (p. ex. terre humide, cours d'eau). Les équipements seront maintenus en bon état de fonctionnement. Des procédures d'urgence et d'intervention en cas de déversement seront mises en œuvre comme indiqué dans le PGE (annexe C).
Défaillance des structures de contrôle de l'érosion	Possibilité de charge sédimentaire dans les habitats en raison des perturbations du sol.	Des structures appropriées de contrôle de l'érosion et des sédiments (CES) seront correctement installées autour des zones de travail avant le début des activités du projet, le cas échéant. Toutes les structures seront inspectées régulièrement pour s'assurer que tout fonctionne comme prévu. Les travaux du projet seront immédiatement interrompus si des signes d'écoulement de sédiments sont détectés. Tous les dispositifs de prévention d'envasement seront inspectés avant le début des travaux et feront ensuite l'objet d'une surveillance continue. Les réparations nécessaires seront rapidement effectuées de manière à ce que les dispositifs remplissent leur fonction prévue. Au besoin, les eaux du site peuvent être traitées dans un bassin de sédimentation avant d'être rejetées dans l'environnement. Une fois les travaux du projet terminés, tous les sols exposés et érodables seront stabilisés contre l'érosion de manière durable. La végétation existante sera conservée dans la mesure du possible et les défrichements d'arbres et de végétation seront réduits au minimum.

Élément du projet	Résumé des interactions potentielles	Mesures d'atténuation
		Des procédures d'urgence et d'intervention en cas de déversement seront mises en œuvre comme indiqué dans le PGE (annexe C).

7.0 PARTICIPATION DU PUBLIC ET DES PREMIÈRES NATIONS

7.1 Participation des Premières Nations

Le gouvernement du Nouveau-Brunswick a l'obligation constitutionnelle de consulter et, au besoin, d'accommoder les peuples autochtones chaque fois qu'il envisage une décision ou une activité susceptible d'avoir un impact négatif sur les droits ancestraux ou issus de traités. Conformément au Guide provisoire des promoteurs publié par le gouvernement du Nouveau-Brunswick, les promoteurs de projets doivent jouer un rôle primordial dans le processus de consultation et inviter les peuples autochtones à participer à l'élaboration de leurs projets ou propositions.

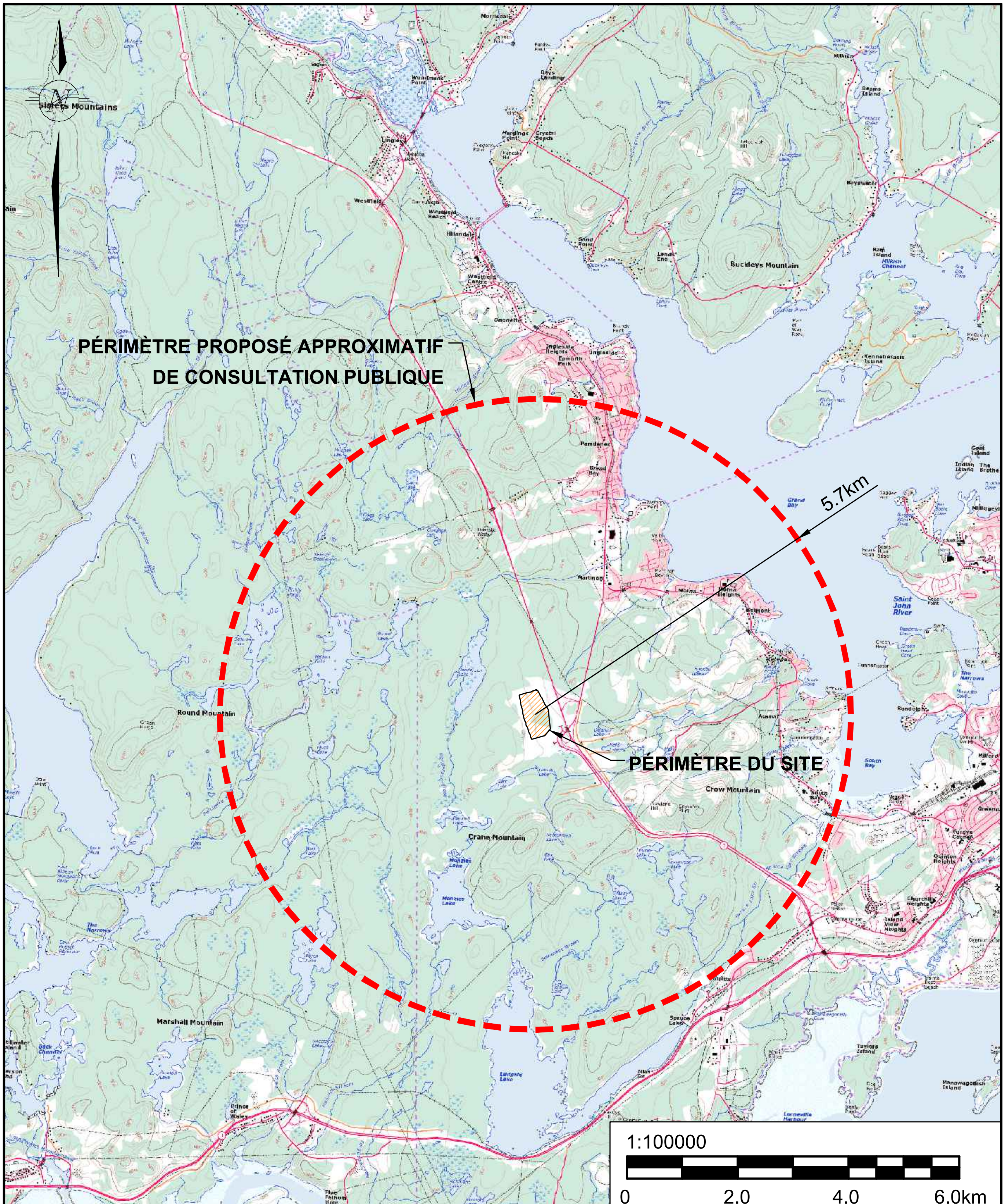
Conformément aux orientations susmentionnées, une description du projet et une invitation à formuler des commentaires et des préoccupations seront envoyées aux Premières Nations voisines dans le cadre du processus d'EIE. Les commentaires et préoccupations que nous recevrons seront présentés au MEGLNB dans un document distinct sur les consultations du public et des Premières Nations.

7.2 Participation du public et des autres parties concernées

Les normes de participation du public à des projets enregistrés sont décrites dans le « Guide aux études d'impact sur l'environnement au Nouveau-Brunswick » (janvier, 2018).

Un rapport de consultation publique détaillé sera préparé et soumis par la CSRF dans un document distinct. On s'attend à ce que les invitations à la participation du public comprennent au moins :

- Un avis d'enregistrement sera publié dans le Telegraph Journal.
- Une lettre d'information sur le projet sera transmise aux députés provinciaux de la zone desservie par la CSRF.
- Une lettre d'information sur le projet sera transmise aux gouvernements locaux, notamment à la Ville de Saint John et à la Ville de Grand Bay-Westfield.
- Une lettre d'information sur le projet sera transmise au ministère des Affaires autochtones.
- Un avis d'enregistrement sera envoyé (par courrier recommandé) aux propriétaires de terrains dans le périmètre proposé décrit dans la figure 10.
- L'enregistrement et les documents justificatifs seront disponibles dans les bureaux du site d'enfouissement de la CSRF et en ligne sur https://www.fundyrecycles.com/accueil/
- L'enregistrement et les documents justificatifs seront disponibles en ligne sur https://www2.gnb.ca/content/gnb/fr/ministeres/egl/environnement/content/etude_d_impact_environnemental.html



PROJET	ILLUSTRATION	
ÉVALUATION D'IMPACT SUR L'ENVIRONNEMENT D'UNE AUGMENTATION DE CAPACITÉ ET DE PROLONGATION DE LA DURÉE DE VIE DU SITE D'ENFOUISSEMENT DE CRANE MOUNTAIN	PLAN ILLUSTRANT LE PÉRIMÈTRE DE CONSULTATION PUBLIQUE	GEMTEC CONSULTING ENGINEERS AND SCIENTISTS

DESSINÉ PAR	DATE	DOSSIER	N° D'ILLUSTRATION	N° DE VERSION
AGSD	JUIN, 2023	100018012-04	FIGURE 10	0

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8.0 APPROBATION DU PROJET

Après la réception d'un certificat de décision, une modification de l'agrément d'exploitation (I-11079) sera obtenue, si nécessaire.

9.0 FINANCEMENT

Le projet sera entièrement financé par la CSRF dans le cadre de son budget de fonctionnement habituel.

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11.0 DÉCLARATION DE LIMITATIONS

Ce rapport a été préparé pour le seul bénéfice de la Commission de services régionaux de Fundy. Aucune autre entité ou personne ne peut utiliser ce rapport sans l'autorisation écrite expresse de GEMTEC Consulting Engineers and Scientists Limited et de la Commission de services régionaux de Fundy.

Toute utilisation de ce document par un tiers et toute décision prise par un tiers sur la base de ce rapport relèvent de la responsabilité de ce tiers. GEMTEC Consulting Engineers and Scientists Limited réfute toute responsabilité pour quelque dommage que ce soit subi par une tierce partie à la suite de décisions ou d'actions basées sur ce rapport.

Certaines des informations présentées dans ce rapport ont été fournies à partir de documents existants et d'entretiens. Bien que des tentatives aient été faites, dans la mesure du possible, pour obtenir un minimum de deux sources d'information confirmatives, il est arrivé que GEMTEC Consulting Engineers and Scientists Limited doive supposer que les informations fournies sont exactes.

Les conclusions présentées sont issues du meilleur jugement du personnel professionnel et technique formé, basé sur les normes environnementales actuelles et sur les conditions du site observées par le personnel au moment où le travail a été effectué.

Si des informations supplémentaires venaient à être disponibles, GEMTEC Consulting Engineers and Scientists Limited demande que ces informations soient portées à son attention afin de pouvoir réévaluer les conclusions présentées dans ce document.

ANNEXE A

Agrément d'exploitation

APPROVAL TO OPERATE

I-11079

Pursuant to paragraph 8(1) of the *Water Quality Regulation - Clean Environment Act*, and paragraph 5 (3) (a) of the *Air Quality Regulation - Clean Air Act*, this Approval to Operate is hereby issued to:

Fundy Regional Service Commission
for the operation of the
Crane Mountain Landfill

Description of Source:	**A regional sanitary landfill with leachate collection and disposal.**	
Source Classification:	**Fees for Industrial Approvals Regulation - Clean Water Act**	**Class 4**
	Air Quality Regulation	**Class 4**
Parcel Identifier:	**55087001, 55087027, 55086987, 55087019, 55043301, 55043293, 55160352**	
Mailing Address:	**P.O. Box 3032 Grand Bay-Westfield, NB E5K 4V3**	
Conditions of Approval:	**See attached Schedules "A" and "B" of this Approval**	
Supersedes Approval:	**I-9959**	

Valid From: **December 01, 2020**

Valid To: **November 30, 2025**

Recommended by: Sheryl Johnstone

Issued by: Mark Glynn
for the Minister of Environment and Climate Change

November 30, 2020
Date

SCHEDULE "A"

A. DESCRIPTION AND LOCATION OF SOURCE

The Fundy Regional Service Commission operates a regional solid waste management and disposal facility that is commonly referred to as the Crane Mountain Landfill. The Landfill is located in Saint John near Grand Bay-Westfield and serves the residents of Saint John county and the western portions of Kings and Queens county. The Commission operates a construction and demolition debris disposal site, a household hazardous waste depot, an organics transfer facility, material recovery facility, a landfill gas collection system, and a flare/electric generation system at the Landfill. A designated area on site is also utilized for the temporary storage of metal, tires, wood, white goods and other such salvageable/recyclable materials.

The operation of the regional solid waste management and disposal facility by the Fundy Regional Service Commission, located in the City of Saint John, County of Saint John, and the Province of New Brunswick and identified by Parcel Identifier (PID) numbers 55087001, 55087027, 55087019, 55043301, 55086987, 55160352 & 55043293 is hereby approved **subject to the following:**

B. DEFINITIONS

1. **"Approval Holder"** means Fundy Regional Service Commission.

2. "**Department**" means the New Brunswick Department of Environment and Local Government.

3. **"Minister"** means the Minister of Environment and Climate Change and includes any person designated to act on the Minister's behalf.

4. **"Director"** means the Director of the Authorizations Branch of the Department of Environment and Local Government and includes any person designated to act on the Director's behalf.

5. **"Facility"** means the property, leachate collection and treatment systems, buildings, equipment and any other activities involved with the operation of the regional solid waste management and disposal facility by the Fundy Regional Service Commission at PID numbers 55087001, 55087027, 55086987, 55087019, 55043301, 55160352 & 55043293.

6. **"containment cell"** means the area at the Facility approved in writing by the Department for the disposal of solid waste.

7. **“watercourse”** means the full width and length, including the beds, banks, sides and shoreline, or any part of a river, creek, stream, spring, brook, lake, pond, reservoir, canal, ditch or other natural or artificial channel open to the atmosphere, the primary function of which is the conveyance or containment of water whether the flow be continuous or not.

8. **“friable asbestos”** means waste material containing asbestos fibre or asbestos dust in a concentration greater than 1% by weight that is **not** tightly bound within a solid matrix such that it is easily crumbled by the hands.

9. **"petroleum product"** means a mixture of hydrocarbons, or their by-products, of any kind and in any form, including airplane fuel, asphalt, bunker "C" oil, crude oil, diesel fuel, engine oil, fuel oil, gasoline, kerosene, lubricants, mineral spirits, naphtha, petroleum based solvents regardless of specific gravity, transformer oil and waste petroleum products and excluding propane and paint.

10. **“biomedical waste”** means,
    a) any part of the human body, including tissues and bodily fluids, but excluding fluids, extracted teeth, hair, nail clippings and the like, that are not infectious,
    b) any part of the carcass of an animal infected with a communicable disease or suspected by a licensed veterinary practitioner to be infected with a communicable disease,
    c) non-anatomical waste infected with communicable disease,
    d) a mixture of a waste referred to in clause (a), (b) or (c) and any other waste or material; or
    e) a waste derived from a waste referred to in clause (a), (b) or (c), unless the waste that is derived from the waste referred to in clause (a), (b) or (c) is produced in accordance with a certificate of approval that states that, in the opinion of the Director, the waste that is produced in accordance with the certificate of approval does not have characteristics similar to the characteristics of waste referred to in clause (a), (b) or (c).

11. "**hazardous waste"** means any waste material intended for disposal or recycling, that is identified as a hazardous waste or hazardous recyclable material by the federal *Export and Import of Hazardous Waste and Hazardous Recyclable Material Regulations*, and/or is included in Class 1 and/or Class 7 of the federal *Transportation of Dangerous Goods Regulations*. This definition excludes any waste(s) for which the Director of the Approvals Branch has issued a written exemption.

12. **“sludge”** means a solid, semi-solid or liquid residue having less than 15% solids generated during the treatment of municipal and/or industrial wastewater, or generated as a result of other processes.

13. **“liquid waste”** means bulk liquids in a volume greater than 20 litres.

14. **“liquid oily waste”** means any waste containing free flowing petroleum products.

15. **"petroleum contaminated soil"** means soil that contains petroleum products at quantities determined, to the satisfaction of the Department, to be above the level indicated in the most recent version of the RBCA Tier I Risk-Based Screening Level (RBSL) Guidelines for Soil: Commercial, Non-potable, Coarse-grained for Modified TPH (Gas + Diesel#2 + #6 Oil).

16. **"C&D debris"** means

    a) concrete, brick and untreated wood,
    b) siding, ceiling tile, gyproc, insulation,
    c) asbestos that is not friable asbestos,
    d) solid roofing materials such as asphalt shingles,
    e) glass from doors and windows,
    f) metal, wood, fibreglass and durable plastic structural materials from the demolition of a building,
    g) wiring and incandescent light fixtures that do not contain fluorescent tubing/lighting,
    h) toilets, bathtubs, wash basins, and plumbing fixtures,
    i) floor coverings attached to a building during demolition,
    j) broken and aged asphalt, or
    k) any mixture of (a) thru (j)

    that has been obtained during the construction, renovation or demolition of a building or structure. Debris or other materials obtained from commercial, industrial and manufacturing sources is not acceptable. Debris: i) from a building that has or may have manufactured, contained, transferred or distributed contaminated or hazardous (such as a pesticide storage warehouse) products; or ii) that contains PCB's (polychlorinated biphenyls), or iii) that contains lead paint of a known concentration greater than 1000ppm (parts per million) or that has been deemed leachable toxic (exceeds 5 mg/L) or contains lead paint that is flaking/chipping/peeling is not considered C&D debris for the purpose of this Approval.

17. **"C&D Site"** means the portion of the Facility approved by the Department for the disposal of C&D debris.

18. **"disposal cell"** means the area at the C&D Site approved by the Department for the disposal of C&D debris.

19. **"sorting area"** means a location at the C&D Site, if approved in writing by the Director, where loads of C&D debris may be dumped and sorted. Unapproved materials may temporarily be stored here.

20. **"household hazardous waste"** means, for the purposes of this approval, hazardous waste that is generated in New Brunswick households.

21. **“hazardous waste collection and transportation network”** means a company that is approved by or acceptable to the Department to collect and transport hazardous waste.

22. **"landfill gas control and collection system"** is the system used to capture landfill gas from the containment cells. The system consists of the collection wells, piping, generator, flare and skid mount blower.

23. **"SWIM"** means Environment Canada's Single Window Information Manager, which is a one-window secure online electronic data reporting system accessible at: https://www.canada.ca/en/environment-climate-change/services/reporting-through-single-window.html

C. EMERGENCY REPORTING

24. The Approval Holder, operator or any person in charge of the Facility **shall immediately** notify the Department where:

    a) there has been, or is likely to be, a release of a contaminant or contaminants, such as leachate, wastewater, petroleum products, hazardous materials, or gaseous material, from the Facility which is of such magnitude or duration that there is a concern for the health or safety of the public, or there could be an impact to the environment.

    Notification Procedure

    During normal office hours, telephone the Department Regional Office **until personal contact is made** (i.e. no voice mail messages will be accepted) and provide as much information that is known about the environmental emergency. The telephone number for the Regional Office is provided below:

    Saint John Regional Office (Phone) at (506) 658-2558

    After hours, or if contact cannot be made to the Regional Office, telephone Environment and Climate Change Canada's National Environmental Emergencies Centre (NEEC) **until personal contact is made** and provide as much information that is known about the environmental emergency. The telephone number for NEEC is provided below:

    NECC (Phone) at 1-800-565-1633

    At this time the problem that occurred, its resulting impact and what was done to minimize the impact should be clearly expressed.

Within 24 hours of the original notification, a copy of an "Incident Report" shall be electronically mailed to the Region 4 (Saint John) Office and Central Office. The "Incident Report" shall clearly detail as much information about the incident that is available. As a minimum the report should include: details of the problem, its resulting impact and what was done to minimize the impact.

Within five (5) working days from the original notification, a "Detailed Emergency Report" shall be emailed to the Region 4 (Saint John) Office and also to Central Office in Fredericton. The "Detailed Emergency Report" shall describe in detail the problem that occurred, why the problem occurred, what the environmental impact was, what was done to minimize the impact, and what measures have been taken to prevent a re-occurrence of the problem.

Electronic Mail Addresses:
Saint John Regional Office at elg.egl-region4@gnb.ca
Central Office in Fredericton to the assigned Approvals Engineer

D. GENERAL INFORMATION

25. The issuance of this Approval does not relieve the Approval Holder from the responsibility of complying with other applicable federal, provincial or municipal legislation and/or bylaws.

26. A copy of this Approval to Operate should be maintained on-site or in the office of the Approval Holder.

27. The Approval Holder shall immediately notify the Department in writing of any change in the legal name or address of the Facility.

28. Any operating problems or other matters that could cause the Facility to be in non-compliance with this Approval should be reported to the Department immediately.

E. TERMS AND CONDITIONS

GENERAL CONDITIONS

29. In the event of Facility closure, the Approval Holder shall, in addition to any requirements under the *Environmental Impact Assessment Regulation 87-83* filed under the *Clean Environment Act*, prepare plans and an engineering closure proposal with ongoing monitoring, landfill gas and leachate management and complete site rehabilitation if appropriate. The plan shall also include other information as requested in writing by the Minister. The plans shall be submitted to the Director for review and approval **at least six (6) months** before the planned closure date. The plans must be prepared or approved by a person who is a member of the Association of Professional Engineers and Geoscientists of the Province of New Brunswick.

30. In the event of closure of the C&D Site at the Facility, the Approval Holder shall ensure that a Closure Plan is prepared and submitted to the Director for review and approval **at least three (3) months** before the planned closure date. The plans must be prepared or approved by a person who is a member of the Association of Professional Engineers and Geoscientists of the Province of New Brunswick and include, but not necessarily be limited to, updated site plans and an engineering proposal for the site rehabilitation, monitoring, leachate treatment if appropriate and closure.

31. The Approval Holder shall ensure that any item received at the Facility containing ozone-depleting substances, including but not limited to those utilized for refrigeration and/or air conditioning, are decommissioned according to the *Ozone Depleting Substances Regulation 97-132* filed under the *Clean Air Act*.

32. The Approval Holder shall ensure that waste, including C&D debris and friable asbestos, that originates from outside of New Brunswick is not accepted at the Facility unless specifically approved by the Minister following an evaluation under the *Environmental Impact Assessment Regulation*.

33. The Approval Holder shall ensure that an Environmental Management Plan (EMP) is in place at the Facility. The EMP should include detailed emergency, contingency response and clean-up procedures for potential spillage, release or mishandling of leachate, a petroleum product, or other dangerous materials at the Facility. The EMP should also include details on how the Facility will respond to emergency situations that may arise such as forest fires, restricted access to the Facility (traffic accidents or other blockade for example), failure of the leachate treatment and sedimentation ponds or leachate collection systems or other events that would interrupt normal operation of the Facility.

    Facility personnel should be appropriately trained to perform emergency and contingency response procedures as described in the EMP.

34. The Approval Holder shall continue to work on developing and implementing the statistical approach, which includes trigger parameters, in order to quickly identify potential impacts from the landfill.

OPERATING CONDITIONS

35. The Approval Holder shall ensure that the Facility is not used for the disposal of the materials listed below unless otherwise approved in writing by the Director.

    - petroleum contaminated soil,
    - liquid wastes (with the exception of septage from the Facility sewage system),
    - sludge (with the exception of sludge from the Facility leachate treatment system),
    - liquid oily wastes,
    - hazardous wastes,
    - biomedical waste or
    - any mixture of the above

36. The Approval Holder shall ensure that any solid waste disposed of at the Facility is done so in the containment cells at the Facility unless otherwise approved in writing by the Director. It is recommended that the waste be regularly and uniformly compacted.

37. The Approval Holder shall ensure that the minimum 25-year breakthrough requirement for the containment cells at the Facility is maintained.

38. The Approval Holder shall ensure that all exposed waste in the containment cells of the Facility is covered with a minimum of 150 mm of clean soil (or an alternate daily cover that has been pre-approved by the Department), as a minimum, at the end of each operating day.

39. The Approval Holder shall provide supervision when any material is being disposed of at the Facility, including the C&D Site. No disposal at the Facility, including the C&D Site, is permitted otherwise.

40. The Approval Holder shall ensure that the incoming waste at the Facility is routinely scrutinized to ensure that unacceptable waste is not received at the Facility.

41. The Approval Holder shall ensure that a buffer strip of native softwood trees is maintained around the Facility in accordance with the Environmental Impact Assessment Study.

42. The Approval Holder shall ensure that a Pest Management Program is in place at the Facility that is in compliance with "Pest Control at NB Landfill Sites and Transfer Stations", attached as Schedule "B".

CONSTRUCTION

43. The Approval Holder shall ensure that the necessary engineering documentation is submitted to the Director, and approved in writing by the Department, prior to the construction, modification or expansion of:
    1) additional solid waste disposal cells;
    2) landfill gas management systems;
    3) sludge handling facilities;
    4) leachate collection and treatment systems;
    5) facilities for processing recyclables;
    6) storage of waste including household hazardous waste;
    7) special waste disposal cells/locations or
    8) any other pertinent construction activity at the Facility.

44. The Approval Holder shall ensure that final cover applied to the containment cells at the Facility shall be a minimum of 300 mm granular layer, 600 mm low permeability clayey till @ 1 x 10^{-7} cm/sec hydraulic conductivity, 150 mm granular protection layer, 150 mm growing medium and vegetative cover and shall be sloped a minimum of 2% to promote precipitation runoff from the disposal cell. All holes, cave-ins and faults shall be filled in or repaired, as required, until the final cover has been properly stabilized. All side slopes shall be designed to ensure proper slope stability and full containment of leachate. As a minimum, a side slope of less than 4 horizontal to 1 vertical should be utilized.

    If approved in writing by the Director, an alternative final cover plan may be used.

45. The Approval Holder shall ensure that a Quality Assurance and Quality Control (QA/QC) report is submitted to the Department upon completion of the installation of final cover on a containment cell or cells at the Facility. The report must be prepared or approved by a person who is a member of the Association of Professional Engineers and Geoscientists of the Province of New Brunswick or is licensed to practise as a professional engineer pursuant to the *Engineering Profession Act* and include as a minimum:
    - commentary that confirms that all construction activities and testing associated with the installation of final cover were supervised by a qualified independent third party and that the final cover meets the Department's requirements as detailed in the previous condition;
    - all test parameters, the number of tests and locations;
    - copies of any inspection and testing reports;
    - a summary of any problems or deficiencies encountered and how they were corrected; and
    - other information as requested by the Department.

    The QA/QC report should be forwarded to the Department no later than 3 months upon completion of the final cover.

46. The Approval Holder shall ensure that all future containment cells at the Facility are designed such that the installed leachate piping can be inspected in the future by video or an alternate method approved in writing by the Director, to ensure that the leachate piping is in proper working condition.

47. The Approval Holder shall ensure that, prior to decommissioning any monitoring wells at the Facility, a decommissioning plan and schedule is submitted to the Director and approved in writing by the Department.

LEACHATE AND SURFACE WATER

48. The Approval Holder shall ensure that no leachate (including treated leachate) or water that has come in contact with solid waste, is released from the Facility to the environment or to the Facility's surface water drainage system including the sedimentation ponds.

49. The Approval Holder shall ensure that all leachate and all water at the Facility that has come in contact with solid waste is directed to the Facility's leachate collection system.

50. The Approval Holder shall ensure that the leachate levels in the disposal cells at the Facility are monitored and recorded Monday thru Friday. If precipitation is scheduled on Saturday and/or Sunday, or if the leachate levels in the disposal cells are high, then monitoring on Saturday and Sunday is also required.

51. The Approval Holder shall ensure that any leachate taken from the Facility to the Lancaster Wastewater Treatment Facility is treated to a level that is acceptable to the City of Saint John.

52. The Approval Holder shall ensure that surface water at the Facility that has not been in contact with leachate or solid waste is directed to the sedimentation pond(s). Clean surface water that has a total suspended solids (TSS) value of 25mg/l or less may be diverted from the sedimentation pond(s) if approved in writing by the Department. Water from empty disposal cells that has not been in contact with leachate or solid waste should bypass the leachate collection system and be directed to the surface water drainage system at the Facility.

53. The Approval Holder shall ensure that the drainage ditches at the Facility are maintained to ensure they remain free flowing at all times.

54. The Approval Holder shall ensure that there is a continuous, permeable layer of gravel surrounding the waste at the Facility from the top of the upper side slopes through the top of the berm area to the leachate collection system. Particular care must be exercised at the top of berm area so that the final cover will properly intersect the top of berm.

55. The Approval Holder shall ensure that the leachate collection piping at the Facility is properly maintained to ensure they remain free flowing.

56. **Prior to October 15, 2021**, and at least once every two years thereafter, the Approval Holder shall ensure that the leachate collection piping at the Facility is inspected by video or other method pre-approved in writing by the Director, to ensure the leachate collection system is in proper working condition.

WASTE DISPOSAL

57. The Approval Holder shall ensure that hot loads arriving at the Facility containing ashes or other materials that could potentially cause a fire in the containment cells are temporarily stored in a separate secure location until the risk of fire has been eliminated. The material shall then be disposed of in the containment cells (or a designated area that has been approved in writing by the Director) at the Facility.

58. The Approval Holder shall ensure that any friable asbestos accepted at the Facility for disposal has been wetted, placed in securely tied, double bagged 6 mil polyethylene bags or securely tied single 6 mil polyethylene bag that has been placed in a drum or cardboard box with all seams securely taped and each bag, cardboard box and/or drum is clearly labelled "WASTE ASBESTOS UN2590" or "DECHETS D'AMIANTE UN2590" and there are no punctures in the containers (if they are punctured, the contents must be wetted and repackaged prior to land filling) and they are placed at a dedicated location within the containment cells and are immediately covered with a minimum of 300 mm of clean cover material, or 1000 mm of municipal solid waste. Asbestos should be accepted at the Facility by appointment only, and not disposed during windy conditions.

59. The Approval Holder shall ensure that there is a sufficient quantity of wetting agent on-site when asbestos is being handled and disposed at the Facility.

60. The Approval Holder shall ensure that any unloading of friable asbestos at the Facility is done by the driver (or assistant) and that they or any personnel at the Facility who handle the asbestos are wearing the proper respirators and clothing during the unloading and disposal of the asbestos waste. Appropriate facility staff must supervise the unloading and covering of the asbestos waste.

61. The Approval Holder shall ensure that an "Asbestos Disposal Record" is maintained. The Record shall include, but not necessarily be limited to, the disposal date, volume of asbestos waste, origin of the shipment, contractor delivering the asbestos waste and a detailed plan of the disposal location at the Facility.

HOUSEHOLD HAZARDOUS WASTE

62. The Approval Holder shall ensure that the household hazardous waste depot at the Facility is operated in accordance with the most recent edition of the household hazardous waste Operations Manual that has been approved in writing by the Department.

63. The Approval Holder shall ensure that only household hazardous waste that is generated in New Brunswick is received and stored in the household hazardous waste depot at the Facility. All household hazardous waste received by the Facility is to be stored in the household hazardous waste depot.

64. The Approval Holder shall ensure that all household hazardous waste being stored in the household hazardous waste depot at the Facility is collected by a hazardous waste collection and transportation network. No household hazardous waste is to be stored at the Facility for more than one year.

65. The Approval Holder shall ensure that household hazardous waste at the Facility shall only be received, sorted, stored, and transferred from the Facility.

66. The Approval Holder shall ensure that all household hazardous waste stored in the household hazardous waste depot is:

    a) secured in sealed and chemically resistant containers;
    b) away from high traffic areas and protected from vehicle impacts;
    c) away from electrical panels;
    d) in a containment area that has secondary containment adequate to contain 110 % of the total volume contained within the containment area;
    e) in a containment area that is designed to prevent contact between incompatible chemicals; and
    f) in a containment area designed to prevent the release or discharge of chemicals to the environment as a result of a spill or other upset condition.

67. **Within 15 days of the end of each month**, the Approval Holder shall submit a monthly report to the Director that includes:
    a) a summary report of all household hazardous waste stored in the household hazardous waste depot for the previous month using a form acceptable to the Department, and
    b) a summary report of all spills that have occurred in association with the operation of the household hazardous waste program. This summary shall identify the material spilled, the approximate volume spilled, the date of the spill, the containment methods employed, and the steps taken to prevent a future recurrence of the spill. This does not relieve the Approval Holder of compliance with the Emergency Reporting section of this Approval.

CONSTRUCTION AND DEMOLITION DEBRIS

68. The Approval Holder shall ensure that only C&D debris is disposed of in the C&D Site's disposal cell. Any material at the C&D Site that is not located in a designated sorting area is considered disposed.

69. The Approval Holder shall ensure that all loads of C&D debris that are brought to the C&D Site have been properly scrutinized before they are disposed. If previously approved in writing by the Director, a designated sorting area may be used to scrutinize loads of C&D debris brought to the C&D Site.

70. The Approval Holder shall ensure that any unapproved materials brought to the C&D Site, including those in a designated sorting area, are either immediately placed in a temporary storage area and removed daily from the C&D Site and properly disposed. If the unapproved material is hazardous or may cause immediate impacts to the environment then it shall be immediately removed from the C&D Site and properly disposed of.

71. The Approval Holder shall provide on-site supervision when C&D debris is being disposed of at the C&D Site. No disposal at the C&D Site is permitted otherwise.

72. The Approval Holder shall ensure that clean/uncontaminated cover material at least 150 mm deep is applied to all exposed C&D debris at the C&D Site at least once per week.

73. The Approval Holder shall ensure that any final cover applied at the C&D Site is sloped in such a manner to ensure positive drainage and prevent standing or pooling of water on the surface.

74. The Approval Holder shall ensure that the area between the property line of the Facility and the C&D Site disposal cell is maintained with a treed or bermed buffer zone.

75. The Approval Holder shall ensure that the C&D Site is designed and operated such that surface water is prevented from entering the C&D debris disposal cell. No C&D debris shall be disposed of in free standing water.

76. The Approval Holder shall ensure that a minimum of 1.5 metres of overburden is maintained between the C&D debris and the bedrock and seasonal high groundwater.

77. The Approval Holder shall ensure that the C&D debris disposed of at the C&D Site is regularly compacted to minimize voids. Compaction with a dozer or equivalent is recommended.

78. The Approval Holder shall ensure that the side slopes of the disposal area of the C&D Site are properly stabilized (using riprap or a vegetative layer as part of the cover system for example) and maintained to limit erosion.

79. The Approval Holder shall ensure that a 50 metre treed or bermed buffer zone is maintained on the southern, northern and western boundaries of the C&D Site. It is understood at this time that the entire approved area for the C&D Site may be clearcut as part of a scientific evaluation of woodlot procedures. Ensure that the clearcut area is not grubbed if the scientific evaluation proceeds.

SITE MANAGEMENT

80. The Approval Holder shall ensure that areas of the containment cells at the Facility that will be inactive for at least three months are covered with a 300 mm intermediate cover layer, graded to promote drainage and minimize erosion and infiltration. Any leachate or any water that has, or could, come in contact with waste in the containment cells must be directed to the leachate collection system.

81. The Approval Holder shall ensure that white goods, scrap metals, electronics, propane tanks/canisters, wood, tires and any other materials being salvaged at the Facility are stored in a secured area separate from the main waste disposal area.

82. The Approval Holder shall ensure that debris and litter at the Facility is controlled. Adequate barriers and/or fencing shall be utilized to confine debris and litter to the immediate disposal area. Any debris or litter found along the access roads or otherwise not contained in the disposal cells shall be routinely collected and disposed in an appropriate location.

83. The Approval Holder shall ensure that unauthorized access to and scavenging at the Facility is controlled.

84. The Approval Holder shall ensure that the visibility buffer that has been established on the south and west borders of the Facility is maintained at a height of at least 6 meters.

LANDFILL GAS MANAGEMENT

85. The Approval Holder shall ensure that any landfill gas that is not utilized by the electric generator should be sent to the landfill gas flare as necessary to reduce greenhouse gases.

86. The Approval Holder shall ensure that a continuous temperature monitor is fully functional and in operation at all times when the landfill gas flare is in use. The temperature shall be recorded once every hour.

    An electronic record of the temperature results shall be maintained for a minimum of two years and shall be made available to an inspector upon request.

87. The Approval Holder shall ensure that the landfill gas control and collection system is properly operated and maintained.

88. The Approval Holder shall ensure that when the flare of the landfill gas control and collection system is operated with a minimum gas residence time of 0.75 seconds at a minimum temperature of 875 degrees Celsius to maximize the destruction efficiency.

89. The Approval Holder shall notify the Department if the continuous temperature monitor is taken out of service for maintenance or repair while the landfill gas flare is in operation. During the maintenance or repair the temperature shall be manually monitored and recorded on a schedule approved in writing by the Department.

EMISSIONS AND DISCHARGES

90. The Approval Holder shall ensure that no leachate is discharged from the Facility to the environment.

91. The Approval Holder shall ensure that any discharge from the Facility, including the sedimentation pond, to a watercourse has a total suspended solids (TSS) value of 25 mg/l or less.

92. The Approval Holder shall ensure that there is no open burning conducted at the Facility, including the C&D Site.

93. The Approval Holder shall ensure that both odour and noise emissions released from the Facility are controlled to prevent impacts to off-site receptors. In the event that odour or noise emission impacts do occur, the Department may require the Approval Holder to develop, submit and implement a Control Plan that mitigates the impacts such that they no longer cause a nuisance to off-site receptors. The Control Plan shall be submitted to the Director for review and approval prior to implementation.

94. The Approval Holder shall ensure that fugitive dust emissions generated from truck traffic or other activities at the Facility are controlled by the use of water. Written permission from the Department must first be obtained if calcium chloride or other chemical compounds are to be used for dust control. The use of a petroleum product for dust control is **prohibited.**

TESTING AND MONITORING

95. The Approval Holder shall ensure that the groundwater monitoring wells at the Facility are sampled at seasonal intervals that provide an accurate representation of groundwater quality at the Facility. The existing network of groundwater monitoring wells at the Facility is as follows:

Well Nest	Shallow Till	Deep Till	Shallow Bedrock	Mid Bedrock	Deep Bedrock
MW31			MW31-S	MW31-U	
MW31-L					
MW32			MW32-U	MW32-L	
MW33	MW33-S		MW33-U		
MW34	MW34-S		MW34-U		
MW35	MW35-S1	MW35-S2	MW35-L		
MW36	MW36-S		MW36-U	MW36-L	
MW37	MW37-S				
MW38	MW38-S		MW38-U	MW38-L	
MW39	MW39-S				
MW40	MW40-S		MW40-U		
MW41	MW41-S		MW41-U	MW41-L	
MW42	MW42-S		MW42-U	MW42-L	
MW43	MW43-S		MW43-U		
MW44	MW44-S		MW44-U		
MW45			MW45-U	MW45-L	
MW46			MW46-U	MW46-L	
MW47	MW47-S		MW47-U	MW47-L	
MW48	MW48-S		MW48-U	MW48-L	

MW49	MW49-S		MW49-U	MW49-L
MW50	MW50-S		MW50-U	MW50-L
MW51	MW51-S1	MW51-S2		MW51-D
MW52	MW52-S			MW52-D
MW53				MW53-D
MW54	MW54-S		MW54-U	

96. The Approval Holder shall ensure that any new groundwater monitoring wells, underdrains, leak detection systems or other sampling points at the Facility are sampled and analyzed as directed by the Department in writing.

97. The Approval Holder shall ensure that all ground and surface water samples required to be obtained for the Facility are obtained by a qualified technician and, unless otherwise approved in writing by the Director, analyzed by a laboratory that is, as a minimum, a member in good standing of the Canadian Association for Laboratory Accreditation (CALA) Proficiency Testing Program for Environmental Laboratories.

For the purpose of this Approval, "GENERAL CHEMISTRY" shall include the following analyses:

Ammonia	Alkalinity (as $CaCO_3$)	Calcium
Chemical Oxygen Demand	Chloride	Colour
Copper	Hardness (as $CaCO_3$)	Iron
Nitrate-Nitrite (as N)	Magnesium	Manganese
o-Phosphate (as P)	Phenols	Potassium
r-Silica (as SiO_2)	Sodium	Sulphur (Sulphate & Sulphide)
Total Suspended Solids	Total Organic Carbon	Turbidity
Total Kjeldahl Nitrogen (TKN)	Zinc	

with the associated calculated parameters: Bicarbonate, Carbonate, Hydroxide, Cation Sum, Anion Sum, % difference, Theoretical conductance, Saturation pH (5^oC) and Langelier Index (5^oC).

and "TRACE METALS" shall include the following analyses:

Aluminum	Antimony	Arsenic	Barium
Beryllium	Bismuth	Boron	Cadmium
Calcium	Chromium	Cobalt	Copper
Iron	Lead	Magnesium	Manganese
Mercury (CVAAS)		Molybdenum	Nickel Potassium
Selenium	Silver	Sodium	Strontium
Thallium	Tin	Uranium	Vanadium
Zinc			

and "BTEX/TPH" shall be analyzed in accordance with the Atlantic RBCA Tier 1 Guidelines for Laboratories and shall include the following parameters:

Benzene	C6-C10 Hydrocarbons
Toluene	>C10-C21 Hydrocarbons
Ethylbenzene	>C21-<C32 Hydrocarbons
Xylene	Modified TPH (Tier 1)

% Rec. iso-butylbenzene-Volatile
% Rec. iso-butylbenzene-Extractable
% Rec. n-dotriacontane-Extractable

98. The Approval Holder shall ensure that the following field parameters are obtained during each sampling event at the Facility:

Conductivity	Dissolved Oxygen	pH
Temperature	ground water elevations (referenced to geodetic datum)	

99. The Approval Holder shall ensure that prior to obtaining a ground water sample from a monitoring well at the Facility, a minimum of one well volume and a maximum of three well volumes be purged from that monitoring well.

100. The Approval Holder shall ensure that all field testing equipment is calibrated before and after each sampling event conducted at the Facility.

101. The Approval Holder shall ensure that groundwater samples to be submitted for analysis of TRACE METALS are field filtered using 0.45 µm in-line waterra filter or equivalent. All other samples should be unfiltered.

102. The Approval Holder shall ensure that the leachate surge pond, leachate holding pond and disposal cell underdrains at the Facility are sampled on at least 5 different occasions each calendar year and analyzed for GENERAL CHEMISTRY, TRACE METALS and BTEX/TPH.

103. The Approval Holder shall ensure that the leachate discharged from the containment cells at the Facility (MH#1) is sampled monthly and analyzed for the following parameters:

Alkalinity	Ammonia	Barium	Boron
BOD_5	Cadmium	COD	Chromium
Calcium	Chloride	Copper	Cyanide
Iron	Magnesium	Manganese	Lead
Mercury	Nitrite-Nitrate	Nickel	Phenols
Sodium	Sulphate	TSS/TDS	Total Organic Carbon (TOC)
TKN	Total Phosphate	Zinc	

and BTEX/TPH

104. The Approval Holder shall ensure that the groundwater monitoring well nests MW31 thru MW50 are sampled during the Spring and Fall seasons of each calendar year for GENERAL CHEMISTRY, TRACE METALS and BTEX/TPH.

105. The Approval Holder shall ensure that the groundwater monitoring well nests MW51 thru MW54 are sampled in the Spring, Summer and Fall months and analyzed for GENERAL CHEMISTRY, TRACE METALS & BTEX/TPH.

106. The Approval Holder shall ensure that the groundwater monitoring wells MW33U, MW34S, MW34U, MW35S2, MW35L, MW38U, MW41S and MW41U are sampled on at least five different occasions between February and November of each year and analyzed for GENERAL CHEMISTRY.

107. The Approval Holder shall ensure that the surface water sampling stations SW1, SW2, SW3, SW4, SW5, SW6 and the sedimentation pond discharge shall be sampled in the Spring and Fall seasons of each year and analyzed for GENERAL CHEMISTRY, TRACE METALS, BTEX/TPH, TKN, BOD_5 and TSS/TDS.

The sedimentation pond discharge shall be sampled near the mid-point of a discharge event.

108. The Approval Holder shall ensure that the results of all sampling and analysis conducted at the Facility are kept on file in both a hardcopy and electronic version.

109. The Approval Holder shall ensure that in September or October of each year the domestic wells chosen for the Domestic Well Monitoring Program are sampled and analyzed for the following parameters:

Ammonia	Alkalinity (as $CaCO_3$)	Calcium
Chloride	Copper	Iron
Nitrate-Nitrite (as N)	Magnesium	Manganese
o-Phosphate (as P)	Potassium	pH
r-Silica (as SiO_2)	Sodium	Sulphate
Total Disolved Solids	Total Organic Carbon	Turbidity
Zinc	Conductivity	Temperature

with the associated calculated parameters: Bicarbonate, Carbonate, Hydroxide, Cation Sum, Anion Sum, % difference, Theoretical conductance, Hardness (as $CaCO_3$), Ion Sum, Saturation pH (5^0C) and Langelier Index (5^0C).

110. The Approval Holder shall ensure that for each discharge of water from the sedimentation pond at the Facility a sample is obtained at the mid-point of the discharge event and analyzed for Total Suspended Solids (TSS).

111. The Approval Holder shall ensure that all monitoring samples required under this approval are obtained by a qualified technician and, unless otherwise Approved, analyzed by a laboratory that is accredited by the Canadian Association for Laboratory Accreditation (CALA) and having completed the CALA Proficiency Testing Program for the requested parameters.

REPORTING

112. On or before **May 31, August 31 & November 30 of each calendar year**, the Approval Holder shall ensure that an environmental monitoring report is submitted to the Director. It is understood that the May report will include monitoring from January to March, the August report will include monitoring from April to June and the November report will include monitoring from July to September. The 4th quarter report for monitoring of October to December will be included with the Annual Environmental Report. The reports must be prepared or approved by a person who is a member of the Association of Professional Engineers and Geoscientists of the Province of New Brunswick or is licensed to practice as a professional engineer pursuant to the *Engineering Profession Act* and include, as a minimum, a copy of the analysis, a comparison of the analysis with previous analytical results from the Facility, and commentary indicating whether their is an indication of any immediate, or potential threat or impact to the environment, ground or any surface waters. If an impact has occurred or is suspected the report must include a proposal for further investigation and/or remediation.

113. On or before **February 28 of each year**, the Approval Holder shall ensure that an Annual Environmental Report for the previous calendar year is submitted to the Director. The report must include as a minimum:
   a) a copy of the Asbestos Disposal Record;
   b) recommendations for any future monitoring, groundwater well installation or other work at the Facility;
   c) confirmation that all field testing equipment has been calibrated before and after each sampling event conducted at the Facility;
   d) confirmation that each groundwater monitoring well has been appropriately purged prior to obtaining a sample;
   e) dates of all sampling conducted at the Facility;
   f) dates of each discharge from the sedimentation pond;
   g) a copy of the analytical results of the sampling and monitoring data obtained from the Facility for the previous calendar year and a review of those analytical results that is completed by a professional engineer or geoscientist licensed with the Association of Professional Engineers and Geoscientists of New Brunswick that includes as a minimum:
   h) comparisons with historical results from the Facility;
   i) identification of possible analytical anomalies;
   j) an evaluation and discussion of the results for the surface water sampling points, groundwater monitoring wells, any cell or leachate pond underdrains/subdrain collection manholes and commentary on whether or not there is evidence of an immediate or potential impact to the environment, ground or surface waters and if so, recommendations for additional investigation, monitoring and remediation to mitigate the impacts;

k) confirmation that the containment cells and leachate pond(s) have been operated such that the minimum breakthrough requirements have been maintained; and

l) trending graphs for each monitoring well at the Facility and the leachate pond leak detection and cell underdrain manholes for the following indicator parameters showing results vs. time:

Alkalinity, Ammonia, Barium, Boron, Calcium, Chloride, Conductivity, Iron, Magnesium, pH, Sodium, Sulphate, and Dissolved Organic Carbon.

Note: Trending graphs should be completed on an annual basis but an alternate schedule may be accepted if approved in writing by the Director.

114. In the event the Approval Holder violates any Term or Condition of this Approval the Approval Holder is to immediately report this violation to the Department by calling (506) 453-7945. In the event the violation may cause the health or safety of the general public to be at risk and/or harm to the environment could or has resulted, the Approval Holder shall follow the Emergency Reporting procedures contained in this Approval.

115. In the event the Approval Holder receives a complaint from the public regarding unfavourable environmental impacts associated with the Facility, the Approval Holder is to report this complaint to the Department within one business day of receiving the complaint.

116. **Prior to November 30 of each year,** the Approval Holder shall ensure that each homeowner that has their well sampled as part of the Domestic Well Monitoring Program receives a signed copy of the analysis from the laboratory that did the analysis and a summary sheet that highlights any concerns or potential problems found in the analysis.

117. **Prior to November 30 of each year**, the Approval Holder shall ensure that a Domestic Well Monitoring Program report is submitted to the Department of Health. The report, as a minimum, shall include a signed copy of the analytical results and a summary of each well that has been completed by a qualified person that highlights any concerns or potential problems found.

A letter shall also be sent to the Department prior to November 30 of each year indicating that the sampling and analysis has been completed and that 1) a report has been forwarded to the Department of Health and 2) a signed copy of the analysis and summary of the results by a qualified person has been sent to each homeowner participating in the program.

118. The Approval Holder shall submit to the Department an annual status report by **June 30th** of each year, with respect to **Condition 34.** The report shall include a summary of work done in the previous year and any new or modified actions taken to the protocols.

119. **Prior to December 15, 2022**, the Approval Holder shall submit a Report, for review and approval by the Department, summarizing the Landfill Closure Plan and Post Closure Expenses Report to include a review for information or financial gaps. The Report shall demonstrate compliance with both the Landfill Closure Plan and Expenses Report requirements and provide a strategy for addressing any outstanding items.

120. **Beginning in 2021**, the Approval Holder shall submit a greenhouse gas emissions report by June 1st of each year, for the previous calendar year, to the Department by means of the SWIM system. Reporting shall be consistent with Environment Canada's Greenhouse Gas Emissions Reporting Program (GHGRP). Reporting requirements are published annually in the Canada Gazette, Part 1 under the authority of subsection 46(1) of the *Canadian Environmental Protection Act, 1999* (CEPA 1999).

121. **Prior to March 31st, 2022**, the Approval Holder shall prepare and submit a Greenhouse Gas Management Plan to the Department in accordance with the Guidelines for Greenhouse Gas Management for Industrial Emitters in New Brunswick, July 2015, or as may be updated from time to time. The Greenhouse Gas Management Plan shall be renewed every 5 years, as a minimum.

122. **Beginning in 2023**, the Approval Holder shall prepare and submit an Annual Greenhouse Gas Progress Report to the Department by July 1st of each year, for the previous calendar year, in accordance with the Guidelines for Greenhouse Gas Management for Industrial Emitters in New Brunswick.

Prepared by: Sheryl Johnstone

Sheryl Johnstone, P.Eng.
Senior Approvals Engineer, Authorizations

SCHEDULE "B"

PEST CONTROL AT NB LANDFILL SITES AND TRANSFER STATIONS

1. **Terms and Conditions for Rodent Control at NB Landfill Sites and Transfer Stations**

1. All personnel directly involved in the mixing, loading and application of the pesticides for the control of rodents at waste disposal facilities must hold a valid Class E, Class F, or Class L Pesticide Applicator's Certificate, which must be in their immediate possession.

2. Professional companies hired to conduct this work must hold a valid Provincial Operator's License and Pesticide Use Permit.

3. The treatment area must be posted with an approved sign prior to the treatment.

4 The signs are to be conspicuously posted at all ordinary points of access.

5 The applicator shall ensure that the signs are removed after either the completion of treatment or the expiration of their permit.

6 The sign shall be rectangular in shape with a minimum size of 14 cm x 21 cm, rain resistant with type or letters of sufficient size and clarity to be easily read together with a symbol of a cautionary raised hand inside a symbol of a stop sign. The information on the sign must be bilingual and must contain the words "Attention, Pesticide Application", the name of the pesticide, the Pest Control Product registration number, date of application, name of applicator, operator name or logo and telephone number.

7 Industry approved tamper resistant bait stations must be attempted before using other methods of baiting.

8 The Director of Pesticides Control or any member of the Pesticides Management Unit must approve areas that require alternative baiting methods. They can be contacted at (506) 453-7945.

ANNEXE B

Caractéristiques typiques des cellules d'enfouissement

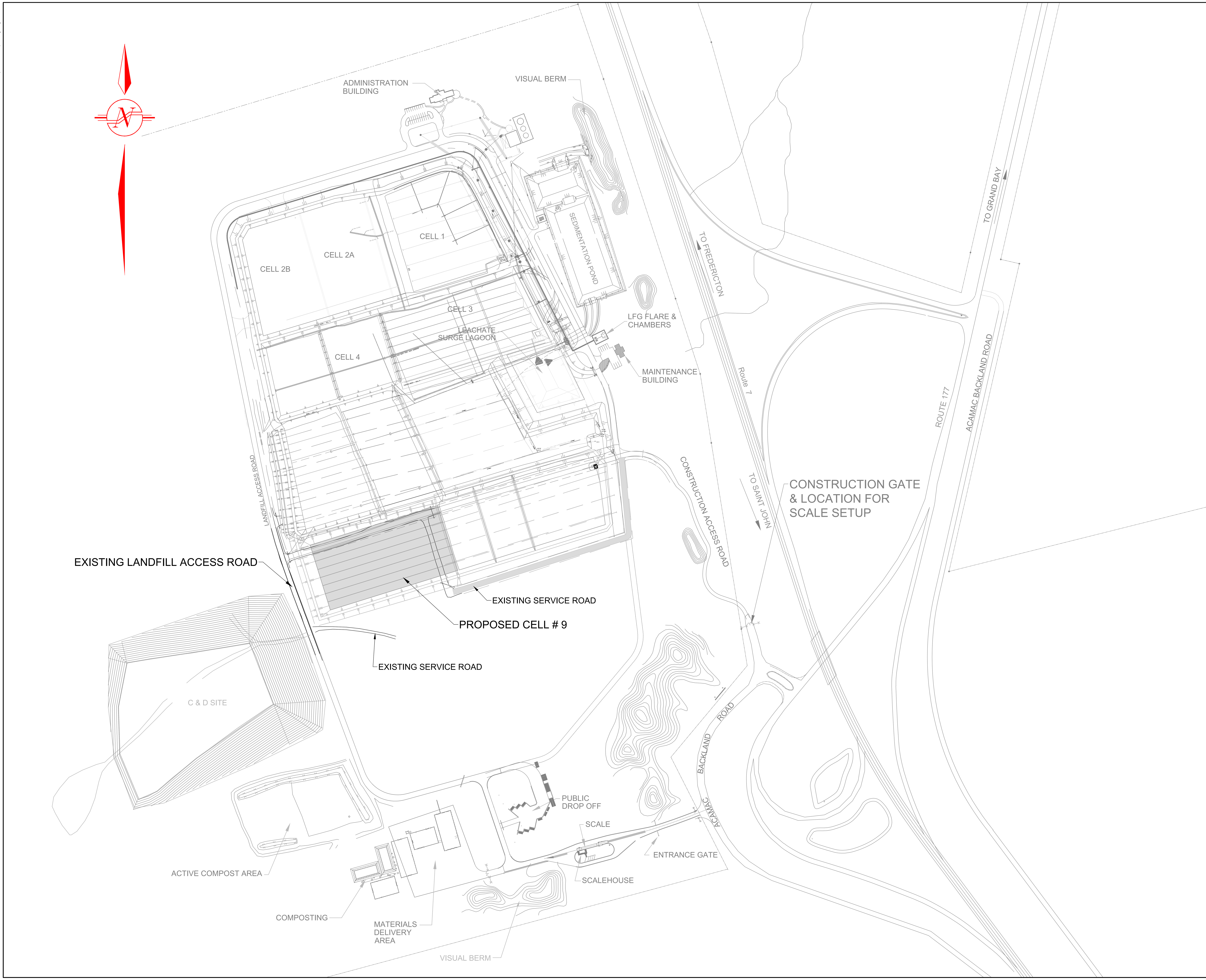
FRSC CRANE MOUNTAIN LANDFILL
PROJECT 2021 - 01
CONTAINMENT CELL # 9

Fundy Regional Service Commission
Commission de Services Régionaux de Fundy

GEMTEC
CONSULTING ENGINEERS AND SCIENTISTS

SITE

DRAWING INDEX	
D1	GENERAL SITE PLAN
D2	SITE PLAN SHOWING EXISTING CONDITIONS
D3	CELL # 9 SUBGRADE LAYOUT AND GRADING
D4	CELL # 9 HDPE LINER LAYOUT AND GRADING
D5	CELL # 9 CLEAR STONE AND FINAL CELL LAYOUT AND GRADING
D6	CELL # 9 CROSS SECTION PROFILES - 1
D7	CELL # 9 CROSS SECTION PROFILES - 2
D6	CELL # 9 DETAILS - 1
D6	CELL # 9 DETAILS - 2



Gemtec Ltd. 191 Doak Road, Fredericton, N.B. (506)453-1025

Fundy Regional Service Commission
Commission de Services Régionaux de Fundy

LEGEND

Number	Issue	YYYY/MM/DD
1	Issued for Construction	2021/05/12

Engineer's Stamp

#M6407 Ljubiša Kalaba 2021/05/12

Drawn By LK | Checked By M.L.S.

Project

FRSC CRANE MOUNTAIN LANDFILL CONTAINMENT CELL # 9 DEVELOPMENT

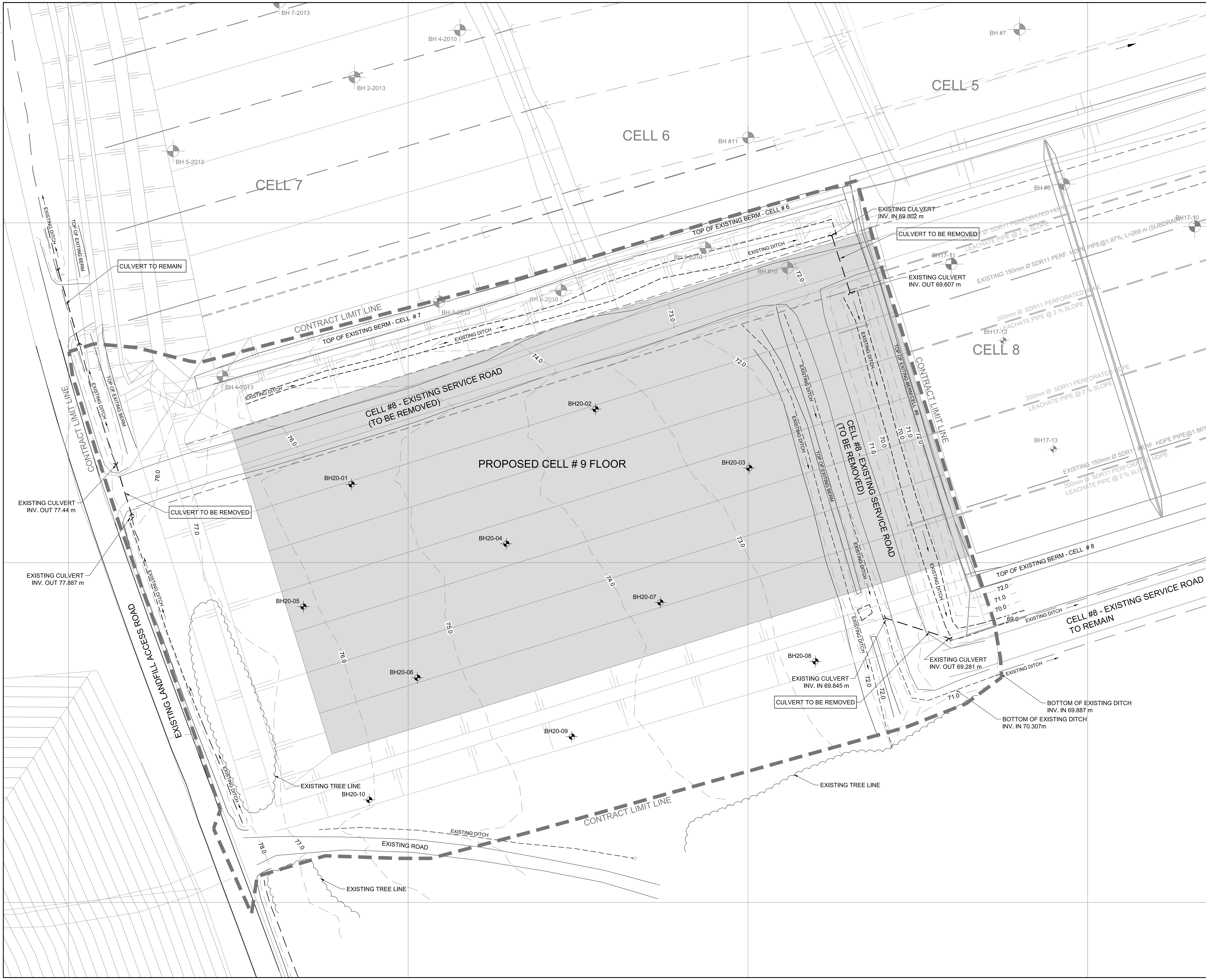
Drawing

GENERAL SITE PLAN

Scale 1:2500
0 50 100 150m

File No. 10001800202 | Sheet No. D1

GEMTEC
CONSULTING ENGINEERS AND SCIENTISTS



LEGEND

BOREHOLE LOCATION CONDUCTED PREVIOUS YEARS

BOREHOLE LOCATION CONDUCTED FOR THE PROPOSED CELL # 9

72.0 EXISTING CONTOURS

EXISTING EDGE OF ROAD

EXISTING DITCH

EXISTING CELL # 8 LEACHATE PIPE

EXISTING CELL # 8 SUBDRAIN PIPE

EXISTING CULVERT

PROPOSED CELL # 9 CONTRACT LIMIT LINE

PROPOSED CELL # 9 FLOOR AREA

PROPOSED CELL # 9 BERM LAYOUT

Number	Issue	YYYY/MM/DD
1	Issued for Construction	2021/05/12

Engineer's Stamp

Drawn By: LK
Checked By: M.L.S.

Project

FRSC CRANE MOUNTAIN LANDFILL CONTAINMENT CELL # 9 DEVELOPMENT

Drawing

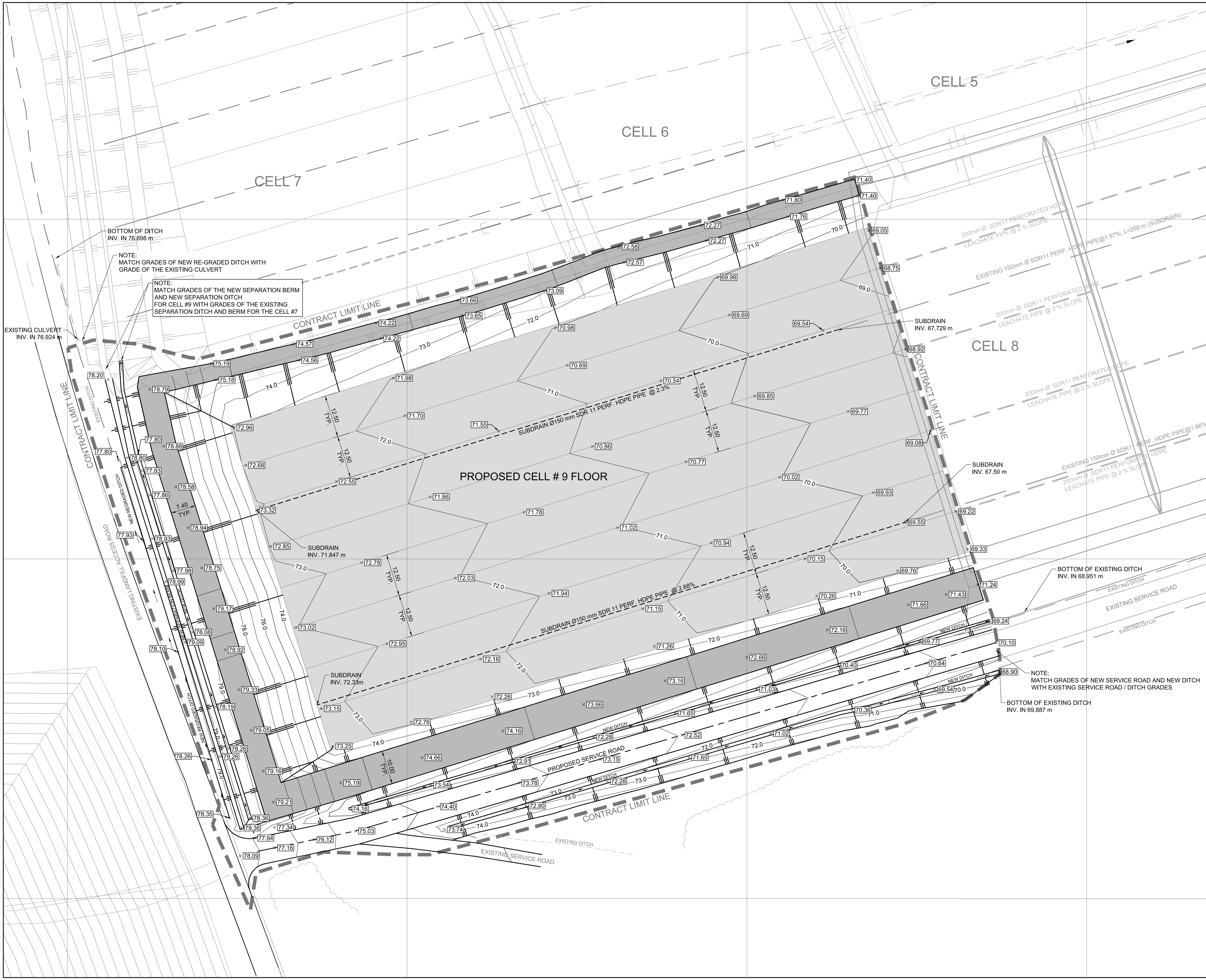
SITE PLAN SHOWING EXISTING CONDITIONS

Scale: 1:500 (0 10 20 30m)

File No.: 10001800202
Sheet No.: D2

GEMTEC CONSULTING ENGINEERS AND SCIENTISTS

Gemtec Ltd. 191 Doak Road, Fredericton, N.B. (506)453-1025



Fundy Regional Service Commission
Commission de Services Régionaux de Fundy

LEGEND

EXISTING EDGE OF ROAD
EXISTING CULVERT
EXISTING DITCH
EXISTING CELL # 8 LEACHATE PIPE
EXISTING CELL # 8 SUBDRAIN PIPE
PROPOSED CELL # 9 CONTRACT LIMIT LINE
72.0 PROPOSED SUBGRADE CONTOURS
69.54 PROPOSED SUBGRADE SPOT ELEV.
PROPOSED CELL # 9 SUBGRADE FLOOR AREA
PROPOSED CELL # 9 BERM LAYOUT
PROPOSED CELL # 9 HDPE SUBDRAIN PIPE
PROPOSED CELL # 9 DITCH

NOTE:
THE PROPOSED SUBBASE FLOOR ELEVATIONS ARE 300 mm ABOVE FLOOR SUBGRADE SURFACE.

Number	Issue	YYYY/MM/DD
1	Issued for Construction	2021/05/12

Engineer's Stamp: REGISTERED PROFESSIONAL ENGINEER, Province of New Brunswick, #M6407, Ljubiša Kalaba, 2021/05/12

Drawn By: LK
Checked By: M.L.S.

Project: FRSC CRANE MOUNTAIN LANDFILL CONTAINMENT CELL # 9 DEVELOPMENT

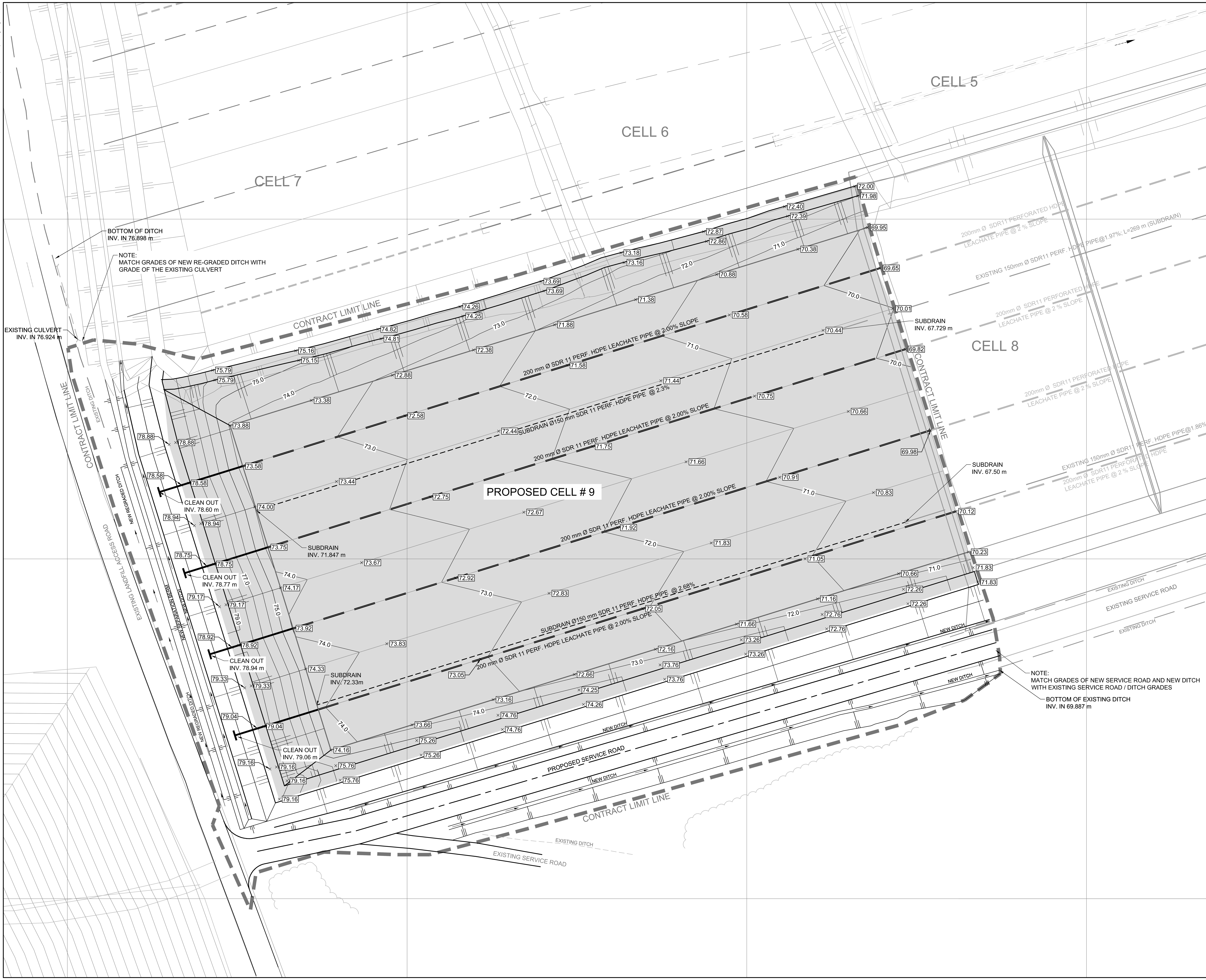
Drawing: CELL #9 SUBGRADE LAYOUT AND GRADING

Scale: 1:500 (0, 10, 20, 30m)

File No.: 10001800202
Sheet No.: D3

GEMTEC
CONSULTING ENGINEERS AND SCIENTISTS

Gemtec Ltd. 191 Doak Road, Fredericton, N.B. (506)453-1025



Fundy Regional Service Commission
Commission de Services Régionaux de Fundy

LEGEND

- EXISTING EDGE OF ROAD
- EXISTING CULVERT
- EXISTING DITCH
- EXISTING CELL # 8 LEACHATE PIPE
- EXISTING CELL # 8 SUBDRAIN PIPE
- PROPOSED CELL # 9 CONTRACT LIMIT LINE
- 72.0 PROPOSED HDPE LINER CONTOURS
- × 69.54 PROPOSED HDPE LINER SPOT ELEV.
- PROPOSED CELL # 9 HDPE LINER AREA
- PROPOSED CELL # 9 FINAL BERM LAYOUT
- PROPOSED CELL # 9 HDPE SUBDRAIN PIPE
- PROPOSED CELL # 9 HDPE LEACHATE PIPE
- PROPOSED CELL # 9 DITCH

Number	Issue	YYYY/MM/DD
1	Issued for Construction	2021/05/12

Engineer's Stamp

REGISTERED PROFESSIONAL ENGINEER
#M6407
Ljubiša Kalaba
2021/05/12

Drawn By: LK
Checked By: M.L.S.

Project

FRSC CRANE MOUNTAIN LANDFILL
PROJECT 2021 - 01
CONTAINMENT CELL # 9

Drawing

CELL # 9
HDPE LINER LAYOUT AND GRADING

Scale: 1:500 (0, 10, 20, 30m)

File No.: 10001800202
Sheet No.: D4

GEMTEC
CONSULTING ENGINEERS AND SCIENTISTS

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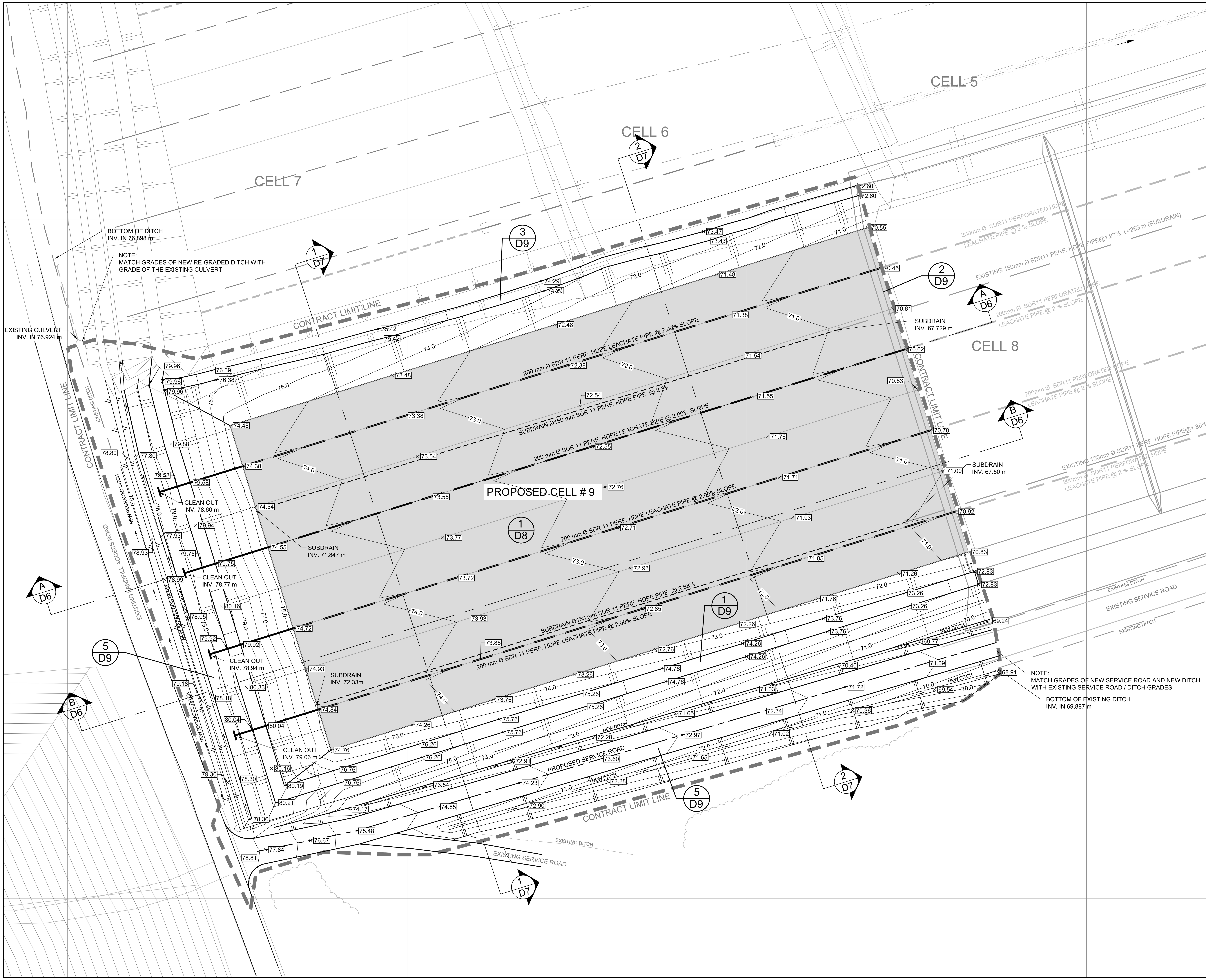


Fundy Regional Service Commission
Commission de Services Régionaux de Fundy

LEGEND

- EXISTING EDGE OF ROAD
- EXISTING CULVERT
- EXISTING DITCH
- EXISTING CELL # 8 LEACHATE PIPE
- EXISTING CELL # 8 SUBDRAIN PIPE
- PROPOSED CELL # 9 CONTRACT LIMIT LINE
- 72.0 PROPOSED CELL # FINAL SURFACE CONTOURS
- × 69.54 PROPOSED CELL # 9 FINAL SPOT ELEVATIONS
- PROPOSED CELL # 9 FLOOR AREA
- PROPOSED CELL # 9 FINAL BERM LAYOUT
- PROPOSED CELL # 9 HDPE SUBDRAIN PIPE
- PROPOSED CELL # 9 HDPE LEACHATE PIPE
- PROPOSED CELL # 9 DITCH

Number	Issue	YYYY/MM/DD
1	Issued for Construction	2021/05/12

Engineer's Stamp: REGISTERED PROFESSIONAL ENGINEER, Province of New Brunswick, #M6407, Ljubiša Kalaba, 2021/05/12

Drawn By: LK
Checked By: M.L.S.

Project: FRSC CRANE MOUNTAIN LANDFILL PROJECT 2021 - 01 CONTAINMENT CELL # 9

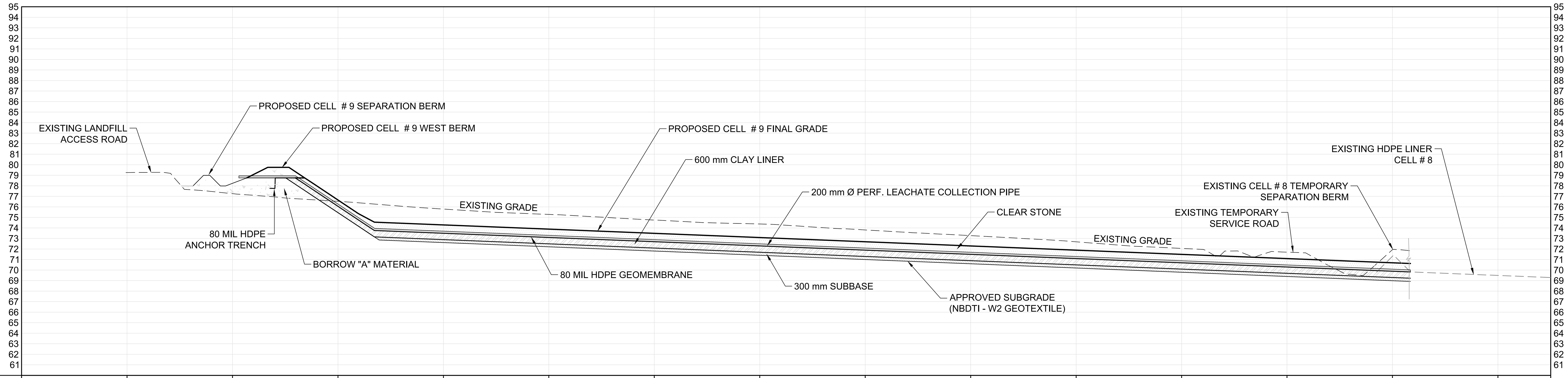
Drawing: CELL # 9 CLEAR STONE AND FINAL CELL LAYOUT AND GRADING

Scale: 1:500 (0, 10, 20, 30m)

File No.: 10001800202
Sheet No.: D5

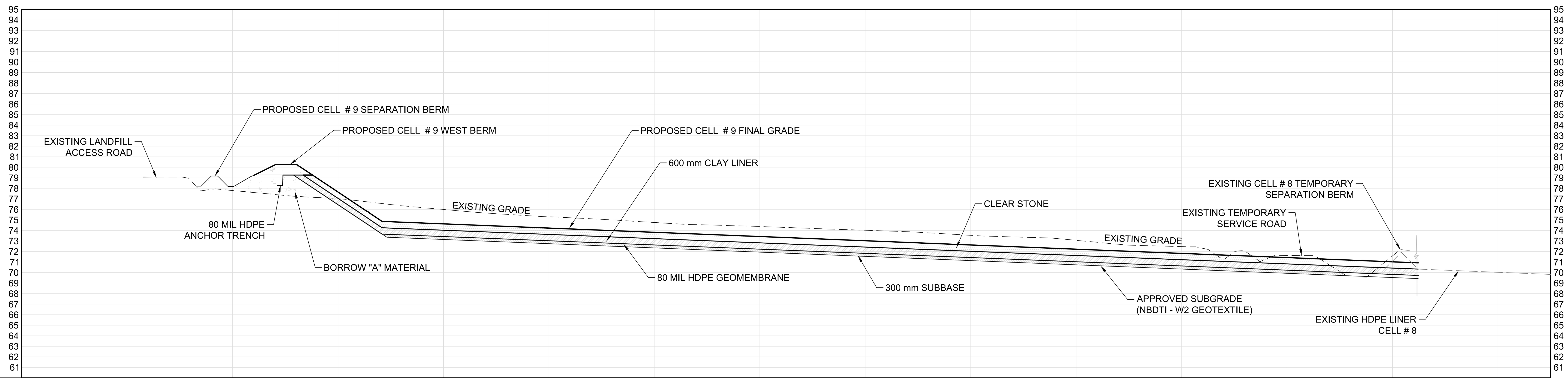
GEMTEC CONSULTING ENGINEERS AND SCIENTISTS
Gemtec Ltd. 191 Doak Road, Fredericton, N.B. (506)453-1025

A-A PROFILE



STATION	EXISTING GRADE	PROPOSED GRADE
0+000		
0+020	79.26	
0+040	77.26	78.237
0+060	76.52	75.450
0+080	75.79	72.605
0+100	75.28	72.203
0+120	74.75	71.801
0+140	74.38	71.399
0+160	73.81	70.998
0+180	73.27	70.596
0+200	72.68	70.194
0+220	72.05	69.792
0+240	71.70	69.390
0+260	71.93	68.988
0+280		
0+290		

B-B PROFILE



STATION	EXISTING GRADE	PROPOSED GRADE
0+000		
0+020		
0+040	77.79	78.166
0+060	77.02	76.451
0+080	76.00	73.144
0+100	75.30	72.743
0+120	74.76	72.341
0+140	74.38	71.939
0+160	74.02	71.537
0+180	73.54	71.135
0+200	73.07	70.733
0+220	72.47	70.331
0+240	71.62	69.930
0+260	71.59	69.528
0+280		
0+290		

Vertical Scale 1:250
0 5 10 15m

Fundy Regional Service Commission
Commission de Services Régionaux de Fundy

LEGEND

Number	Issue	YYYY/MM/DD
1	Issued for Construction	2021/05/12

Engineer's Stamp
REGISTERED PROFESSIONAL ENGINEER
#M6407
Ljubiša Kalaba
2021/05/12

Drawn By: L.K.
Checked By: M.L.S.

Project:
FRSC CRANE MOUNTAIN LANDFILL
PROJECT 2021 - 01
CONTAINMENT CELL # 9

Drawing:
CELL #9
CROSS SECTIONS PROFILES - 1

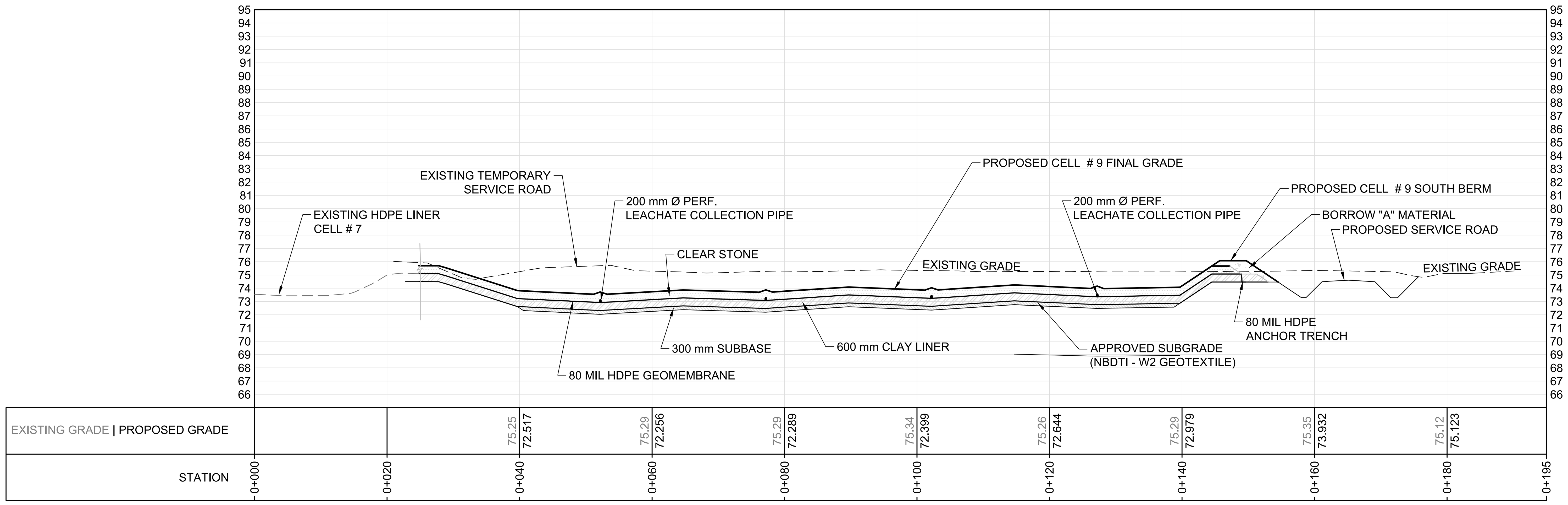
Scale: 1:500
0 10 20 30m

File No.: 10001800202
Sheet No.: D6

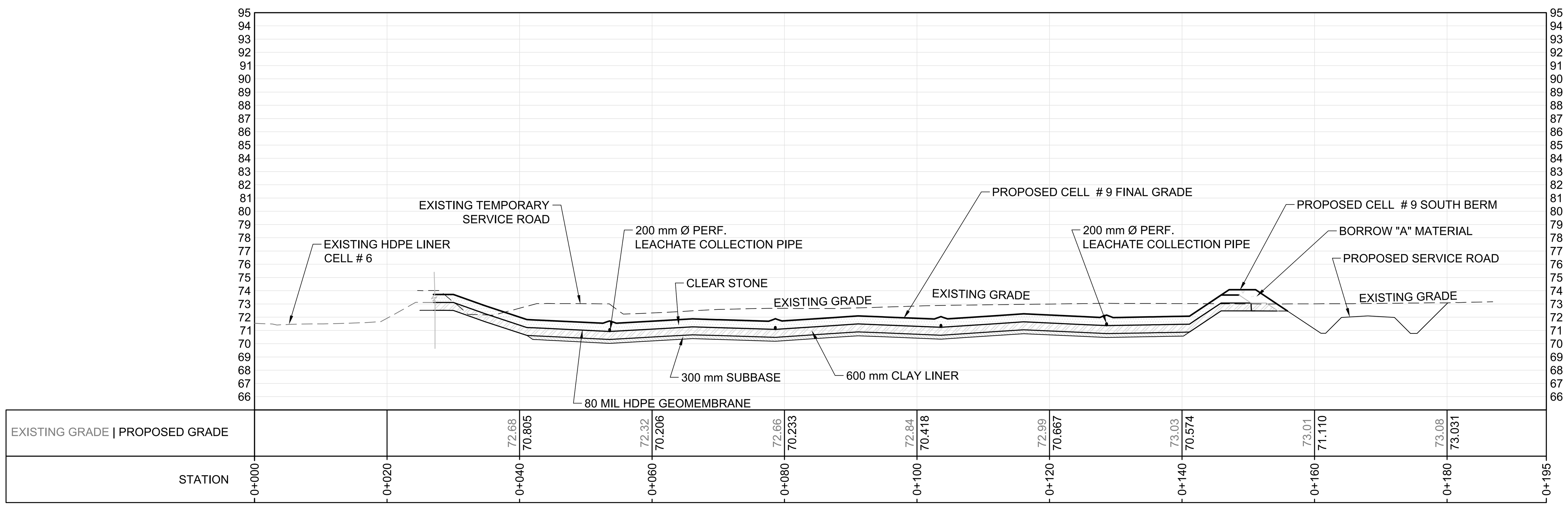
GEMTEC
CONSULTING ENGINEERS AND SCIENTISTS

Gemtec Ltd. 191 Doak Road, Fredericton, N.B. (506)453-1025

1-1 PROFILE



2-2 PROFILE



Vertical Scale 1:250
0 5 10 15m

Fundy Regional Service Commission
Commission de Services Régionaux de Fundy

LEGEND

Number	Issue	YYYY/MM/DD
1	Issued for Construction	2021/05/12

Engineer's Stamp
REGISTERED PROFESSIONAL ENGINEER
Province of New Brunswick
#M6407
Ljubiša Kalaba
2021/05/12

Drawn By: L.K.
Checked By: M.L.S.

Project
FRSC CRANE MOUNTAIN LANDFILL
PROJECT 2021 - 01
CONTAINMENT CELL # 9

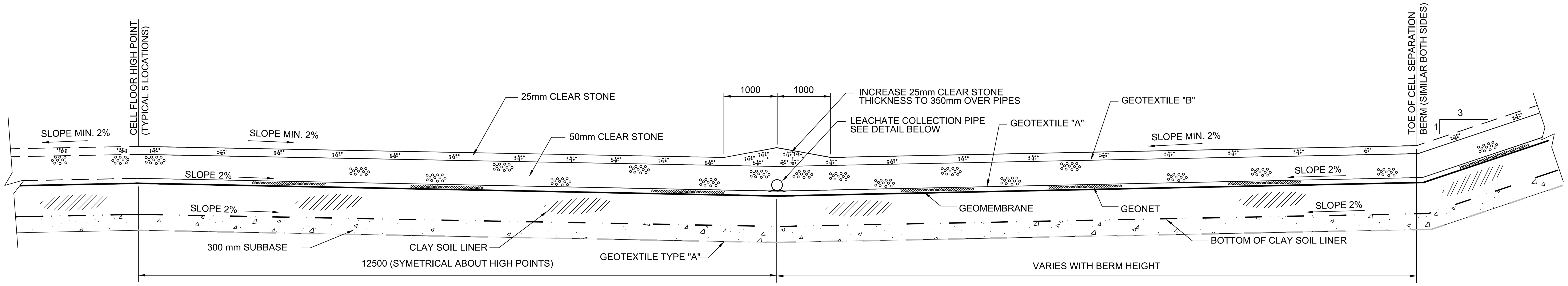
Drawing
CELL #9
CROSS SECTIONS PROFILES - 2

Scale
1:500
0 10 20 30m

File No.: 10001800202
Sheet No.: D7

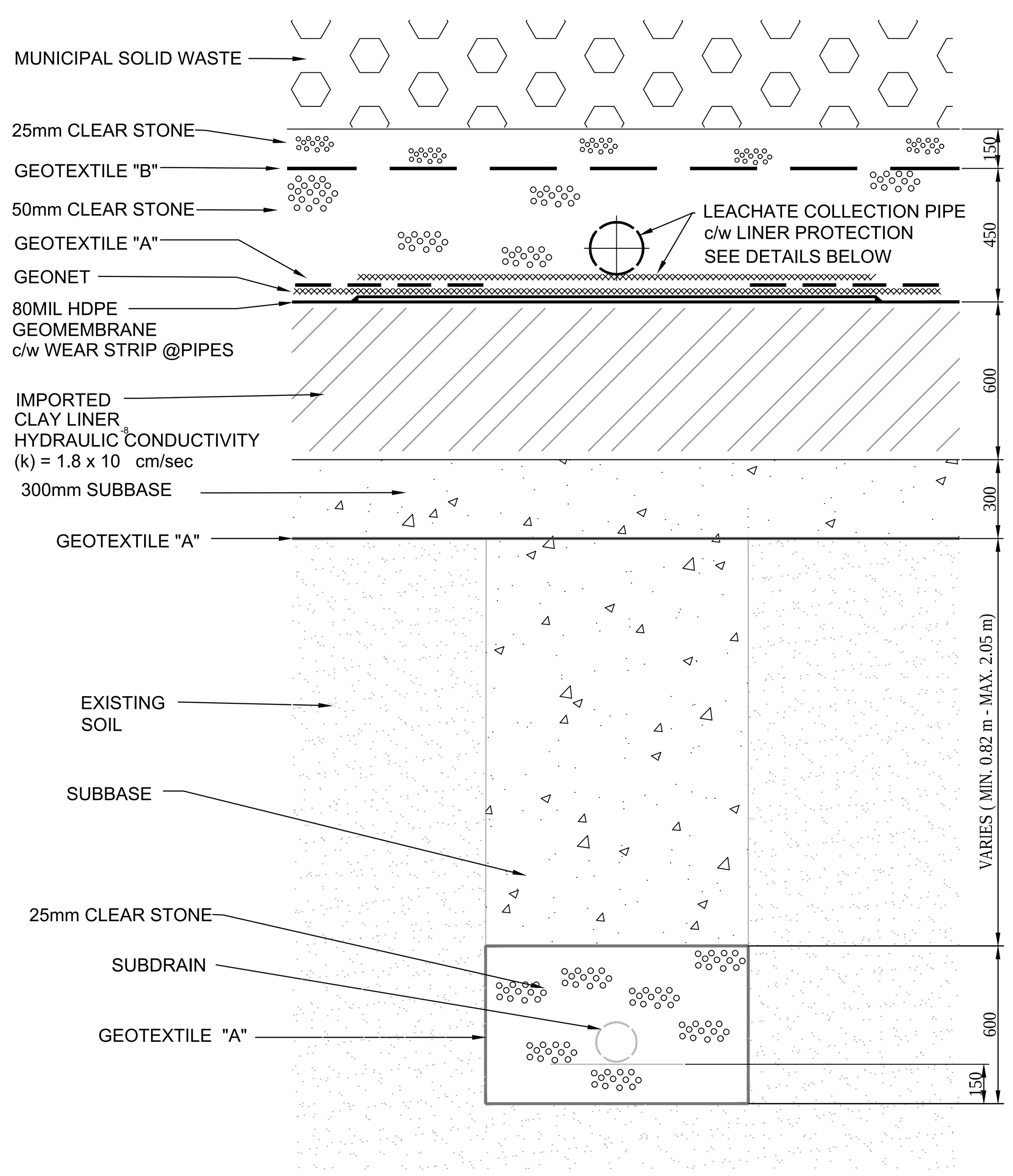
GEMTEC
Consulting Engineers and Scientists

Gemtec Ltd. 191 Doak Road, Fredericton, N.B. (506)453-1025



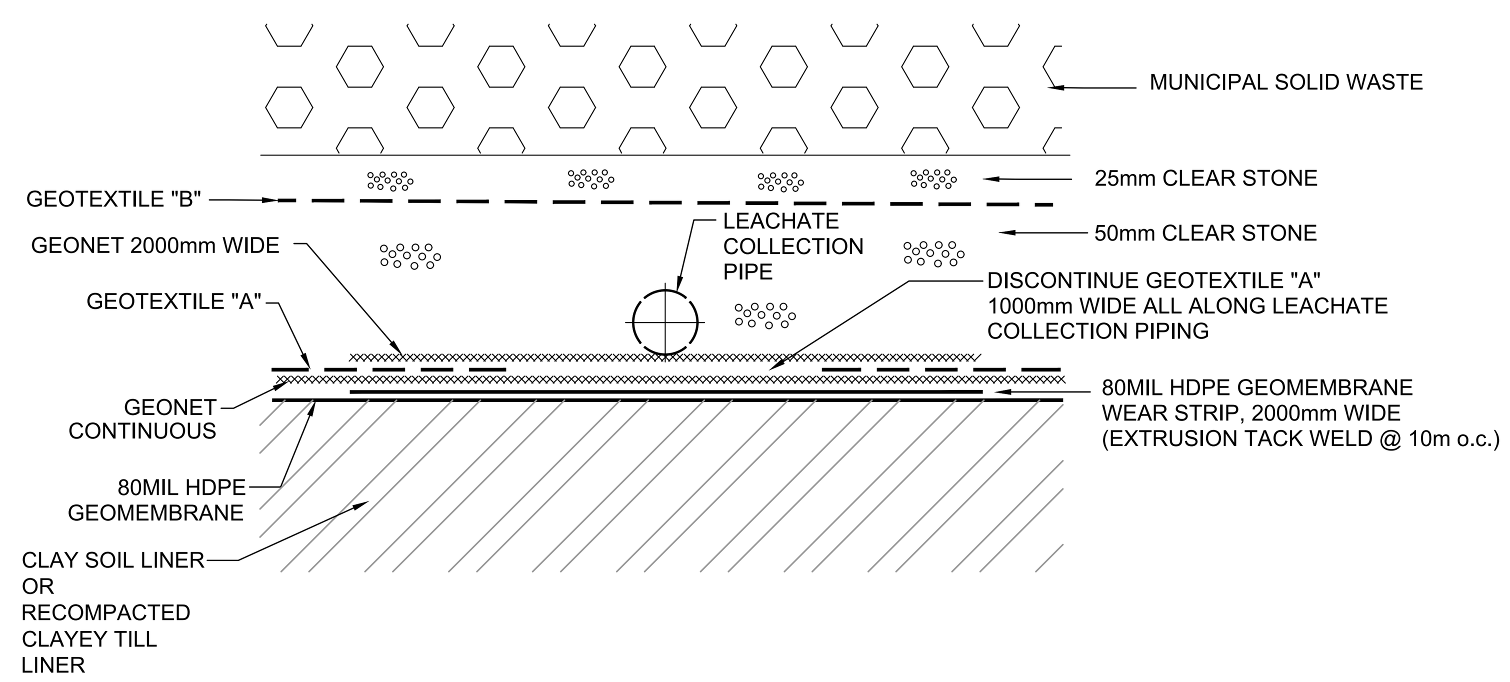
1 D08 PARTIAL TRANSVERSE SECTION THROUGH CELL BOTTOM

SCALE 1:50



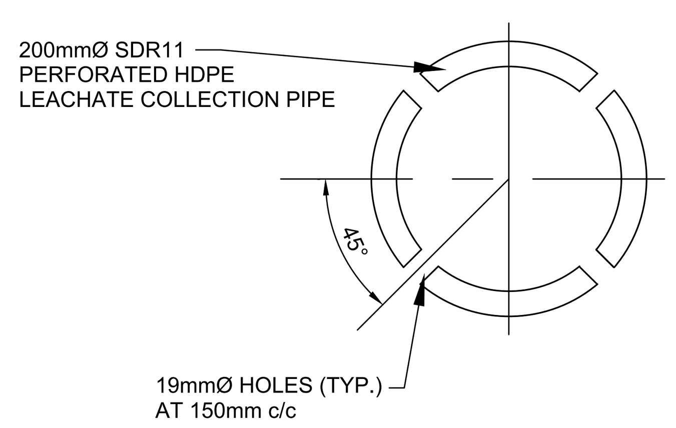
LINER SCHEMATIC

SCALE 1:20



LINER PROTECTION DETAIL AT LEACHATE COLLECTION PIPE

SCALE 1:20



2 D08 PERFORATED LEACHATE COLLECTION PIPE DETAIL

NOT TO SCALE

Fundy Regional Service Commission
Commission de Services Régionaux de Fundy

LEGEND

Number	Issue	YYYY/MM/DD
1	Issued for Construction	2021/05/12

Engineer's Stamp

REGISTERED PROFESSIONAL ENGINEER Province of New Brunswick #M6407 Ljubiša Kalaba 2021/05/12 Date Province du Nouveau-Brunswick INGÉNIEUR IMMATRICULÉ

Drawn By LK

Checked By M.L.S.

Project

FRSC CRANE MOUNTAIN LANDFILL
PROJECT 2021 - 01
CONTAINMENT CELL # 9

Drawing

CELL # 9 DETAILS - 1

Scale 1:50

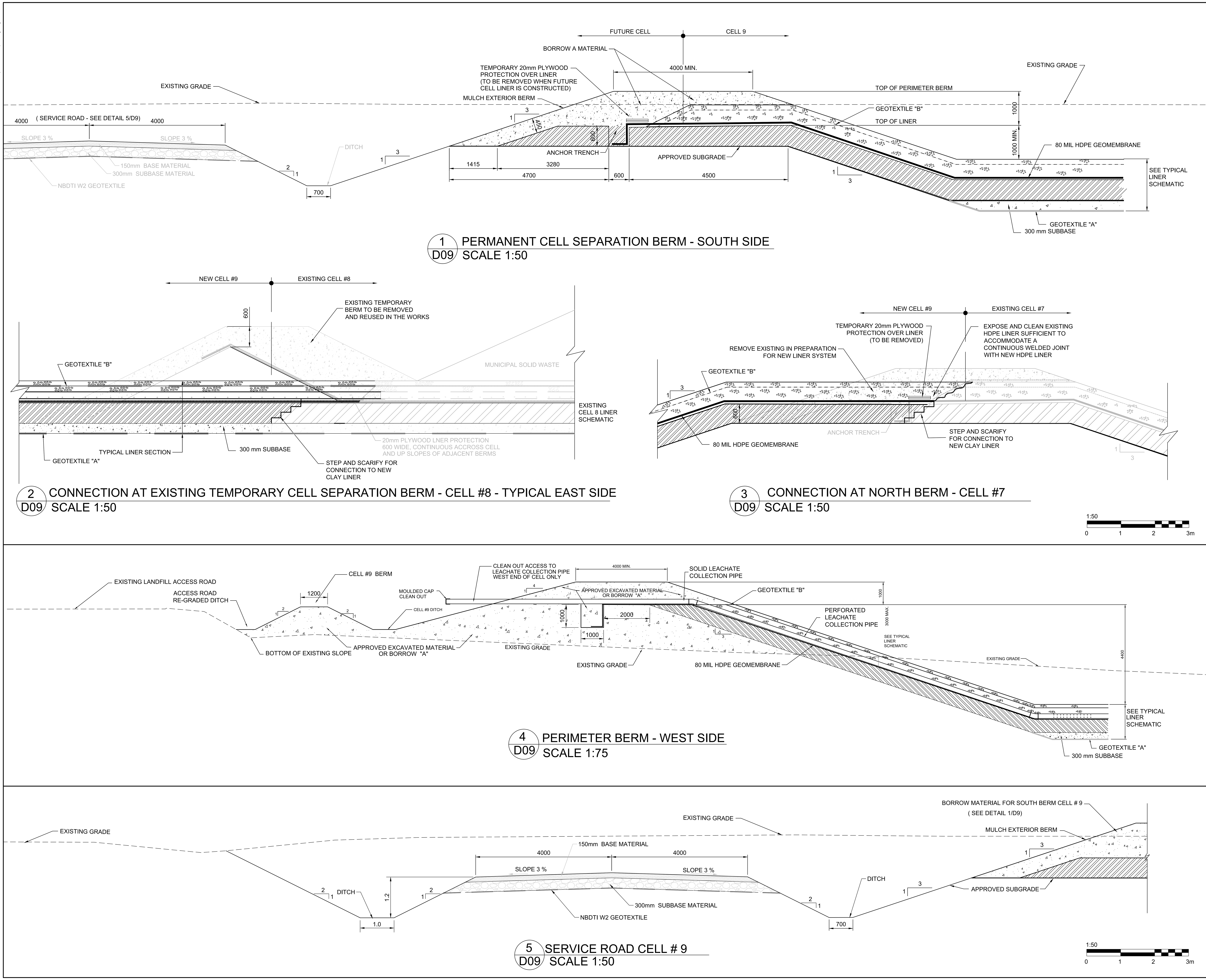
0 1 2 3m

File No. 10001800203

Sheet No. D8

GEMTEC
CONSULTING ENGINEERS AND SCIENTISTS

N:\PROJECTS\100000\100018\00203_DRAFTING\100018\00203.DWG,D8, 2021-05-10 2:27:48 PM



Fundy Regional Service Commission
Commission de Services Régionaux de Fundy

LEGEND

Number	Issue	YYYY/MM/DD
1	Issued for Construction	2021/05/12

Engineer's Stamp

#M6407 Ljubiša Kalaba 2021/05/12

Drawn By: LK
Checked By: M.L.S.

Project: FRSC CRANE MOUNTAIN LANDFILL PROJECT 2021 - 01 CONTAINMENT CELL # 9

Drawing: CELL # 9 DETAILS - 2

Scale: 1:50

File No.: 10001800203
Sheet No.: D9

GEMTEC CONSULTING ENGINEERS AND SCIENTISTS

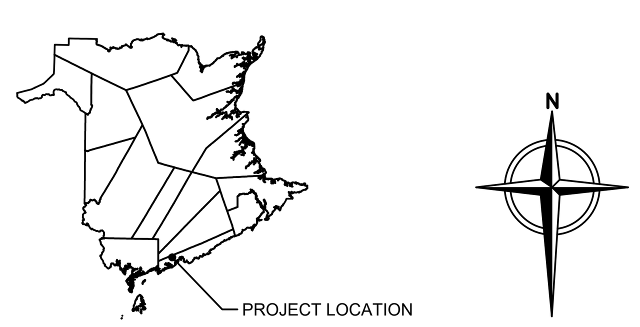
Gemtec Ltd. 191 Doak Road, Fredericton, N.B. (506)453-1025

DESIGN DRAWINGS
FOR THE
2023 LFG SYSTEM EXPANSION
LFG WELLS INSTALLATION
PREPARED FOR
FUNDY REGIONAL SERVICE COMMISSION
CRANE MOUNTAIN LANDFILL
SAINT JOHN, NEW BRUNSWICK

APRIL 2023

INDEX OF DRAWINGS

0	COVER SHEET
1	LFG EXPANSION PLAN
2	LFG EXTRACTION WELL DETAILS



LOCATION MAPS

PREPARED BY:

TETRA TECH

TETRA TECH CANADA INC.
140 QUARRY PARK BLVD SE, SUITE 110
CALGARY, AB, T2C 3G3
Tel: (403) 203-3355

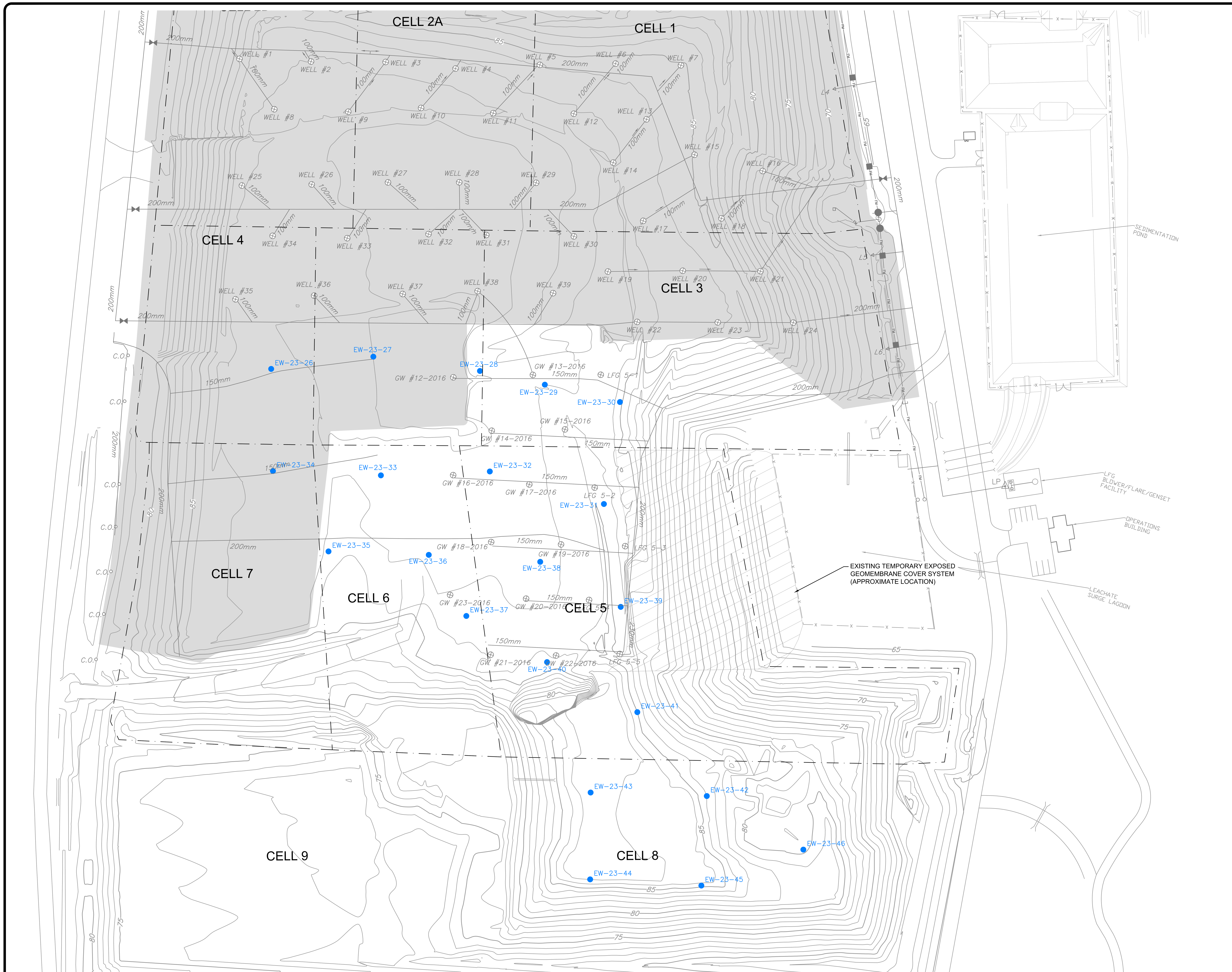
PROJECT NO. 704-SWM.SWOP04814-01

TETRA TECH
100 CRYSTAL RUN ROAD SUITE 101
MIDDLETOWN, NEW YORK 10941
Tel: (877) 294-9070
Fax (845) 692-5894
PROJECT NO. 209-4233491

REVIEW

DILLAN BUCKINGHAM, PROFESSIONAL ENGINEER

N.B.P.Eng. Lic. No. XXXXXXXXXXXX
NB Certificate of Authorization No. XXXXXXXXXXXX



LEGEND

- PHASE LIMITS
- FINAL COVER AREA (APPROXIMATE)
- EXISTING TEMPORARY EXPOSED GEOMEMBRANE COVER SYSTEM (APPROXIMATE LOCATION)
- EXISTING BUILDING
- EXISTING FENCE
- EXISTING SEDIMENTATION POND
- EXISTING ROAD
- 850 EXISTING 5m CONTOUR
- EXISTING 1m CONTOUR
- LH EXISTING LEACHATE HEADWELL
- EXISTING LEACHATE MANHOLE
- CO EXISTING LEACHATE CLEANOUT RISER
- 100mm EXISTING LANDFILL GAS LINE
- WELL #5 EXISTING LANDFILL GAS EXTRACTION WELL
- EXISTING LFG CONTROL VALVE
- FM EXISTING LEACHATE FORCE MAIN
- EW-28 PROPOSED LFG EXTRACTION WELL

NOTES:

1. THE EXISTING LFG COLLECTION SYSTEM IS FROM A FILE ENTITLED: "CRANE MOUNTAIN LANDFILL - LANDFIL GAS COLLECTION_NAD83.dwg" PROVIDED BY FRSC.
2. THE EXISTING TOPOGRAPHY IS FROM A FILE PROVIDED BY GEMTEC ENTITLED "100018.014.03" WHICH CONTAINS DATA COVERING THE FOLLOWING AREAS:
   - CELLS 1-4 FROM PRIOR FIELD SURVEYS.
   - CELLS 5-9 FROM FIELD GPS-BASED SURVEYS BY GEMTEC IN DECEMBER 2022 OR MARCH 22, 2023.

REVIEW

DILLAN BUCKINGHAM, P.E.

N.J.P.E. Lic. No. XXXXXXXXXX Date
NJ Certificate of Authority No. XXXXXXXXXX

REV	DATE	DESCRIPTION	DWN BY	DES BY	CHK BY	APP BY

DATE OF ISSUE: APRIL 2023 | DRAWN BY: JWK | DESIGNED BY: JMB | CHECKED BY: MMS | APPROVED BY: DB

TETRA TECH

FUNDY REGIONAL SERVICE COMMISSION
CRANE MOUNTAIN LANDFILL
SAINT JOHN, NEW BRUNSWICK

2023 LFG SYSTEM EXPANSION
LFG WELLS INSTALLATION
LFG EXPANSION PLAN

SHEET NO. 1

PROJECT NO. 209-4233491

CLIENT	PROJECT		
Fundy Regional Service Commission	**Crane Mountain Landfill 2023 LFG Collection System Expansion**		
SUBJECT **Landfill Gas Extraction Well Schedule**		BY **JMB**	DATE **4/24/2023**
		CHECKED **MMS**	DATE **4/24/2023**

WELL ID[6]	SURVEY STAKE ID	LOCATION	NORTHING (m)	EASTING (m)	APPROX. ELEVATION (m MSL) GROUND SURFACE[1]	APPROX. ELEVATION (m MSL) BOTTOM OF WASTE[2]	DEPTH OF WASTE (m)	BOREHOLE DEPTH (m) (D_B)[3]	PIPE LENGTH (m) PERFORATED (D_P)	PIPE LENGTH (m) SUBGRADE SOLID CASING (D_{S1})	PIPE LENGTH (m) ABOVE GRADE SOLID CASING (D_{S2})
EW-23-26		Cell 4	7,363,383.4	2,522,461.4	87.8	73.6	14.2	11.1	4.4	6.4	1.5
EW-23-27		Cell 4	7,363,406.9	2,522,513.3	89.0	71.5	17.5	14.4	7.7	6.4	1.5
EW-23-28		Cell 4	7,363,417.1	2,522,571.9	87.2	72.0	15.2	12.1	5.4	6.4	1.5
EW-23-29		Cell 3	7,363,420.7	2,522,608.4	87.0	70.2	16.8	13.7	7.0	6.4	1.5
EW-23-30		Cell 3	7,363,424.0	2,522,651.0	85.3	69.2	16.1	13.0	6.3	6.4	1.5
EW-23-31		Cell 5	7,363,367.5	2,522,659.5	85.5	69.3	16.2	13.1	8.7	4.1	2.4
EW-23-32		Cell 5	7,363,365.7	2,522,593.9	87.4	70.6	16.8	13.7	8.8	4.7	2.4
EW-23-33		Cell 6	7,363,345.5	2,522,537.0	87.5	71.1	16.3	13.2	8.6	4.3	2.4
EW-23-34		Cell 7	7,363,329.8	2,522,479.3	87.2	73.2	14.0	10.9	4.2	6.4	1.5
EW-23-35		Cell 6	7,363,296.6	2,522,522.0	86.4	72.3	14.2	11.1	7.0	3.8	2.4
EW-23-36		Cell 6	7,363,311.5	2,522,575.5	87.4	70.7	16.7	13.6	9.4	3.9	2.4
EW-23-37		Cell 6	7,363,285.5	2,522,605.5	86.4	70.2	16.2	13.1	9.4	3.4	2.4
EW-23-38		Cell 5	7,363,326.4	2,522,635.5	87.3	69.9	17.4	14.3	8.9	5.1	2.4
EW-23-39		Cell 5	7,363,316.0	2,522,685.5	85.7	68.6	17.1	14.0	9.3	4.4	2.4
EW-23-40		Cell 5	7,363,274.6	2,522,655.8	85.9	69.8	16.2	13.1	8.9	3.8	2.4
EW-23-41		Cell 5	7,363,263.2	2,522,711.8	85.0	68.6	16.4	13.3	7.3	5.7	2.2
EW-23-42		Cell 8	7,363,230.5	2,522,762.4	83.9	68.0	15.9	12.8	7.6	5.0	2.4
EW-23-43		Cell 8	7,363,213.0	2,522,700.5	87.3	69.3	18.0	14.9	8.9	5.8	2.1
EW-23-44		Cell 8	7,363,167.1	2,522,714.7	87.0	69.4	17.6	14.5	8.7	5.5	2.4
EW-23-45		Cell 8	7,363,182.3	2,522,774.4	85.4	68.2	17.2	14.1	8.7	5.1	2.4
EW-23-46		Cell 8	7,363,218.3	2,522,822.3	79.8	67.0	12.8	9.7	5.3	4.1	2.4
							TOTALS:	**273.6**	**160.4**	**107.0**	**44.6**

WELL SCHEDULE ACKNOWLEDGEMENTS: THE UNDERSIGNED ACKNOWLEDGES THAT HE/SHE HAS REVIEWED THE ABOVE WELL SCHEDULE DATA AND BELIEVES THE INFORMATION TO BE CORRECT TO THE BEST OF HIS/HER KNOWLEDGE AND HAS NOTIFIED THE DESIGN ENGINEER OF DEFICIENCIES OR OMISSIONS.

TT DESIGN ENGINEER ACKNOWLEDGEMENT: ______________________ **DATE** ________

TT QA/QC REVIEWER ACKNOWLEDGEMENT: ______________________ **DATE** ________

TT PROJECT MANAGER ACKNOWLEDGEMENT: ______________________ **DATE** ________

OWNER OR OWNER REPRESENTATIVE ACKNOWLEDGEMENT: ______________________ **DATE** ________

CQA INSPECTOR ACKNOWLEDGEMENT: ______________________ **DATE** ________

SURVEYOR ACKNOWLEDGEMENT: ______________________ **DATE** ________

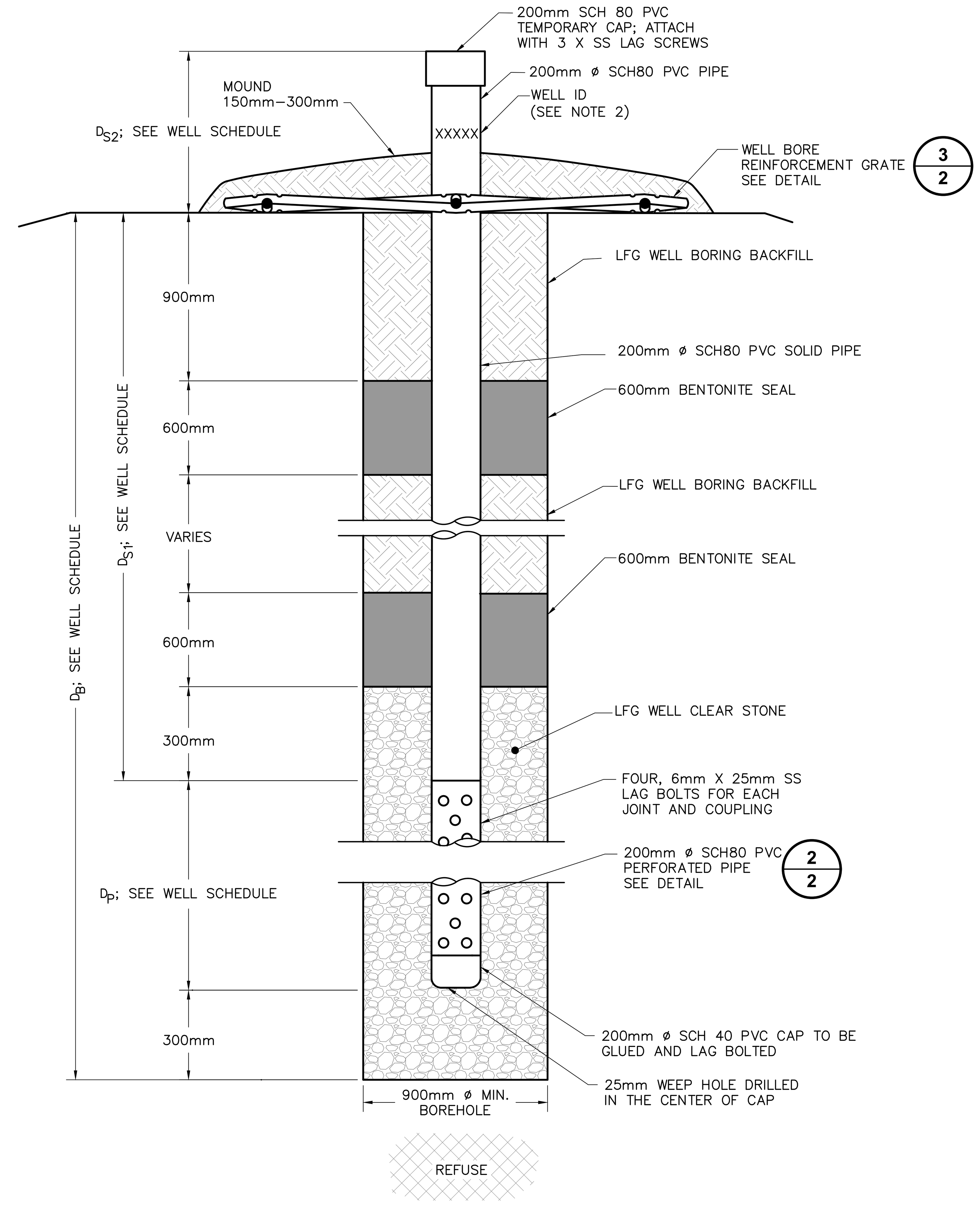
GENERAL CONTRACTOR ACKNOWLEDGEMENT: ______________________ **DATE** ________

DRILLER ACKNOWLEDGEMENT: ______________________ **DATE** ________

***UNDER NO CIRCUMSTANCES SHALL DRILLING ACTIVITIES BEGIN WITHOUT PROVIDING THE ABOVE SIGNATURES. ANY CHANGES TO WELL LOCATIONS OR DEPTHS SHALL REQUIRE THESE SIGNATURES BE OBTAINED AGAIN.**

NOTES:

1. GROUND SURFACE ELEVATIONS TAKEN FROM SURFACE REFERENCED WITHIN THE DRAWING TITLED "233491-LFG-CRANE MTN.dwg" PROVIDED BY FRSC, DATED MARCH 22, 2023.
2. BOTTOM OF WASTE ELEVATIONS REFERENCED FROM "LANDFILL BASE DECEMBER 2022-CLEAR STONE.dwg", PREPARED BY FRSC, WHICH SHOW TOP OF DRAINAGE STONE LAYER OF BASE LINER SYSTEM.
3. BOREHOLE DEPTH TO HAVE A MINIMUM 3.1m SEPARATION BETWEEN THE BASE OF THE BOREHOLE AND THE BOTTOM OF WASTE.
4. WELL LOCATIONS MAY BE RELOCATED DURING CONSTRUCTION TO ACCOMMODATE FIELD CONDITIONS. ALL CHANGES MUST BE RE-SURVEYED AND AN UPDATED WELL SCHEDULE FOR THAT LOCATION, APPROVED BY ALL PARTIES PRIOR TO THE COMMENCEMENT OF DRILLING.
5. TETRA TECH AND OWNER ARE NOT LIABLE FOR DELAYS INCURRED RESULTING FROM THE CONFIRMATION AND FINAL APPROVAL OF ALL WELL DRILLING LOCATIONS.



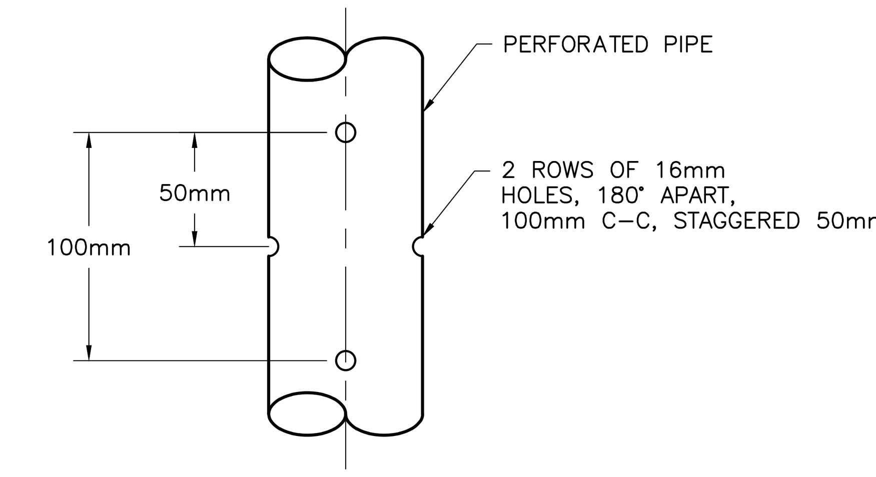
VERTICAL EXTRACTION WELL

DETAIL 1/2

SCALE: NOT TO SCALE

NOTES:

1. A WELL SCHEDULE IS PROVIDED ON THIS SHEET. NO DRILLING IS TO TAKE PLACE WITHOUT A FULLY SIGNED WELL SCHEDULE.
2. CONTRACTOR TO PROVIDE AND INSTALL WELL ID LABELS ON THE WELLS. DRILLER TO LABEL NEWLY INSTALLED WELLS WITH WELL ID IN GREASE PENCIL.
3. WATER SHOULD NEVER BE ADDED TO THE SOIL BACKFILL TO AID IN COMPACTION.
4. ALL PVC PIPE JOINTS AND COUPLINGS TO BE PRIMED, GLUED AND LAG BOLTED.



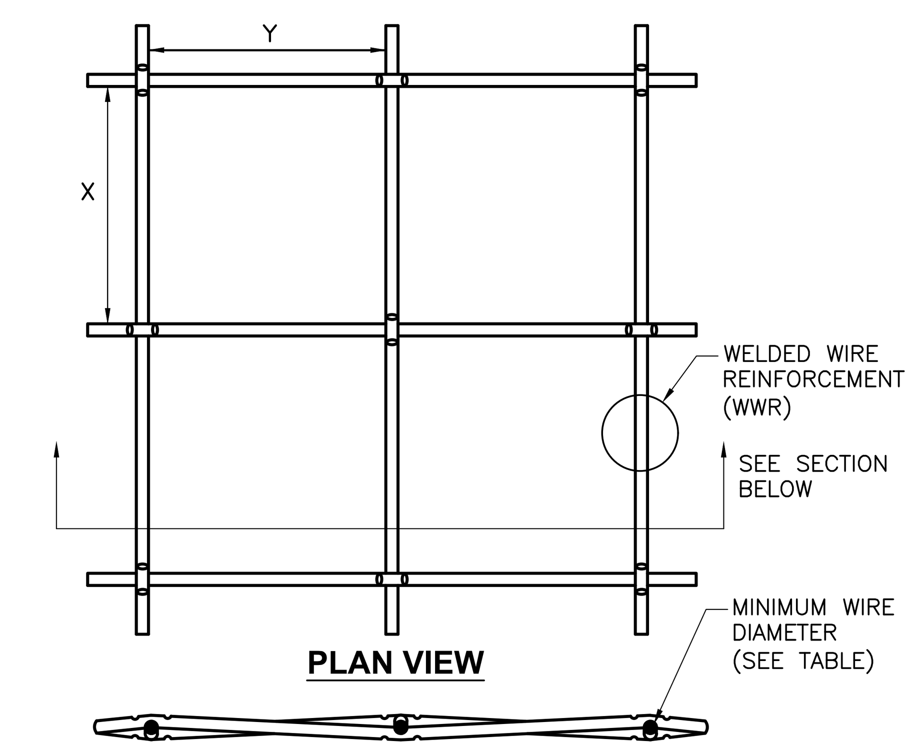
PERFORATED PIPE

DETAIL 2/2

SCALE: NOT TO SCALE

NOTE:

1. CONTRACTOR TO USE FACTORY-PERFORATED PVC ONLY.



WELL BORE REINFORCEMENT GRATE

DETAIL 3/2

SCALE: NOT TO SCALE

NOTES:

1. WELL BORE REINFORCEMENT GRATE TO BE INSTALLED AT GRADE.
2. OVERALL DIMENSIONS OF THE WELL BORE REINFORCEMENT GRATE SHALL BE 1200mm X 1200mm.

ALLOWABLE OPENING SIZES

"X"	"Y"	MIN. WIRE DIAMETER	WWR PANEL DESIGNATION
100mm	50mm	6.35mm	W5 x W5
100mm	100mm	7.59mm	W7 x W7
100mm	150mm	7.85mm	W7.5 x W7.5
150mm	150mm	7.85mm	W7.5 x W7.5

REVIEW

DILLAN BUCKINGHAM, P.E.

N.J.P.E. Lic. No. XXXXXXXXXX Date
NJ Certificate of Authority No. XXXXXXXXXX

REV	DATE	DESCRIPTION	DWN BY	DES BY	CHK BY	APP BY

DATE OF ISSUE APRIL 2023 | DRAWN BY JWK | DESIGNED BY JMB | CHECKED BY MMS | APPROVED BY DB

TETRA TECH

FUNDY REGIONAL SERVICE COMMISSION
CRANE MOUNTAIN LANDFILL
SAINT JOHN, NEW BRUNSWICK

2023 LFG SYSTEM EXPANSION
LFG WELLS INSTALLATION
LFG EXTRACTION WELL DETAILS

SHEET NO. 2

PROJECT NO. 209-4233491

ANNEXE C

Plan de gestion environnementale (PGE)

Rapport présenté à : Department of Environment and Local Government
Projet GEMTEC : 100018.012 (June 21, 2023)

ENVIRONMENTAL MANAGEMENT PLAN

for the

FUNDY REGION SOLID WASTE COMMISSION

Fundy Region Solid Waste Commission

January 2008

Revision 1

Environmental Management Plan
Table of Contents

1.0 INTRODUCTION

The Fundy Region Solid Waste Commission (Commission Which is comprised of representatives from municipalities and unincorporated areas within it's geographical boundaries, has been given a mandate by the New Brunswick Department of the Environment (NBDOE) for the management of solid waste generated within it's region. After a review of alternatives, an extensive siting exercise, an environmental impact assessment (EIA), and public consultation, the Commission has opted to implement an integrated waste management strategy which includes waste reduction, waste diversion and the disposal of residential material in a containment landfill. The Landfill situated at Crane Mountain, Adjacent to the northern boundary of the city of Saint John, in Saint John County, New Brunswick.

1.1 Environmental Policies and Philosophy

The Commission's environmental policy is to operate the landfill in a manner that provides a high level of service, at a reasonable cost to all waste generators in the region, while at the same time minimizing any potential negative environmental effects on groundwater, surface water, air quality, aesthetics, generators using the site or on the quality of life of the people living near the facility. It is also part of the environmental policy to ensure that the necessary resources financial or otherwise are provided to allow the environmental policies and commitments made within this document to be met.

The Commission is committed to operating an exemplary facility, ensuring all environmental commitments are met or exceeded and no unacceptable environmental impacts are incurred. The Commission is also committed to a program of ensuring that all subsequent construction phases are carried out with the highest regard to environmental protection. All regulations, guidelines and conditions set out in the EIA will be met and the Commission will follow and meet the conditions in the current and subsequent Certificates of Approval to Operate issued by the NBDOE. The Commission and its employees will manage the containment landfill with respect to all regulations, guidelines and conditions set out in the EIA, the Environmental Management Plan, the Operations Manual and the conditions in the current and subsequent Certificates of Approval to Operate.

The EMP as it applies to landfill operations and to the construction of subsequent disposal cells is used as a tool throughout the entire life of the landfill. With changes and advances in technology, waste diversion requirements and disposal needs the EMP will be updated to provide guidance and ensure all environmental standards are met. As changes occur, the appropriate pages will be revised and the document updated.

1.2 Organization of the Environmental Management Plan

The EMP is broken down into seven sections, as follows. The first section is the Introduction, it sets out the purpose of this document, Commission policies and the organization of the management plan.

The second section provides the detailed description of the project and identifies the applicable regulations, guidelines, permits and approvals.

The third section describes how the plan will be implemented and the revision process and schedule, and describes the Environmental management team, required training and reporting procedures.

The fourth section is an outline of the Environmental Protection Plan (EPP) which is regarded as a project specific plan that is the practical application of the mitigative measures outlined in the EIA and the conditions set out by the Lieutenant Governor-in-Council. The detailed plan is included in the appendices.

The fifth section presents the Environmental emergency Response Plans which detail the actions to be taken in the event of an incident or unplanned environmental upset. Operational emergency response procedures are presented in the Operating manual.

The sixth section is the Environmental Monitoring Plan. It sets out what is to be monitored, the frequency of monitoring, parameters, responsibilities for monitoring and reporting procedures.

The seventh section presents the information with respect to Communications. It identifies the Commission's commitment to continued consultation and mechanisms for communications.

2.0 PROJECT DESCRIPTION AND ENVIRONMENTAL LEGISLATION AND GUIDELINES

2.1 Project Description

The Commission in consultation with the public has developed a comprehensive waste management strategy which includes waste reduction, recycling, composting and containment landfilling. The project description herein refers to the landfill component of the waste management strategy.

The Fundy Region Solid Waste Commission's Landfill is located on a 132 hectare (ha) site, within the City of Saint John, at 10 Crane Mountain Road. The southeast corner of the site is situated at the intersection of Highway 177 and Highway 7, as shown in *Figure 1*. The waste management Facility includes: scales and scale house, operations building, administration building/interpretative centre, compost facility, construction and demolition disposal area, containment disposal area, household hazardous waste collection and storage facility, sedimentation ponds, leachate surge pond, landfill gas collection and flare system and a three tiered groundwater monitoring network.

The following describes the various components of the waste management facility.

Roadways
Access to the landfill facility is via Crane Mountain road, off the interchange at the intersection of Highway 7 and route 177 from GrandBay-Westfield. The access road off the Crane Mountain road is a paved two lane all weather road and is gated at the entrance. The perimeter road that is used to covey traffic to the disposal area and Administration/ Interpretative centre is a paved two-lane all weather road. All other on site roads are two lane gravel roads. Both the paved and gravel roads are maintained by the Commission.

Scales and Scale House
All incoming vehicles containing waste are weighed by a computerized scale. The scale will be located on the access road beyond the security gate. The scale system will be above grade with ramps up to scale level.

The scales are operated by an individual situated in a scale house adjacent to the scales. The building accommodates the operator, the computer equipment to run the scale and prepare billing tickets, an electrical room and washroom.

Beyond the scale, incoming traffic travels to either, the small load drop off area, the compost receiving area, the construction and demolition materials disposal area, the disposal cell, the administration/interpretive centre, the household hazardous waste disposal storage facility, or the operations maintenance building.

Small Load Drop-off Area
The drop-off is a disposal area for general users with small loads of waste (as opposed to commercial waste haulers) so they do not have to travel to the active tipping face of the landfill. It is situated beyond the scale along the southern boarder of the site. The drop-off area consists of a grade separation defined by a retaining wall, and waste receiving containers next to the retaining wall. The waste from the bins is removed and disposed of in the landfill daily.

Compost Facility

The in-vessel compost facility receives organic waste from residential and IC&I generators. The facility consists of a receiving hall where organic material is sorted and processed, two composting buildings, a biofilter for the control of odours, an outside curing area for compost, a large storage building for recyclable materials and an employee building with paved parking area. On site signage directs deliveries to the compost facility which is located directly west of the scale and small load drop-off area.

Construction and Demolition Materials Disposal Area
The construction and demolition materials disposal area (C&D site) is an unlined cell area approved by the NBDOE for the disposal of acceptable debris obtained during the construction, renovation or demolition of a building or structure. Debris or other material obtained from commercial, industrial, manufacturing sources, or materials that may contain contaminants are not accepted at the C&D site. Recyclable metals are removed from the waste material and recycled. The current and subsequent Certificates of Approval to Operate will detail operating requirements. On site signage directs deliveries to the C&D site which is located on the western side of the two lane paved road.

Disposal Cell
The disposal component of the landfill facility is designed to accommodate all residential, commercial and some industrial waste generated within the Fundy Region for a minimum of 25 years and has a footprint of approximately 37 hectares in size. It is evident however; because of waste diversion initiatives the disposal cells will ultimately have a longer lifespan.

The disposal cells will be constructed in a sequential basis such to minimize area exposed to precipitation at any time. The commission will develop an operating plan that details anticipated cell construction and capping schedules. Cells will be constructed according to conditions, drawings and specifications approved by NBDOE in approval to construct documents. Capping of cells will in turn be constructed according to conditions, drawings and specifications approved by NBDOE in approval to construct documents.

The Leachate Collection System
The leachate collection system is situated on top of the lining system. A series of perforated pipes collect the leachate from the waste layer and direct it, via gravity, to collection sumps located on the southern side of the disposal cell. To prevent the storing of leachate in the disposal cell and as a control measure during extreme precipitation events leachate can be pumped to a constructed leachate surge lagoon where it is pumped into tanker trucks and transported to the Lancaster Sewage Treatment Facility for treatment. A back up power system is in place to provide continued operation of the leachate collection system during power interruptions. The current and subsequent Certificates of Approval to Operate will detail the operating conditions and requirements of the leachate collection system.

Administration/Interpretive Building

The administration/interpretive building is located on site opposite the north end of the disposal cell. The building serves as the administrative center for all landfill business and has an interpretive area to host public education activities for school classes, special interest groups and the general public.

Household Hazardous Waste Storage and Receiving Facility

The household hazardous waste storage and collection facility provides disposal service for residentially generated hazardous waste within the Fundy Region. The Commission receives household hazardous waste (HHW) every Saturday morning at the facility located near the northeast corner of the disposal cell area. The Commission contracts a qualified disposal company to remove the HHW from the site for proper disposal or recycling. The facility is operated under the conditions set forth in the current and subsequent Certificates of Approval.

Operations Building

The operation building is situated at the midpoint of the cell just east of the disposal area. It includes offices, washrooms, equipment storage area, emergency response equipment and one garage bay.

Landfill Gas System

The landfill gas system is comprised of a sequence of gas collection wells connecting to a biogas Flare and blower skid system. The biogas flare utilizes automated operation and is designed to destroy safely, with automatic temperature control, typical organic compounds generated by solid waste and other biogas products. The system is controlled with a programmable logic controller (PLC), which receives and transmits signals with respect to operating conditions. If an unacceptable operating condition occurs, the control system discontinues flow of biogas or adjusts the operating parameters to correct the problem. Controls of the *Enclosed ZTOF Biogas Flare* include an initial purge cycle, automatic ignition sequence, and fail safe controls. The system is operated under the conditions set forth in the current and subsequent Certificates of Approval.

Groundwater Monitoring

An extensive three tier groundwater monitoring program is in place as required by the EIA. The purpose of this system is to permit the detection of any impact on the groundwater as a result of landfill construction or operations. This system includes several multi-level, vertical and angled wells set at a distance of 50, 100, 150 and 200 metres or more from the boundary of the disposal cell. The details of the monitoring program including well locations are presented in section 6.

Storm Water Management

The landfill site is drained by a series of perimeter ditches designed to accept a 24 hour 1 in 100 year storm water flow from the site. Sediment laden flows are directed to a permanent two stage pond. Non-sediment laden flows are directed through stabilized ditches around the sedimentation ponds.

A 1.5 hectare sedimentation system is located near the northeast corner of the site and is fed by gravity flow from all areas of the site. It consists of two ponds in series, a gravity settling pond a pond where flocculent may be added if necessary. Discharge is to a stabilized channel.

During the construction of future cells, all reasonable and practical efforts to limit the amount of erosion on the site will be taken. This includes minimizing the area to be cleared and grubbed and stabilizing grubbed areas as soon as possible.

Basic Infrastructure

Electricity – The site is provided with three phase power from the NB power grid. All building on site are provided with electrical power. The leachate collection system and the scale are provided with a back up power supply.

Lighting – Exterior lighting is provided for security at all buildings, at the main gate, scale, parking areas, and small load drop off area.

Telephone – Telephone service, including fax and modem connections, is provided to the scale house, compost facility, administration building, HHW facility and operations building.

Water supply – On-site drinking water is provided by four wells located near the scale house, the administration building, the HHW facility and the operations building.

Waste Water – On-site waste water is treated by four dedicated septic systems which have been inspected and approved by the Department of Health and Community Services.

Visual Buffer

An extensive buffer has been established along Highway 7 for the length of the site and adjacent to Highway 177 extension. The berm enhances existing natural site features and vegetation to provide screening and meets the EIA requirement for visual buffering

Management and Operations

The landfill facility is owned, operated and managed by the Commission on behalf of the member municipalities and local service districts within its geographical boundaries. The Commission is responsible for the overall management of the landfill and is responsible through the General Manager and staff for the day to day operations at the site.

The landfill is open 6 days a week and receives waste between 7:30 am and 5:00 pm except on Saturdays when the site is open between 8:00 am and 12:00 pm.

As previously discussed the commission will develop an operating plan that details anticipated cell construction and capping schedules. As construction of future cells begin, closure of existing cell will be undertaken. The closure of a cell involves the placement of an impermeable cover to limit the amount of precipitation percolating through the waste. In addition a gas collection system will be installed to manage gas generated during the decomposition of organics.

Further details with respect to the day to day operation are detailed in the Operations Manual.

2.2 Environmental Legislation and Guidelines

This section identifies the various regulations, guidelines, permits and approvals under which the landfill has been constructed and is operated. It also identifies operating and construction conditions set-out by the Lieutenant Governor-in-Council, as part of the EIA approval process.

2.2.1 Construction

In order for the landfill to be constructed the following permits/approvals were obtained and conditions met.

Certificate of Approval to Construct
A Certificate of Approval to Construct (COA-C) from the director of the Assessment and Approvals Branch of the New Brunswick Department of Environment (NBDOE) is required before the construction of a landfill may begin. This certificate is issued under the Water Quality Regulation of *The Clean Environment Act.*

The conditions of the certificate for the Crane Mountain Landfill were developed by NBDOE through extensive discussions with the project management team during the design phase. The COA-C stipulates, among other things, requirements with respect to: the need to construct a settling pond before clearing and grubbing and discharge limits from the pond.

Water Course Alteration Permit
A water course alteration permit is not required if a COA-C has been issued, as requirements for the alteration will be included in the COA-C.

However, if construction activities occur before a COA-C is issued and are within 30 metres of a watercourse or involves crossing a watercourse (or any other condition specified in the regulation) then a water course alteration permit is required. In order to obtain the permit, a dimensioned sketch and a brief write-up describing the work to be completed is to be submitted.

Drinking water

All wells drilled on site to provide drinking water must be assigned an identification number and tested in accordance with the Potable Water Regulation. Within one year of the well being dug, the Commission must collect a sample from the well for analysis at the NBDOE laboratory.

On-Site Sewage Disposal System

The sewage disposal system is inspected and permitted by the Department of Health and Community Services.

Woods Work During Fire Season

Fire season in New Brunswick extends from mid-April to mid-October. Any work carried out in the woods during this period must be permitted by the Department of Natural Resources and Energy (DNRE). To obtain the permit, the location of the job site, duration of the project, number of people at the site and the type of equipment being used must be provided to DNRE. DNRE staff may inspect the work area, confirm the equipment and staffing levels, they may also visit the site from time to time to ensure the conditions of the permit are being met. The permit is obtained from the district ranger at the DNRE office in Welsford.

Zoning Requirements- City of Saint John

The Crane Mountain Landfill property is zoned as Utility and service-Landfill (US-L). Land zoned under this designation is for sanitary landfill and associated facilities, including recycling and composting facilities, and any accessory buildings, structures, etc. US-L zoning requires that the landfill be enclosed by "natural buffering and/or constructed earth berms". It also requires that building permits are obtained before construction proceeds.

Construction Conditions Required and Met as Part of EIA Approval

The design and construction of the landfill cells shall ensure the reliability and effectiveness of the soil portion of the liner of not less than 25 years and the advective breakthrough of the liners shall be designed using a distributed gradient approach and approved by the Director of the Assessment and Approvals Branch-NBDOE, prior to the issuance of the COA-C.

Proposed waste diversion initiatives must be registered pursuant to the EIA Regulation of the *Clean Environment Act,* prior to the COA-C being issued.

Should the Commission wish to convey leachate from site to a sewage treatment plant (STP) via a pipeline, as opposed to trucking it off-site as originally planned, this change will have to be registered under the EIA Regulation of the *Clean Environment Act***.** In Addition, the Commission will be required to enter into a five year agreement with the operator of the STP and this Agreement will have to be approved by the Director of the Assessment and Approvals Branch- NBDOE.

The Commission must develop and implement a drinking water well baseline monitoring program that includes organic and inorganic compounds relative to the Canadian Water Quality Guidelines- Drinking Water. The program must be approved by the director of the Assessment and Approvals Branch- NBDOE prior to its implementation and the survey must be conducted prior to site construction.

The Commission shall develop an enhanced three tier ground water monitoring program. The specific location of the well nests shall be identified on site by staff of NBDOE, prior to construction of the facility. The monitoring frequency of the wells shall be determined in consultation with NBDOE and approved by the Director of the Assessment and Approvals Branch – NBDOE.

The Commission must establish a "Community Environmental Monitoring Committee", prior to the initiation of construction of the landfill. The membership and mandate of the Committee are to be determined in consultation with NBDOE.

The construction of the next and all subsequent disposal cells will be carried out under a new COA-C. The only other legislation anticipated to guide future landfill construction activities will be the requirement for work permits from DNRE during fire season.

2.2.2 Operations

The landfill is operated under the following permits/approvals and EIA conditions.

Certificate of Approval to Operate
The landfill is permitted to operate under a Certificate of Approval to Operate (COA-O) issued by NBDOE. The COA-O will, among other things, stipulate requirements with respect to: discharge of leachate, discharge from the sedimentation pond, application of daily and intermediate cover, acceptable and non-acceptable wastes, etc.

Operating Conditions Required and Met as Part of EIA Approval
In addition to the COA-O, several operating requirements were set out in the EIA process. The requirements were as follows:

Establishment of a visual buffer. A visual buffer has been established adjacent to Highway 7 for the length of the site and adjacent to Highway 177 extension/ Crane Mountain Road for the width of the site and to a height of six metres.

Prepare an environmental management plan. The initial review of the plan has been completed by NBDOE.

The Commission is to ensure that appropriate traffic access and highway signage is in place. The New Brunswick Department of Transportation has approved the interchange and appropriate signage is in place.

The Commission is to encourage and fund public access to and enjoyment of portions of the site not dedicated to waste management. The Commission has constructed an interpretive centre and is committed to developing recreation facilities and has undertaken forestry management projects.

The Commission will ensure any residents whose drinking water becomes contaminated as a direct result of landfill operations, will have a safe, uninterrupted and adequate water supply. The Commission will provide drinking water to any resident whose drinking water becomes contaminated as a direct result of landfill operations

3.0 INPLEMENTATION OF THE ENVIRONMENTAL MANAGEMENT PLAN

The Environmental Management Plan (EMP) is used to ensure that environmental protection measures and proactive policies, such as the requirement for employee environmental awareness training, are utilized throughout operations and the construction of subsequent cells at the landfill facility. The plan clearly identifies environmental policies and procedures for regulators and the public as well as staff.

For the plan to be properly implemented, the roles and responsibilities of the Commission, General Manager, Environmental Coordinator and staff must be clearly defined. Each participant must know what they are responsible for and must be provided with the resources necessary to complete the assigned tasks. In addition to defining roles and responsibilities, all staff must be provided with the appropriate training.

Finally successful implementation of the EMP relies on a proactive approach to communications, both internally and externally with the public and the regulators.

3.1 Roles and Responsibilities

The following sets out the roles and responsibilities for the Commission and its staff with respect to environmental management.

3.1.1 The Commission

With respect to Environmental management, the Commission is responsible for:

- establishing the EMP and facilitating its implementation
- having general knowledge of the EMP
- reviewing all environmental issues arising through operations on a regular basis
- ensuring there are sufficient resources to carry out all aspects of the EMP
- revising the environmental policy and EMP as required, and
- reviewing and approving as necessary suggested changes to the EMP

3.1.2 The General Manager

The General Manager is responsible for the overall operation of the site, including implementation of the EMP by ensuring:

- all employees are aware of the Commission's commitment to environmental protection
- the Commission is aware of environmental incidents and that environmental management issues are included as a regular agenda item at monthly Commission meetings.
- all employees and contract workers receive the appropriate level of environmental training
- adequate environmental training sessions are provided and documented, and
- suggested changes to the EMP are taken before the commission for review

3.13 The Environmental Coordinator

The environmental coordinator is responsible for:

- direct implementation of the EMP.
- obtaining environmental permits and updating them as required
- being the point of contact with the regulatory agencies
- ensuring all environmental commitments are met
- ensuring construction is carried out in accordance with the Environmental Protection Plan
- preparing environmental monitoring reports as required
- directing emergency response activities
- forwarding suggested revisions to the EMP to the General Manager for review, and
- and seeing that approved revisions are properly documented, communicated and distributed to all EMP holders

3.1.4 Staff

Staff are responsible for the implementation of the EMP through:

- acquiring the proper environmental training and updating the training as required
- being aware of and upholding the principals of environmental protection
- instituting corrective action, or notifying the General Manager, when environmental protection policies are not being followed, and
- making suggestions to improve environmental protection practices and the EMP as necessary.

3.2 Environmental Training Program

To be successfully implemented, site staff must be fully aware of the EMP and the Commissions commitment to environmental protection and the operation of an exemplary site. Therefore all employees and outside contractors and consultants will be required to fully understand the objectives of the environmental training program.

The objective of the training program is to ensure all staff and on-site workers have a:

- sound understanding of the Commissions commitment to high levels of environmental protection,
- general awareness of and sensitivity to the environment,
- appreciation of the impacts their actions have on the environment, and
- understanding of how to complete their specific job without negatively impacting the environment.

General operations training will be provided for all staff at the landfill site. Environmental training will be included as part of this initial orientation. On going training will be provided as part of regular “lunch box” meetings or those called for health and safety issues. Additional formalized training will be provided as required. Environmental training will address the following issues, however the additional topics will be incorporated into the training program as they arise.

1. General Environmental Awareness
2. Erosion/Sediment Control
3. Waste Inspection Procedures
4. Collection Vehicle Inspection
5. Emergency Response
6. Fire Fighting

All full-time and part-time staff will receive training related to these issues. Training will be provided by the Environmental Coordinator with assistance from the General Manager and any other experts deemed useful. Training will be provided before operations begin in both a classroom setting and on-site, although emphasis will be on “hands on” activities. Outside contractors will receive Environmental instruction before undertaking any work on projects at the site, including environmental awareness and environmental protection plan review.

3.2.1 Content

The following items are included in the environmental training program.

General Environmental Awareness

- history of the site and it’s development
- local environmental concerns and issues
- Commission policies with respect to environmental protection
- overview of EMP
- presentation of the Environmental Monitoring Program
- on-site vehicle maintenance procedures

Erosion/Sediment Control

- operating procedures for the sedimentation pond
- control of sediment laden water

Waste Inspection Procedures

- description of non acceptable wastes as regulated by current and subsequent COA-O

- procedures for handling unacceptable wastes-at the scale and at the working face
- completion of monitoring log forms, reporting procedures and follow-up action

Collection Vehicle Inspection
- inspection procedures as outlined in monitoring program
- procedures for notification of non- compliance
- banning from the landfill

Emergency Response
- as outlined in EMP

Fire Fighting
- Emergency response protocol for fires
- Personal safety

3.2.2 Documentation of Training

The General Manager will be responsible for ensuring that personnel files for all staff are updated as directed by the Environmental Coordinator, as staff completes various training courses, environmental or otherwise.

3.3 Reporting

Proper and timely reporting of any environmental incidents or operation problems will facilitate the environmentally appropriate operation of the landfill site, by allowing corrective measures to be implemented as needed and will allow procedures to be revised to permit environmental protection goals to be achieved.

The Environmental coordinator will be responsible for establishing and maintaining the Environmental Monitoring Log, which will track various components of the environmental monitoring plan. The contents of the log are presented in Section 6.

In addition the Environmental Coordinator, with input from on-site staff, as required, will be responsible for compiling the environmental management data for presentation to the General Manager and included in the annual report as described in the Operating Manual.

3.4 Plan Revisions

As discussed in the introduction, the EMP will be revised in keeping with changes in the operation of the landfill. The EMP will be reviewed on an annual basis by the Environmental Coordinator to ensure all operational, procedural, project description changes and environmental protection plan revisions are properly reflected in the document. In addition, the environmental emergency response procedures will be reviewed, by the Environmental Coordinator and all staff after each incident to ensure they are practical and effective. If upon review, it is decided changes to the response are necessary, the EMP will be revised accordingly.

4.0 OUTLINE OF THE ENVIRONMENTAL PROTECTION PLAN

The Environmental Protection Plan (EPP) is a project specific plan that is the practical application of the mitigative measures in the EIA and the terms and conditions set out by the Lieutenant Governor in Council in the approval of the site. The purpose of the EPP is to serve as a ready, easy to understand and quick reference of environmental protection measures to be employed during the construction and operation or the Fundy Region Waste Management Facility.

The EPP is prepared under the broader framework of the Environmental Management Plan. The EPP will identify the environmental protection procedures for construction of subsequent disposal cells and any other future projects. Additional information with respect to applicable acts, regulations, guidelines, etc., reporting, training, contingency planning, and environmental monitoring etc. are provided in the EMP. Environmental protection procedures for operations are contained in both the Operations Manual, and the EMP in general terms and more specifically in the EPP.

The EPP – Construction - identifies future construction activities at the site, mitigation strategies, and specific construction methods to prevent significant environmental impacts. Environmental protection procedures for clearing, grubbing, excavation, and sediment control are included. The detailed EPP construction is contained in Appendix F. in practice, it will be kept under separate cover for ease of handling and practical use.

The EPP – Operations - presents protection measures to be employed during operation of the site and covers issues relating to monitoring of incoming waste, groundwater, leachate handling, aesthetics, operational environmental emergency response and training. The detailed EPP – Operations is contained in Appendix F. In practice, it will be kept under separate cover for ease of handling and practical use.

The requirements of the EPP will be referenced in all tender documents and all contractors on-site will be required to follow standard environmental procedures as well as the specified protection measures. All contractors will also be required to participate in an environmental orientation session.

5.0 ENVIRONMENTAL EMERGENCY RESPONSE PLANS

The implementation of the environmental training program and adherence to the EPP will decrease the likelihood of an accidental event. However, human error, extreme weather conditions or other situations can result in unplanned events. The Commission recognizes that a well developed response plan can decrease the impact of such an event on the environment. The Commission is committed to the implementation of such plans and providing resources for emergency response equipment and training. In addition, the environmental emergency response procedures have been reviewed by the City of Saint John Fire Department emergency response personnel.

The accidental or unplanned events that could have a significant detrimental impact on the environment are:

- petroleum spills
- chemical (including hazardous liquids and leachate) spills
- failure of the sedimentation pond
- forest fires

Section 13 of the Operations Manual contains Response Plans for the following Operational emergencies:

- Fires (13.5)
- Explosive Gas Accumulation (13.5.2)
- Lightening (13.5.3)
- Power Outages (13.5.4)
- Medical Emergencies (13.5.6)
- Vehicle Accidents (13.5.7)

The objective of an environmental emergency plan is to minimize: danger to persons, pollution to watercourse or groundwater, and the area affected. The purpose of these plans is to set out methods for preventing the emergency, action to be taken should an emergency occur and the reporting requirements after an emergency situation.

In addition to the information contained in this document, check-lists identifying emergency response procedures and contact numbers will be posted at the scale house, compost facility, operations building, administration building and household hazardous waste facility. A copy of all lists is provided in Appendix G.

5.1 Direction of Emergency Response Procedures

The Environmental Coordinator will direct all environmental emergency response procedures at the FRWMF. In addition, a second person will be designated to assist the Environmental Coordinator or to direct the response activities in the Environmental Coordinators absence. Both the Environmental Coordinator and the additional staff person will receive training relating to emergency response, WHMIS, and first aid training.

All other staff will assist in environmental emergency response under the direction of the Environmental Coordinator or his designate. All staff will be made aware of the appropriate response procedures as part of overall environmental training requirements. A copy of the Commissions contingency plan for dealing with emergencies is provided in Appendix G.

In instances where the Hazardous Materials Response Team of the Fire Department is called to the site they will assume command and direct the emergency response.

5.2 Petroleum Spills

5.2.1 Risks

Based on the types of operations at the FRWMF, petroleum spills or leaks may occur from any one of a number of sources including:

On- site petroleum product storage areas

Sufficient quantities of hydraulic and motor oil will be stored at the Operations Building, and Compost facility areas for the purpose of equipment maintenance.

On-site equipment

The on-site mobile equipment, trucks etc, potentially could spill some of the contents of a fuel tank. The mobile equipment that operates in the waste disposal cell will generally be left in the cell area or at the Operations Building parking compound when not in use. The on site mobile equipment that operates at the Compost Facility and the Commissions recycling trucks will be parked within the facilities buildings or in the parking compound when not in use.

During fuelling of on-site equipment

The on-sit mobile equipment will be fuelled by contracted fuel delivery. During fueling a spill may occur.

Discharge from a non-Commission operated vehicle

A fuel spill from a non-Commission operated vehicle could occur as a result of collision or other accident.

5.2.2 Prevention

Prevention of an emergency situation is a key component of the Environmental Emergency Response Plan. The following preventative measures will be undertaken to decrease the likelihood of a petroleum leak or spill:

- Weekly inspection of the petroleum product storage areas
- Record any petroleum staining surrounding storage areas and attempt to locate the source
- Weekly inspection of each fuel tank on the mobile equipment
- Fuel vehicles in a designated area away from on-site wells
- During fueling do not leave vehicles unattended
- Carry out immediate follow-up to any deficiencies noted during the inspection

5.2.3 Response Procedures

Initial Response

All spills of petroleum products, regardless of size must be reported immediately to the Environmental Coordinator.

The Environmental Coordinator must follow reporting requirements as directed by the current and subsequent COA-O.

The responder must be aware of the situation he is entering. Do not approach an unsafe scene!

After calling the Environmental Coordinator, the employee first observing a spill or leak will extinguish all sources of flames or sparks, and then shut off the source of the leak if the employee can do without risk of injury.

The Environmental Coordinator or his designate (the responder) will then attempt to secure the area to minimize environmental impact by containing the spilled product.

Surround the spilled product with absorbent material such as sand, straw, peat moss, synthetic absorbent boom or cloth.

Absorbent materials are stored at the Operations Building, Household Hazardous Waste Facility, Compost Facility and Scale House.

In the case of a vehicle accident resulting in spilled fuel call the Fire Department and place absorbent material around spill site to control the spilled product. Report the incident as directed by the current and subsequent COA-O. Proceed with clean-up as directed by the NBDOE.

A meeting of landfill employees responding to the emergency will be held after each event to determine the cause of the spill and whether or not the response procedures were adequate or need to be revised.

The Environmental Coordinator will be responsible for obtaining approval from the General Manager to revise the Emergency Response Procedures, as required, documenting any changes and ensuring all EMP holders receive the appropriate revisions.

5.3 Chemical Spills

5.3.1 Risks

Based on the type of operations at the FRWMF, a chemical spill or leak, including leachate may occur from a limited number of sources including:

On-site chemical product storage areas

Very small quantities of chemicals may be stored, from time to time in the bay area of the Operations Building, Compost Facility and flocculent will be stored in the Sedimentation Control Building. House hold hazardous waste materials generated by the residential segment within the Fundy region will be accepted and temporarily stored at the on-site facility. The design of the facility and the operating protocol found in the facilities Operation Manual minimize any chance of a spill impacted the environment.

On-site equipment
Tanker trucks will transport leachate from the site to the Lancaster Sewage Treatment Plant. There is a possibility that these vehicles could leak or spill contents on or off-site as the result of a vehicular accident or a failure of the tanker. Transfer of leachate from the disposal cell or surge pond will take place within a contained area, therefore, a spill of leachate during the transfer of leachate from the landfill holding area to the tanker is not a concern.

Discharge from a non-Commission operated vehicle
A chemical spill from a non-Commission operated vehicle could occur as a result of a collision or other accident.

5.3.2 Prevention

Prevention of an emergency situation is a key component of the Environmental Emergency Response Plan. The following preventative measures will be undertaken to decrease the likelihood of a chemical leak or spill:

- Weekly inspection of chemical storage areas
- Weekly inspection of the leachate transport vehicles, all connecting hoses, valves and the loading containment area.
- Posted procedures for the loading, transport and unloading of leachate
- Carry out immediate follow-up to any deficiencies noted in the inspection.

5.3.3 Response Procedures

Initial Response- Known or Unknown Chemical Spill or Leak
All chemical spills, regardless of size must be reported. If a chemical spill or leak is detected, prevent others from entering the spill area, remain upwind of the spill site and call the Environmental Coordinator or his designate.

The Environmental Coordinator or his designate will call initiate the call to the **HAZMAT RESPONSE TEAM**- Saint John Fire Department at **911** and **NBDOE** as detailed in the current and subsequent COA-O.

Excavation and earth moving equipment will be on standby and ready to work, if necessary, under the direction of the Hazmat Team. Ensure access to the spill area by emergency responders is unobstructed. Once the Hazmat Team arrives, brief them as to the situation and initiate further containment and clean-up under their direction. Details of the incident will be reported as required by the Current and subsequent COA-O.

Initial Response – Leachate Spill – On-site
All spills of leachate, regardless of size must be reported.

The employee first observing a spill or leak will shut off the source if he or she can do so without risking injury, then call the Environmental Coordinator, who will contact the NBDOE as required in the current and subsequent COA-O. The Environmental Coordinator or his designate (the responder) will then attempt to secure the area to minimize environmental impact by containing the spill. Containment may require blocking sewers, ditches and culverts that lead off-site or to the sedimentation ponds. Leachate should be diverted to the disposal cell or a manhole attached to the leachate collection system. Clean-up of spills on-site will be directed by the Environmental Coordinator or his designate.

The incident will be reported as required in the current and subsequent COA –O.

Initial Response – Leachate Spill – Off-site
All spills of leachate, regardless of size must be reported.

The employee first observing a spill or leak (likely the leachate truck driver) will shut off the source if he or she can do so without risking injury, then call the Environmental Coordinator, who will contact the Hazmat Response Team as necessary and the NBDOE as required in the current and subsequent COA-O. The Environmental Coordinator will proceed to the site of the incident where he or his designate (the responder) will then attempt to secure the area to minimize environmental impact by containing the spill. Once the Hazmat team has arrived, they will be briefed as to the situation and further containment and clean-up will proceed under their direction.

The incident will be reported as required in the current and subsequent COA-O.

In the case of a vehicle accident:

- pump over cargo to an appropriate container prior to attempting to move the vehicle
- place absorbent material around the site for the collection of petroleum during the righting of the vehicle

Excavation of Contaminated Soil
Leachate contaminated soil should be excavated and deposited in the disposal cell. Where possible and practical, the site should be restored to a condition comparable to its original state.

Reporting and Evaluation
Once the emergency has passed and clean-up is well underway, an Emergency Response Report will be prepared while details and relative information is easily recalled. The reports will be completed as required in the current and subsequent COA-O.

A meeting of all landfill employees involved in the emergency will be held after each event to determine the cause of the spill and whether or not the response procedures were adequate or need to be revised.

The Environmental Coordinator will be responsible for obtaining approval from the General Manager to revise the Emergency response Procedures, as required, documenting any changes and ensuring all EMP holders receive the appropriate revisions.

5.4 Forest Fires

5.4.1 Risks

Although burning at the landfill is not permitted and hot loads will be isolated from the active face, there is always a possibility a cinder could be blow into the forested area surrounding the landfill. It is also a possibility that a fire could be caused by lightning strike or possibly careless individuals in the forested area.

5.4.2 Prevention

Prevention of an emergency situation is a key component of the Environmental Emergency Response Plan. The following preventative measures will be undertaken to decrease the likelihood of a forest fire.

- following all operating procedures with respect to working with hot loads
- quickly containing and extinguishing any fires at the working face or elsewhere on site
- maintain the cleared area between the disposal cell and the adjacent wooded area
- prohibit workers and customers from smoking at the active face

5.4.3 Response Procedures

Initial Response

If a fire in the forested area adjacent to the site is observed, call 911, then the Environmental Coordinator.

The Environmental Coordinator shall notify staff with appropriate training to gather fire fighting equipment and proceed to the fire area.

Staff will ensure that access to the fire scene by emergency responders is kept clear of vehicles, site users or any other obstruction and keep site users away from the fire scene. Staff will assist the emergency responders as directed by the fire commander at the scene.

Initiate Clean-up

Once the fire is completely extinguished, bulldoze the site and prepare for planting.

Where practical ensure run-off from burned area is directed over vegetated areas and if possible, away from any near-by water course.

Reporting and Evaluation

Once the emergency has passed and clean-up is well underway, an Emergency Response Report will be prepared while details and relative information is easily recalled. The reports will be completed as required in the current and subsequent COA-O.

A meeting of all landfill employees involved in the emergency will be held after each event to determine the cause of the spill and whether or not the response procedures were adequate or need to be revised.

The Environmental Coordinator will be responsible for obtaining approval from the General Manager to revise the Emergency response Procedures, as required, documenting any changes and ensuring all EMP holders receive the appropriate revisions.

5.5 Failure of the Sedimentation Pond

5.5.1 Risks

The sedimentation control system at the site will be operated as a total retention pond. That is, a pond designed to accommodate flows arising from a 1 in100 year storm. Therefore, the pond will contain a minimal amount of water the majority of the time. The pond is not likely to fail when operated in this manner and if it does, the impact would be minimal due to the small volume of water in the pond.

5.5.2 Prevention

Prevention of an emergency situation is a key component of the Environmental Emergency Response Plan. With respect to failure of the sedimentation pond, preventative measures will include diligent operation and regular inspection of the pond, as outlined in the Operations Manual, to ensure water is maintained at the lowest possible level for the given circumstances. This will minimise the risk of failure and impact should a failure occur. In addition, minimizing the area exposed to precipitation will also decrease potential impacts.

5.5.3 Response Procedures

Initial Response

The pond failure should be reported to the Environmental Coordinator as soon as immediately.

The Environmental Coordinator must call NBDOE to relay information about the situation.

The Environmental Coordinator will assess the situation to determine the most practical method of repairing the pond.

All reasonable and practicable methods will be undertaken by landfill staff under the direction of the Environmental Coordinator; to prevent serious impacts on receiving streams due to high volumes of sediment laden water form exposed portions of the site.

Reporting and Evaluation

Once the emergency has passed and clean-up is well underway, an Emergency Response Report will be prepared while details and relative information is easily recalled. The reports will be completed as required in the current and subsequent COA-O.

A meeting of all landfill employees involved in the emergency will be held after each event to determine the cause of the spill and whether or not the response procedures were adequate or need to be revised.

The Environmental Coordinator will be responsible for obtaining approval from the General Manager to revise the Emergency response Procedures, as required, documenting any changes and ensuring all EMP holders receive the appropriate revisions.

6.0 THE ENVIRONMENTAL MONITORING PLAN

The Commission is committed to carrying out environmental monitoring as part of the overall environmental monitoring plan. That is, monitoring will be conducted by measuring quantitatively and qualitatively components in both the ecosphere and socioeconomic sphere before and during construction and operation of the landfill. Environmental monitoring will be conducted as part of the Commissions overall commitment to environment protection and as committed to in the EIA.

Monitoring will permit predictions in the EIA to be verified, it will also allow mitigative measures to be implemented, if necessary, in a timely fashion and will facilitate the minimization of environmental impacts. The monitoring program is designed to:

- provide for the collection of meaningful data that will allow mitigative measures to be implemented as required,
- fulfill all monitoring commitments made in the EIA,
- fulfill all monitoring required by the COA-O, and
- be flexible in scope and content such that the program can be easily adjusted to reflect real world conditions and ongoing monitoring

The monitoring program described herein is to be carried out in conjuncture with the routine inspection activities mandated in the Operations Manual. As part of the program, air quality, groundwater , surface water, leachate, noise, waste, visual buffers, assessment and land values, collection vehicles and traffic will be monitored during site operations, Groundwater and surface water monitoring will begin before construction and operational activities in order that meaningful baseline data is compiled. During the construction phase, groundwater and surface water, as well as dust, noise and traffic will be monitored as required by the current and subsequent COA-O.

The Environmental Coordinator, with assistance from the General Manager as required, will have overall responsibility for ensuring the Environmental monitoring plan is implemented, the required sampling stations established and the Environmental Monitoring Log is maintained as required in the COA-O.

Monitoring Components

- Air Quality
- Leachate
- Groundwater On-Site
- Groundwater Off-Site
- Surface Water
- Indiscriminate Dumping
- Waste Inspection
- Aesthetics
- Noise
- Property Assessments
- Collection Vehicles and Traffic

6.1 Air Quality

6.1.1 Monitoring Requirements

Non Methanagenic Compounds

Air quality monitoring will be conducted to confirm calculated emission rates from the landfill and off property for total suspended particulate (TSP), specifically air quality at a receptor 100 metres outside the peripheral road near the landfill. The sampling results will be monitored for a minimum of two years after which the sampling requirements will be determined by the current and subsequent COA-O. If quality does not meet the required levels, then mitigative measures will be under taken as required by the current and subsequent COA-O.

Landfill Gases

A monitoring schedule of methane concentrations will be established with the Commission's construction of the landfill gas collection system. The construction is expected to take place once the Commission has operated the landfill for at least five years and will coincide with the schedule for applying final cap to the initial landfill cells. The monitoring will be conducted according to the schedule, conditions and parameters detailed in the current and subsequent COA-O.

6.1.2 Remedial Measures

If TSP levels are higher than the regulated maximums the following remedial measures will be implemented during prolonged dry windy periods:

- treating the unpaved roads with water, or other dust control product, or method, approved by the current or subsequent COA-O,
- flushing and/or sweeping of paved roadways,
- treating areas where heavy equipment is operating with water or other chemical stabilizers approved by the current or subsequent COA-O,

If methane concentrations are above acceptable levels the collection system controls will be inspected adjusted as necessary and gas dissipated as required.

6.2 Leachate

6.2.1 Monitoring Requirements

Leachate collected from the waste disposal cells shall be sampled as required by the City of Saint John for BOD and other required parameters, and as required by current and subsequent COA-O.

6.2.2 Monitoring Responsibility

The Environmental Coordinator or his designate is responsible for engaging qualified sampling personnel, maintaining monitoring data, reporting monitoring results to the Commission as required and compiling data for the annual report. He or she is also responsible for forwarding monitoring data to the NBDOE as outlined in the current and subsequent COA-O. The General Manager is responsible for ensuring mitigative measures are undertaken as required.

6.2.3 Remedial Measures

Remedial measures will be undertaken as required.

6.3 Groundwater Monitoring Wells

6.3.1 Monitoring Requirements

The locations of groundwater monitoring sites are shown on Figure 6-1. Groundwater monitoring wells will be sampled place prior to acceptance of waste, and continue to be monitored for the parameters, and at the frequency outlined in the current, and subsequent COA-O.

6.3.2 Monitoring Responsibility

The Environmental Coordinate, or his or her designate, is responsible for engaging qualified groundwater sampling personnel, maintaining monitoring data, compiling data for the annual report and reporting monitoring results to the Commission as required. The Environmental Coordinator is also responsible for reporting the results to the NBDOE as required by the current and subsequent COA-O. The General Manager is responsible for taking mitigative measures as required.

6.3.3 Remedial Measures

From the analysis of the background water chemistry data, “trigger” concentrations will be established for key parameters. If these trigger concentration are exceeded, those wells will be sampled on a more frequent basis in accordance with the intent of ASTM PS 64-96. Should it become clear that these exceedances reflect a true change in water quality attributed to landfill presence, not statistical or seasonal variability, remedial measures will be implemented.

One or more of the following remedial measures will be considered:

- plume delineation and source identification by the construction and sampling of addition more closely spaced monitoring wells

- containment and remediation of affected groundwater by pump and treat
- containment of affected groundwater by slurry cut-off or reaction walls in-situ groundwater remediation by biological and/or chemical means

6.4 Groundwater Domestic Wells

6.4.1 Monitoring Requirements

Two comprehensive rounds of domestic well groundwater sampling have been completed prior to placing waste at the site to establish a water quality baseline as required by the EIA. Future samples will be collected and analyzed for parameters established by the current and subsequent COA-O.

6.4.2 Monitoring Responsibility

The Environmental Coordinator or his or her designate is responsible for engaging qualified groundwater sampling personnel to maintaining monitoring data, reporting monitoring results to the NBDOE and Department of Health and Wellness as required by the current and subsequent COA-O. The General Manager is responsible for ensuring mitigative measures are undertaken as required.

6.4.3 Remedial Measures

From an analysis of the background water chemistry data, "trigger concentrations will be established for key parameters. If these trigger parameters are exceeded, those wells will be sampled and tested on a more frequent basis in accordance with the intent of ASTM PS 64-96. Should it become clear that these exceedances reflect a true change in water quality attributed to landfill presence, not statistical or seasonal variability, not other non-landfill source of contamination, remedial measures will be implemented. The Department of Environment and Health will be advised.

Should water quality deteriorate and become non potable as a direct result of the landfill operation, then one or more of the following remedial measures will be implemented so as to ensure that property owners have an acceptable water supply:

- Replacement of the domestic supply or supplies with an alternative supply
- Provision of in-line treatment using filtering processes

6.5 Surface Water

6.5.1 Monitoring Requirements

Surface water monitoring will be conducted at locations in the unnamed drainage basin, Henderson Brook and Mill Creek. Surface water sampling schedule and parameters are set out in the current and subsequent COA-O. In addition surface water that discharges from the sedimentation ponds shall be sampled as scheduled and for the parameters set out in the current and subsequent COA-O.

6.5.2 Monitoring Responsibility

The Environmental Coordinate or his/her designate is responsible for engaging qualified surface water sampling personnel, maintaining monitoring data, reporting results to the Commission as required and compiling data for the annual report. The

Environmental Coordinator is responsible for reporting results to NBDOE as required by the current and subsequent COA-O. The General Manager is responsible for ensuring mitigative measures are undertaken as required.

6.5.3 Remedial Measures

The discharge from the sedimentation pond shall have total suspended solids of 25 mg/L or less. If surface water contamination origination from the landfill is detected, one or more of the following remediation measures will be implemented

- Contamination source identification and restoration
- Adjust discharge practices (from the sedimentation pond)
- Containment and treatment
- Dilution and natural attenuation

6.6 Indiscriminate Dumping

6.6.1 Monitoring Requirements

All incidents of indiscriminate dumping at the gate will be recorded as observed in the Environmental Monitoring Log under the heading “Indiscriminate Dumping“.

6.6.2 Monitoring Responsibility

All staff are responsible for reporting incidents of indiscriminate dumping as observed to the Environmental Coordinator or his/her designate who will record incidents in the Log. The Environmental Coordinator or his/her designate is responsible for ensuring the waste is removed and follow-up action taken as necessary.

6.6.3 Remedial Measures

Indiscriminately dumped waste will be removed and disposed of as appropriate in the landfill. All reasonable steps will be taken to determine the source of the waste and prosecution of alleged offenders will be undertaken.

6.7 Waste Inspection

6.7.1 Monitoring Requirement

On three randomly selected days each month, a random load of solid waste delivered to the facility, will be inspected in detail. The load will be discharged by the driver to an area within the landfill cell as directed by landfill staff. The load will be inspected for any regulated hazardous waste or other unacceptable wastes. If unacceptable wastes are suspected, landfill staff will contact the generator and/or hauling contractor or other parties responsible for shipping the waste to determine the actual contents of the waste.

6.7.2 Monitoring Responsibility

The Monitoring will be scheduled and conducted by the Environmental Coordinator or his/her designate. All observations made during the random inspections will be recorded in the Log.

6.7.3 Remedial Measures

If the waste is determined to be unacceptable the responsible party will be required to remove the waste at his or her own expense.

6.8 Aesthetics

6.8.1 Monitoring Requirement

The trees and plantings situated on the visual berm will be inspected seasonally to ensure maintenance of cover. Dead or dying will be noted in the Environmental Monitoring Log under "Aesthetics". Follow-up action will be taken as required

6.8.2 Monitoring Responsibility

The Monitoring will be scheduled and conducted by the Environmental Coordinator or his/her designate.

6.8.3 Remedial Measures

Trees and plantings will be replaced as required.

6.9 Noise

6.9.1 Monitoring Requirements

Noise levels will be monitored, if there are any complaints at locations near existing adjacent development. If found to be beyond acceptable levels, (55 dB) remedial measures such as equipment checks or construction of buffers or berms will be undertaken. All complaints are to be recorded in the Environmental Monitoring Log under the heading of "Noise".

6.9.2 Monitoring Responsibility

The Environmental Coordinate is responsible for engaging qualified personnel to conduct noise monitoring, as complaints arise. The Environmental Coordinate is also responsible for maintaining monitoring data for reporting as necessary and ensuring mitigative measures are taken as required.

6.9.3 Remedial Measures

Mitigating noise impacts will include equipment checks, maintenance of mufflered vehicles and ensuring construction and/or operations activities take place within normal operating hours.

6.10 Property Assessments

6.10.1 Monitoring Requirements

Property assessment and land values will be monitored to determine if any changes might be attributed to the landfill site.

6.10.2 Monitoring Responsibility

The regional provincial assessment branch will conduct the monitoring, and the General Manager will be responsible for maintaining liaison with the local assessors, and communicating with the Commission as required.

6.10.3 Remedial Measures

If property assessments are declining in a statistically significant manner, and because of landfill operations, remedial measures will be employed where possible. For example, if it is determined that assessments are declining due to noise, dust, odour or some other aesthetic parameter. The remedial measures identified for these occurrences will be implemented and monitored to ensure their effectiveness.

6.11 Collection Vehicle Maintenance

6.11.1 Monitoring Requirements

The hauling contractors will be monitored on a continual basis to ensure collection vehicles are properly equipped to contain garbage and prevent spillage or littering of the highways.

6.11.2 Monitoring Responsibility

The scale operator and disposal cell personnel will be responsible for continually visually monitoring incoming collection vehicles to ensure they are properly equipped to deliver waste. The Scale Operator will record all incidents of non-compliance and record them in the Environmental Monitoring Log under the heading of "Collection Vehicle Maintenance". The Scale Operator will report maintenance and safety issues and actions taken to the immediate supervisor on a regular basis.

6.11.3 Remedial Measures

For maintenance and safety issues the vehicle in question will not be allowed to deliver waste to the landfill until the necessary maintenance is completed.

6.12 Traffic

6.12.1 Monitoring Requirements

Monitoring of traffic is conducted on a continuous basis by both the City and the NBDOT. This will ensure any decrease in the level of service is rectified as identified.

6.12.2 Monitoring Responsibility

City of Saint John and NBDOT will monitor traffic.

6.12.3 Remedial Measures

Remedial measures will be undertaken by the City of Saint John and the NBDOT as required.

7.0 COMMUNICATION

The Commission has been and is committed to public consultation, providing accurate information about the project to the region as a whole and the local community near the site in a timely fashion and ensuring mechanisms which allow for public input are in place and easily accessible.

Over the years the Commission have used and continue to use a variety of communication methods including:

- Publication of brochures, pamphlets and a news letter, strategic public displays, press releases, open houses, public meetings and articles in the local newspaper;
- Open monthly Commission meetings at which the public may attend and observe, if desired interested parties can have an opportunity to give presentations to the Commission, please see our web site for details;
- Support of the Fundy Future Environment Benefits Council, currently actively functioning as Crane Mountain Enhancement Inc., which is an independent community based advisory group monitoring all aspects of the landfill.
- A free telephone line (506-738-1212) staffed during normal operating hours; and
- A web site www.FundyRecycles.com and an e-mail address hotline@fundyrecycles.com

At present concerned citizens with questions about the Commission or the landfill facility itself may contact the Commission directly or the Crane Mountain Enhancement Inc.

The Commission employs a Recycling and Waste Diversion Supervisor and Public Education Personnel who act as a resource to the residents and businesses of the Region with respect to waste diversion and waste management issues. The Recycling & Waste Diversion Supervisor and Public Education Officer are available by contacting the Commission office.

In 1998 the on-site Administrative Building was constructed. This building has a permanent interpretative centre providing information about responsible solid waste management in the region. The Commission will also be preparing an annual report summarizing all activities at the landfill for each calendar year. The annual report will contain environmental monitoring data, a summary of waste throughput and other activities at the site.

The Commission will continue to utilize these consultation options as well as others, throughout the operating life of the landfill and welcomes all comments and questions.

APPENDIX A

ENVIRONMENTAL PROTECTION PLAN

TABLE OF CONTENTS

3.0 INTRODUCTION

1.1 Background

The Fundy Region Solid Waste Commission (FRSWC) opened their modern sanitary landfill in November 1997. The design and construction of the facility was completed in accordance with the requirements of the Minister of the Environment under the Clean Environment Act.

Design and construction of the landfill incorporated a number of features to minimize potential environmental risks with the project. Although many of the environmental concerns were with the initial project construction, there will be ongoing work which will require management of environmental risks. This Environmental Protection Plan (EPP) provides supplementary information to ensure future construction activities are carried out in an environmentally sensitive manner. The plan outlines the specific activities which have potential environmental consequences, generally related to erosion and sedimentation control during construction, and identifies those measures which can be taken to minimize the risk to the environment.

1.2 Objective of the Environmental Protection Plan

Specifically the objectives of this environmental protection plan are to:

- document potential environmental concerns related to future landfill construction activities;
- to identify the appropriate environmental protection measures that can be implemented;
- to provide documentation to operations staff to ensure environmental issues are identified and addressed accordingly; and
- to ensure environmental mitigation techniques are consistent with the ongoing site operations

1.3 Accompanying Documentation

This environmental management plan should be read in conjunction with the following documentation:

- Crane Mountain Landfill Management Plan
- Crane Mountain Landfill Preliminary Design Report
- Crane Mountain Landfill Operations Manual

These documents provide additional information to that included in the EPP and operations staff should be familiar with each.

Also available to the FRSWC landfill staff are individual construction contracts showing details and specific application of environmental mitigating techniques discussed in the EMP.

3.0 LANDFILL FACILITY

Environmental protection has been paramount in the design and construction of the Crane Mountain landfill. A significant portion of the cost of the facility is related to the construction of both permanent and temporary facilities to minimize the potential for erosion on site, and escape of sediment laden runoff from the site.

The most significant potential for erosion and sedimentation was during the construction of the initial cell, perimeter road, site ditching, ancillary buildings and temporary facilities. All contracts included requirements for environmental protection, including temporary sedimentation ponds, ditching, sedimentation fencing, erosion control structures, and slope stabilization, as the works were completed the temporary structures were removed

In addition to temporary features, permanent facilities, including a sedimentation control pond and interceptor and perimeter ditching have become part of the landfill operation. These facilities have been designed to accommodate activities related to ongoing landfill operations, however, it will be necessary to supplement these with further temporary works as the landfill progression occurs.

This section provides a summary of the design rational related to sedimentation and erosion control, and as well, describes the significant construction activities with potential environmental risks over the life of the site.

2.1 Landfill Design

Preparation of a stormwater management plan is a critical component of landfill design, and is the prime tool in minimizing potential negative environmental impacts associated with construction. The primary objectives of such a plan are to:

- minimize the amount of overland runoff that becomes contaminated with sediment;
- minimize erosion potential by stabilizing soil and reducing flow velocities;
- convey uncontaminated runoff to a natural watercourse at rates and quantities that will not aggravate erosion; and
- collect and treat sediment laden runoff prior to discharge to the receiving watercourse.

Stormwater management features such as drainage ditches were designed to accommodate precipitation design events defined by a 100 year return event. Culvert design was based on a 100 year return event.

Sediment laden runoff from disposal and support areas will be drained to the sedimentation pond for an on-site settlement/ treatment to lower the suspended solids (SS) concentrations to the acceptable limits established by the New Brunswick Department of Environment for this location prior to discharging into receiving waters.

To permit construction of the facilities designed as part of the StormWater Management Plan, and to supplement these facilities during ongoing construction activities, a construction erosion and sedimentation control plan was prepared. This was incorporated into construction documents during initial construction, and will be required for future construction activities.

2.2 Future Construction Activity

Most of the ancillary facilities associated with the landfill, including buildings and roadways, have been completed. There will be, however, ongoing construction activities throughout the life span of the landfill. Major construction activities are noted as follows.

New Cell Construction
The initial cell was constructed in the northeast corner of the landfill footprint. Cell 2 was constructed immediately west of the first cell, with the following cell progressing southerly. Activities associated with new cell construction include grubbing, excavation, temporary ditching, berming, construction of soil composite liner and temporary access ramps.

Completion of Perimeter Road
Under the initial construction, the perimeter road was completed from the site entrance, along the west side of the landfill cell footprint and continuing around the footprint to the Operations/Maintenance Building. There remains a 700 m stretch to complete the perimeter road loop. Construction of the perimeter road may proceed in short sections as the cell progresses, or in one contract. This will be determined at a later date by the Commission.

Ditches and Trenches
As part of the cell construction, temporary perimeter ditches will be constructed. The purpose of these ditches is to prevent overland flow away from entering the construction area from the landfill cell construction by directing flows to adjacent roadway ditches. Sediment laden water from the construction area will be directed to the sediment control ponds.

As well, if required to improve the drainage of the existing soils, interceptor ditches will be constructed to help drain the future cell subgrade. Again these ditches would be directed toward the landfill perimeter ditching.

Temporary Access Roads
Temporary access roads will be constructed as required for construction purposes.

Excavation of daily cover
Options for provision of daily cover for the site include excavation of on-site materials as well as importation of borrow material. Because of the cost benefit associated with obtaining the material on-site, and the potential for merging this requirement with excavation for future cells, there will be on-going grading activities on adjacent future cell sections. Material would be stripped cleared, grubbed and stockpiled for future use.

3.0 ENVIRONMENTAL PROTECTION PLAN - Operations

The Environmental Protection Plan (EPP) is a project specific plan that is the practical application of the mitigative measures in the EIA and the terms and conditions set out by the Lieutenant Governor in Council in the approval of the site. The purpose of the EPP is to serve as a ready, easy to understand and quick reference of environmental protection measures to be employed during the construction and operation or the Fundy Region Waste Management Facility.

The EPP is prepared under the broader framework of the Environmental Management Plan. For this facility, two separate plans have been prepared, one plan will deal specifically with construction related issues, the other with operations.

The EPP – Construction identifies future construction activities at the site, mitigation strategies, and specific construction methods to prevent significant environmental impacts. Environmental procedures for clearing, grubbing, excavation, and sediment control are included.

The EPP – Operations - presents protection measures to be employed during operation of the site and covers issues relating to monitoring of incoming waste, groundwater, leachate handling, aesthetics, operational environmental emergency response and training.

The following document presents the EPP – Operations for the Fundy Region Solid Waste Management Facility. It is developed in accordance with Commissions Commitment to operating an exemplary facility, ensuring all environmental obligations are met or exceeded and no unacceptable environmental impacts are incurred.

4.0 ENVIRONMENTAL PROTECTION

Environmental protection for the operations phase at the Fundy Region Waste Management Facility is achieved through the consistent and continual application of procedures outlined in the Operations Manual and the Environmental Management Plan.

Operations procedures have been planned with due regard for environmental protection, operations staff at the site have been trained in environmental protection procedures and will carry out their operations functions accordingly, ands finally, operations at the site will be continually monitored to ensure environmental protection is provided.

The following sections highlight the specific procedures to be undertaken for environmental protection during the operations phase at the landfill.

4.1 Site Access

In order to control waste entering the site and to ensure that it is "acceptable", physical access to the site will be restricted by the use of an entrance gate as well as other natural barriers and fences at various locations of the site. The entrance gate will be locked outside of normal operating hours. All gates and entrances will be inspected regularly in accordance with the schedule outlined in the Operations Manual. In addition a key log will be maintained to control access.

Reference 2.1.1, 2.1.2, 11.0 Operations Manual

4.2 Collection Vehicles

The hauling contractors will be monitored on a continual basis to ensure collection vehicles are properly equipped to contain garbage and prevent spillage or littering of the highways. The scale operator and disposal cell personnel will be responsible for continually visually monitoring incoming collection vehicles to ensure they are properly equipped to deliver waste. The Scale Operator will record all incidents of non-compliance and record them in the Environmental Monitoring Log under the heading of "Collection Vehicle Maintenance". The Scale Operator will report maintenance and safety issues and actions taken to the immediate supervisor on a regular basis.

Reference: 6.11 Environmental Management Plan

4.3 Incoming Waste – Acceptable and Non – Acceptable Wastes

All incoming waste will be monitored to ensure that only acceptable wastes are received at the site. An initial inspection will be carried out by the Scale house operator where possible, inspection for prohibited wastes will also be conducted at the working face by Landfill Spotters and Equipment Operators. In addition, detailed random load inspections will be carried out three times per month by the Environmental Coordinator or his designate.

Reference: 6.1.1, 6.1.2, 6.2.3, 6.2.4, 6.3 Operations Manual

4.3.1 Asbestos

Asbestos generated within the Fundy Region will be accepted for disposal at the facility in accordance to strict conditions and procedures outlined in the Operations Manual and the current and subsequent COA-O.

Reference: 6.2, 3.6 Operations Manual

4.4 Liner Protection

The liner under the disposal cell will be protected during the initial placement of waste. The waste placed in this initial lift will be inspected to ensure that no large, bulky or long items could potentially harm the liner system. Wastes of concern include rebar, pipes, and large pieces of demolition rubble. Preferred waste to deposit closer to the liner includes non- bulky residential waste, in addition a bulldozer will be used for primary spreading and compacting during initial waste placement activities, as opposed to a compactor.

Reference: 6.7 Operations Manual

4.5 Cover

Daily, intermediate and final cover will be placed on waste deposited ion the cell to minimize wind blown litter, leachate, vectors, and odors. A minimum of 150 millimetres of cover is required on a daily basis, and an additional 150 millimetres is required on areas that will not receive wastes for more than 30 days (intermediate cover).When filling, in a particular area, reaches design elevation, final cover will be applied. Design details are located in the Current and subsequent COA – O, and COA – C.

Reference: 6.3.3, 6.4, 6.5 Operations Manual

4.6 Nuisance Control

Litter

Litter will be controlled by the use of daily cover, 4.0 metre high portable litter fences, and stationary litter fencing placed strategically around the disposal cell to capture wind blown litter. In addition, the length of the working face will be minimized to facilitate cover and litter control. Litter encountered at the site will be collected as required and deposited at the working face.

Reference: 6.3.3, 7.1, 11.0 Operations Manual
6.11 Environmental Management Plan

Odour
Odour will be controlled by the use of daily cover, immediately covering unusually odorous loads, elimination of localized surface water ponding or drainage problems.

Reference: 7.2, 11.0 Operations Manual

Dust
Dust will be controlled as required by treating unpaved roads with water, sweeping of paved roads, treating areas where heavy equipment is operating, and as required by the current and subsequent COA – O.

Reference: 7.3.2 Operations Manual
6.1 Environmental Management Plan

Noise
Noise will be controlled by the use of mufflers and regular inspection and maintenance of all on-site equipment. Noise will also be minimized by the existing vegetation at the site and the man-made berms. Procedures for monitoring noise are presented in the EMP.

Reference: 7.5 Operations Manual
6.9 Environmental Management Plan

4.7 Indiscriminate Dumping

Any indiscriminately dumped waste will be removed immediately and deposited in the transfer container or at the working face. All reasonable steps will be taken to determine the source of the waste and prosecution of the alleged offenders will be undertaken whenever possible.

Reference: 7.7 Operations Manual
6.6 Environmental Management Plan

4.8 Burning

Open burning of waste at the site is not permitted. Hot loads will be placed in a secure area until cool then they will be placed in the cell. Procedures for dealing with on-site fires are presented in the Emergency Response section of the Operations Manual

Reference: 7.6, 13.5.1 Operations Manual

4.9 Leachate Management

The proper collection and disposal of leachate is what sets modern containment landfill; apart from disposal sites of the past. The following has been incorporated as leachate management methods to ensure environmental protection.

The leachate collection system is situated on top of the lining system. A series of perforated pipes collect the leachate from the waste layer and direct it, via gravity, to collection sumps located on the southern side of the disposal cell. To prevent the storing of leachate in the disposal cell and as a control measure during extreme precipitation events leachate can be pumped to a constructed leachate surge lagoon where it is pumped into tanker trucks and transported to the Lancaster Sewage Treatment Facility for treatment. A back up power system is in place to provide continued operation of the leachate collection system during power interruptions. The current and subsequent Certificates of Approval to Operate will detail the operating conditions and requirements of the leachate collection system. A Copy of the Commission 2005 Leachate management plan is found in appendix C.

Also as part of operations environmental protection procedures, leachate will be monitored as outlined in Section 6.4 of the EMP.

Reference: 10.0 Operations Manual
6.4 Environmental Management Plan

4.10 Ongoing Monitoring – Operations

As part of normal operations, monitoring of virtually all components of landfill operations will be conducted on an on-going basis. Active areas of the site will be inspected daily by the Operations Supervisor and inactive areas will be inspected on a weekly basis. The inspections will be recorded in a log. The following components of the landfill operations will be monitored:

- site access and gates and entrances
- site visitors
- incoming waste deliveries and general sources
- litter control – litter fences, buffer zones, etc.
- odours, dust
- erosion and sediment control measures
- leachate collection and handling equipment
- landfill gas
- noise
- equipment
- buildings
- landscape and berms
- incoming collection vehicles

Reference: 11.0 Operations Manual

6.1, 6.8, 6.9, 6.11 Environmental Management Plan

4.11 Landfill Gas

A monitoring schedule of methane concentrations will be established when the Commission constructs the landfill gas collection system. The construction is expected to take place once the Commission has operated the landfill for at least five years and will coincide with the schedule for applying final cap to the initial landfill cells. The monitoring will be conducted according to the schedule, conditions and parameters detailed in the current and subsequent COA-O.

Reference: 9.0 Operations Manual
6.1 Environmental Management Plan

4.12 On- Going Monitoring – Environmental

Monitoring of surface water, leachate, groundwater, discharge fro the sedimentation pond, domestic wells in the vicinity of the site, air quality, and site aesthetics will be monitored as required by the current and Subsequent COA–O. The purpose of monitoring is to, among other things allow for remedial measures to be implemented, if necessary, in a timely fashion and to minimize any potential negative environmental impacts. Environmental monitoring will be carried out under the direction of the Environmental Coordinator.

Reference: 6.1, 6.2, 6.3, 6.4, 6.5, 6.8 Environmental Management Plan

4.13 Emergency Response

Both environmental and operational response plans for incidents at the landfill facility have been prepared. Response Plans for the following environmental emergencies have been prepared and are included in the Environmental Management Plan:

- Petroleum Spills – Section 5.2
- Chemical Spill – Section 5.3
- Forest Fires – Section 5.4
- Sedimentation Pond Failures Section 5.5

Environmental emergency response is directed by the Environmental Coordinator with assistance from outside experts as required. A Contingency Plan has been developed to detail roles and responsibilities during an emergency response situation. See appendix B

Emergency response plans for the following operational situations have been prepared, and are included in the Operations Manual:

- Evacuation – Section 13.4
- Fires – Section 13.5.1
- Accumulation of Explosive Gas – Section 13.5.2
- Lightning – Section 13.5.4
- Power Outages – Section 13.5.5

- Medical Emergencies – Section 13.5.6
- Vehicular Accidents – Section 13.5.7

Response procedures for operational emergencies will be directed by the Operations Supervisor.

Reference: 13.0 – Operations Manual
5.0 – Environmental Management Plan

4.14 Staff Preparedness

All staff will be trained to perform his or her job in a safe, efficient and environmentally responsible manner. All staff will be required to undergo training before being permitted to work at the site. This training will ensure all workers have a:

- Sound understanding of the Commission's commitment to environmental protection
- General awareness of the environment
- Appreciation of the impacts their actions have on the environment and,
- Understanding of how to complete their specific job without negatively impacting the environment while protecting their safety and the health and safety of others.

The Environment Coordinator is responsible for conducting training and documenting participation for personnel files.

Reference: 2.2.2 Operations Manual
3.2 Environmental Management Plan

4.15 Complaint Response

From time to time, complaints regarding landfill operations may be received. To ensure good community relations are maintained and any potential negative environmental impacts are minimized, responses to complaints will be prompt and courteous.

Any complaint will be referred to the General Manager or his/her designate for an appropriate, timely response and follow-up as may be required.

Reference: 12.2 Operations Manual

APPENDIX B

EMERGENCY RESPONSE CONTACT LIST AND RESPONSE PROCEDURES

13.0 Emergency Response Contingency Plan

13.1 Contact List

In the case of emergency, FRSWC employees will follow the procedure outlined in section 11.2. Contact information for FRSWC contacts, emergency services and regulatory officials is included in the table below.

Table 1. Emergency Contact List

Agency	Contact Person	Telephone Number
Note: for fire, medical, police and emergency calls dial 911 for 24 hour emergency service		
Fundy Region Solid Waste Commission Contacts		
General Manager	Current Manager	(506) 738-1213 (W) (506) 650-1720 (C)
Environmental Coordinator	Current Environ. Coordinator	(506) 738 1203 (W) (506) 647-4270 (C)
Operations Officer	Current Supervisor	(506)738-1204 (W) (506) 333-7146 (C)
Alternate Officer	Current Supervisor	(506) 738-1257(W) (506) 333-4573
Regional Emergency Services		
RCMP (Grand Bay - Westfield)		(506) 757-1020
Fire (Grand Bay - Westfield)		(506) 757-8343
Hospital (Saint John Regional)		(506)648-6000
Regulatory Contacts		
NBDELG SJ Office(during business hours)		(506) 658-2558
Canadian Coast Guard (after hours)		1-800-565-1633
External Contractors for Emergency Response		
W& S General Contractors	William Shannon	(506) 635-8735
Simpson Contractors	Andrew Simpson	(506)635-8711

13.2 Organization

The organizational structure and individual roles and responsibilities during the implementation of the ERCP are as follows;

<u>Response Team Organization and Duties</u>

General Manager	**Phone # Office 738-1213** **Cell 650-1720**
Environmental Coordinator	**Phone # Office 738-1203** **Cell 647-4270** **Cell 651-5567**
Operations Officer **(First Alternate)**	**Phone # Office 738-1204** **Cell 333-4573**
Alternate Officer **(Second Alternate)**	**Phone # Office 738-1257** **Cell 333-4573**

13.3 General Manager Duties

Overall corporate responsibility for the plan including:

- Provide necessary resources to fund the plan
- Liaison with regulatory authorities and others
- Formulate the release information for the Environmental Coordinators Approval
- Monitors information flow for accuracy
- Provides advice to the Environmental Coordinator based upon evaluation and research
- Anticipates future actions based on potential scenarios

13.4 Environmental Coordinator Duties:

Gather and evaluate information:
- Analyze the situation
- Establish objectives
- Develop a plan of action

Organize personnel and material resources:

- Develop the organizational structure for the situation
- Requisition the necessary equipment

Direct Resources:
- Delegate functions
- Brief Staff
- Approve request for additional resources
- Approve requests to release resources

Coordination:
- Command
- Operations
- Tasks

Communications:
- With staff regarding operations logistics, and planning
- Ensure plans are appropriate
- Demand continuous feedback
- Authorize release of information

Evaluate:
- Effectiveness of the action
- Compare to established objectives

3.5 Operations Officer

- Manages the team dealing directly with the problem
- Puts action plans into effect
- Coordinates multi-agency responses
- Advises the Environmental Coordinator
- Charged with providing requested equipment and manpower
- Responsible for directing the team working to contain and reduce immediate environmental damage
- Responsible to direct the team working on site cleanup once emergency is over.

13.6 Alternate Officer

Will assist the response team as directed by the Environmental Coordinator

13.7 Initial Response

Spill or other Emergency:

- Ensure no danger to yourself or others in the immediate vicinity
- Use appropriate personal protective equipment (PPE) as required
- Contain spill and/or control emergency scene
- Contain spills by blocking ditches, culverts, etc, if necessary
- Immediately contact your supervisor to report the incident, initiate emergency response and actions required by the Commission's Current Certificate of Approval to Operate.

13.8 Internal Reporting Procedure

An incident would be reported by landfill staff by contacting the proper personnel. It is expected that if the person named cannot be contacted his/her designated alternative(s) will be contacted. Do not give up until someone on the list has been contacted. The following pages contain contact information for all Commission managers, staff, and employees.

13.9 External Reporting Procedure

External alerting will take place any time the situation grows beyond the ability of personnel to respond, if there is any threat to public safety and as directed by the Commission's current Certificate of Approval to Operate.

13.10 Action Plan

Upon notification of an incident, the Environmental Coordinator or his/her designate shall immediately dispatch a staff member to the site with the appropriate PPE and equipment to supervise the initial response and report on the situation. The Environmental Coordinator or his/her designate will convene a meeting with appropriate staff to initiate an operational response to the situation.

This Group will determine the following:

- Risk to public and environment (present and potential)
- Ability of on site resources to handle the situation
- Do outside agencies need to be informed?
- Does the response team need to be activated?
- Is there a need for outside expertise?

Having answered these questions, an operational action plan will be developed and initiated immediately.

APENDIX C

LEACHATE MANAGEMENT PLAN

LEACHATE MANAGEMENT PLAN
FUNDY REGION SOLID WASTE COMMISSION
SAINT JOHN, NEW BRUNSWICK

TABLE OF CONTENTS

1.0 BACKGROUND

The Fundy Region Solid Waste Commission Started Operations on November 10th, 1997. During the design phase of the project the Commission reviewed various options for the treatment of leachate generated at the landfill. Ultimately the decision was made to treat leachate with the Zenon, Zenogem/Reverse Osmosis process. The treatment Facility was designed to treat the generated leachate to Fresh Water Aquatic Levels which would allow the discharge of treated leachate on site.

During the first year the landfill operated all the leachate that was generated was trucked to the City of Saint John and treated at the Lancaster Waste Water Treatment Facility. The City of Saint John bylaw requires that wastewater received for treatment is 400 mg/l or less when a BOD5 sample is analyzed. When leachate sampling indicated that the BOD exceeded 400mg/l the landfill was required to pre-treat its leachate prior to trucking the leachate for disposal at the Saint John wastewater facility. This was accomplished by diluting the leachate with water to lower the BOD result to 400mg/l or less.

By the fall of 1998 the construction of the Water Treatment Facility (WTF) at Crane Mountain Landfill was completed. The commissioning of the WTF was expected to be complete by the end of December, 1998, unfortunately numerous process complications delayed the completion of this process for close to 2 years and approval to discharge on site was not approved until 2002.

The unique situation that was being dealt with was the fact that the proposed WPF was the first of its kind in the world. Although Zenon operated several plants in Europe, none were required to meet the conditions set for the Crane Mountain site, which was to treat leachate from residential and ICI waste. At that time the Commission members understood that the desire to develop the landfill as an exemplary facility with high environmental standards would require more significant capital investment and annual operational costs than other more conventional methods of treatment. It was only after the plant went into operation that the extent of the operating cost was known. As it turned out, these costs exceeded the Zenon estimate by a wide margin.

Although by the end of 2002 the exterior side slopes of cell 1 and the larger portion of the exterior side slopes of cell 2 were already capped there was a general consensus that the WTF was unable to treat all of the leachate being generated within the landfill. The practice of trucking leachate to the Lancaster Waste Water Treatment Facility for treatment and storing leachate within the containment cell had become a very significant component in managing leachate.

The Zenon facility was only able to treat and discharge on site an average of 68m3/day compared to the design of 87m3/day due to seasonal conditions and operational planned and unplanned maintenance. More significantly, less than half of the total leachate flow from the landfill was being processed by the WTF. In addition to capacity and high cost issues, commission staff needed to deal with large surge flows of leachate during heavy rainfall events.

In February of 2003 the Fundy Region Solid Waste Commission formed a sub-committee to review leachate management issues at the Crane Mountain Landfill. The sub-committee included representation from Commission executive and staff as well as representatives of the local communities, the Department of the Environment and Local Government and the City of Saint John. Although the Department of Environment and Local Government representative did not attend many of the working group meetings, he received printed reports and was kept updated on a regular basis on the direction the sub-committee was heading.

The major issues needing to be addressed were the assessment of the current containment, treatment and disposal methods of leachate at the landfill. The primary issues being, Cell holding capacity and its designed intent, as well as the Zenon facilities capability to deal with the leachate that is currently being generated. The focus of the sub committee was to investigate options within the existing system and the goal being to establish a treatment system that can meet current and future requirements.

The following were some of the areas of consideration;

- Need for sufficient surge capacity to handle storm and seasonal conditions
- Need to determine what maximum volume of surge capacity will be required
- Need to determine at what point during the life of the landfill the maximum surges are most likely to occur
- Need for a system that can effectively process 100% of the leachate generated on a yearly basis
- Need to determine what the maximum yearly volumes will be and when this peak will likely occur
- Need to look at our existing system and determine whether an expansion is possible or cost effective
- Need to investigate other available options and the financial costs associated with them.
- Need to take into consideration and consult with representatives of the local communities and other parties with vested interest.
- Need to proceed toward solutions that are environmentally acceptable

In August 2003 the sub committee concluded its work and submitted a recommendation and a consultant report prepared by Gemtec Ltd. based on sub-committee input to the Commission. The focus of the sub-committee was to investigate possible options for leachate treatment and disposal and the associated costs. There were five options found to be worth serious consideration, those being, the expansion of the Zenon facility, to pre-treat at Crane Mountain and then pipe to Grand Bay-Westfield, to pipe or truck untreated leachate to the Lancaster sewage plant down highway 7 or to pipe untreated leachate to the Lancaster sewage plant via the Westfield Rd. A review of the options indicated that the expansion of the Zenon facility was not viable given that its lifecycle costs were 55 to 60 million higher than the other options. The committee thus concluded by making three recommendations; 1) to design and obtain regulatory approval for a surge pond to be constructed in 2004, 2) to proceed to the next phase of studying pipeline options to Saint John (directly or via the Westfield Rd.), and 3) to make a decision on the timing of shutting down the Zenon facility. Consequently although the tanks have been used to store leachate when required the WTF ceased processing leachate in January 2005.

Based on estimates and numbers provided by the Commissions consultant Gemtec Limited as found in the August, 2003 *Assessment of Leachate Management Options* (Appendix A) document, the following can be predicted. The average daily flow during the period of maximum uncapped area is estimated at 213 cubic meters / day and when the uncapped area is reduced to six hectares, the average flow is reduced to an average of 160 cubic meters / day. These volumes included leachate that would be generated with the construction and operation of Cell 4.

The Fundy Region Solid Waste Commission awarded a contract to Gemtec Ltd. to site, design and obtain regulatory approval for a leachate surge pond at the Crane Mountain Landfill, the preparation of tenders for construction and managing the project through to completion. The purpose of this pond is to act, as a short term holding pond for leachate during extreme storm events when leachate volumes generated may be greater than the Cells holding capacity. The leachate would need to be pumped from the surge pond into tanker trucks for off site disposal in the days following a storm event. This project received approval and the construction of the Surge Pond and related pumping and control system has been completed.

The issue of landfill cells holding or storing leachate was one of the issues recognized by the Commission when the sub-committee to review leachate management issues at the Crane Mountain Landfill was formed and subsequently the August, 2003 Assessment of Leachate Management Options report was produced. In January 2005 the Commission made the decision to close the on site WTF and proceed with trucking all of the leachate generated at the landfill to the Lancaster facility for treatment and disposal. This decision was made only after continuing communications with the City of Saint John management staff and with the understanding that the City of Saint John would and could accept all of the commission's leachate without pre-treatment. This agreement required that the City of Saint John receive all the leachate generated at the Crane Mountain Landfill. Consultants for the City of Saint John have concluded that the city's treatment facility can effectively handle and treat all of the present and future leachate that is and will be generated at the Crane Mountain landfill. The Commission and the City of Saint John and its consultants are currently in the process of finalizing an agreement. (See correspondence in Appendix B). The new agreement will permit all the leachate generated at the Crane Mountain Landfill to be treated at the City of Saint John, Lancaster Wastewater Treatment Facility. This agreement will set a disposal charge per cubic meter for all leachate with a BOD of 400 mg/l or less. The agreement will include a surcharge formula for any leachate that exceeds the 400 mg/l BOD level. The City of Saint John has agreed to currently receive all of the landfills leachate without the requirement of pretreatment as a finalized agreement is imminent.

The leachate management plan presented here represents a number of management options the Commission has to consider for controlling leachate in a cost effective manner as the landfill continues to develop landfill infrastructure and implement additional environmental controls. The current landfill area is depicted in Figure 1.

2.0 CURRENT LEACHATE SITUATION AT CRANE MOUNTAIN

The current leachate management system at the Crane Mountain Landfill includes a number of systems and facilities for the collection, containment, transportation and treatment of leachate. The basic concept of the Leachate Management system as it is currently being applied can be described as a cell with an engineered composite liner system of clay and HDPE geomembrane material, a series of collector pipes which direct leachate to a sump where the leachate can be pumped out for disposal, or during severe weather events, re-directed to the surge lagoon for temporary storage. The leachate is trucked to the City of Saint John, via Commission owned trucks with tanker trailers for treatment at the Lancaster Waste Water Treatment Facility. The Commission has a standby trucking contract with independent contractors should it be necessary to truck additional leachate volumes during a severe weather event. The existing three tanks at the WTF are available for storage of leachate if required. These tanks have the combined capacity of storing up to 500,000 gallons of leachate.

The Commission purchased two new trucks in December 2005 for transporting leachate to the Lancaster Waste Water Treatment Facility for disposal. These new trucks will provide dependable and reliable service for the Commission for several years. The commission now has two full time truck drivers whose primary job is to truck leachate. Additionally in the fall of 2005, the Commission created a part time position for an additional truck driver as well as continuing to utilizing other qualified drivers on a casual basis.

Significant rainfall events occurred in the fall and early winter of 2005. At this time the lower half of Cell 4 was operational, Cell 3 was uncapped, Cell 2 had one side caped and Cell 1 had two sides capped. The leachate generated was effectively controlled using the current management options. The leachate was directed to the surge pond and the leachate levels in the cells were brought to low levels within a few days by trucking leachate using Commission and standby trucks.

According to information gathered through Environment Canada’s reports, the Saint John Region and the Province of New Brunswick experienced several severe weather events in 2005. Heavy rain in March through April, combined with melting snow, brought flood waters in the Saint John River just ½ metre below the level of the 1973 flood, considered to be a once in 200 year occurrence. The fall brought significant rainfall much of it as a result of the effects of an unusually severe hurricane season. The Saint John region received 246 millimeters in the month of October just shy of a record rainfall amount.

Utilizing all the leachate management options currently in place has allowed the commission to manage its current leachate flows and effectively lower the volume of leachate stored in the containment cells.

3.0 FUTURE LEACHATE MANAGEMENT INITIATIVES

The Commission intends to continue to research and investigate the pipeline options brought forth in the August 2003 Gemtec Ltd. report, *Assessment of Leachate Management Options*. The option of a pipeline to transport leachate to the Lancaster Waste Water Treatment Facility for disposal whether via Highway 7 or the Westfield Road will require significant time to research, approve, fund and construct. The project would require the involvement and participation of the public and municipal, provincial and federal levels of government, various shareholders, regulatory authorities and others.

The Commission intends for the time being to manage its leachate flow using the current options available. At the same time projects which have direct impacts on leachate generation as well as projects which need construction to be timed and coordinated with our leachate management plan will be undertaken in 2006.

In 2005 the Commission actively pursued the development of a gas management plan for the Crane Mountain Landfill. CH2M Hill was retained by Gemtec Ltd. to assess the landfill gas potential of the Crane Mountain Landfill and to develop a landfill gas management plan for the site that would specifically address control of odors generated by waste placed at the facility. In November 2005, the report titled, *Crane Mountain Landfill Site Landfill Gas Management Study,* by Gemtec Ltd. and CH2M Hill, was submitted to the New Brunswick Department of the Environment and Local Government. The report included an assessment of landfill gas generation rates, evaluation of options available for landfill gas management, conceptual design details, as well as capital and operational cost estimates.

The Commission has budgeted to purchase a generator system in 2006. This generator system will be capable of supplying the electrical power necessary to operate the all the leachate pumping requirements on site and will allow for uninterrupted control and management of our leachate system.

The Commission has budgeted to install final capping to some of the presently uncapped area within the landfill containment cells in 2006. The timing and coordination of capping construction and landfill gas collection infrastructure construction will be a cost effective approach to the completion of these projects in 2006 and following years.

4.0 CONCLUSION

The leachate management techniques and infrastructure currently in place at the Crane Mountain Landfill have demonstrated the ability to deal with leachate flows experienced under normal and extreme conditions.

The surge pond was first used in October 2005 and has added a very significant measure of control and comfort in leachate management. With the implementation of additional capping in 2006, leachate volumes will be further reduced from current levels. Current leachate volumes and the volumes expected to be generated in the foreseeable future can be effectively managed with the techniques currently used and with the implementation of timely final capping construction.

ANNEXE D

Documents justificatifs

New Nouveau Brunswick

Environment

Report Number **30315**

Well Driller's Report

Date printed 4/17/2023

Drilled by

Well Use	Work Type	Drill Method	Work Completed
Drinking Water, Domestic	New Well	Rotary	04/25/2016

Casing Information

Casing above ground

Drive Shoe Used?

Well Log	Casing Type	Diameter	From	End	Slotted?
30315	Steel	15.24cm	0m	6.10m	

Aquifer Test/Yield

Method	Initial Water Level (BTC)	Pumping Rate	Duration	Final Water Level (BTC)	Estimated Safe Yield	Flowing Well?	Rate
Air	7.62m	4.55 lpm	1hr	22.86m	4.55 lpm	No	0 lpm

(BTC - Below top of casing)

Well Grouting

There is no Grout information.

Drilling Fluids Used
None

Disinfectant
Bleach (Javex)

Qty 0L

Pump Installed
Submersible
Intake Setting (BTC)
67.06m

Driller's Log

Well Log	From	End	Colour	Rock Type
30315	0m	3.66m	Brown	Fill
30315	3.66m	73.15m	Red and grey	Sandstone

Overall Well Depth
73.15m

Bedrock Level
3.66m

Water Bearing Fracture Zone

Well Log	Depth	Rate
30315	67.06m	4.55 lpm

Setbacks

Well Log	Distance	Setback From
30315	21.34m	Septic Tank
30315	39.62m	Septic Tank
30315	28.96m	Leach Field
30315	47.24m	Leach Field
30315	21.34m	Center of road

Environment

Report Number **37197**

Well Driller's Report

Date printed 4/17/2023

Drilled by

Well Use	Work Type	Drill Method	Work Completed
Drinking Water, Domestic	New Well	Rotary	11/08/2018

Casing Information

Casing above ground

Drive Shoe Used?

Well Log	Casing Type	Diameter	From	End	Slotted?
37197	Steel	15.24cm	0m	21.34m	

Aquifer Test/Yield

Method	Initial Water Level (BTC)	Pumping Rate	Duration	Final Water Level (BTC)	Estimated Safe Yield	Flowing Well?	Rate
Air	12.19m	136.5 lpm	1hr	12.19m	136.5 lpm	No	0 lpm

(BTC - Below top of casing)

Well Grouting

There is no Grout information.

Drilling Fluids Used
None

Disinfectant
Chlorine pellets

Qty 0L

Pump Installed
Submersible
Intake Setting (BTC)
24.38m

Driller's Log

Well Log	From	End	Colour	Rock Type
37197	0m	5.49m	Grey	Sandstone
37197	5.49m	19.81m	Brown	Clay
37197	19.81m	36.58m	Grey	Sandstone
37197	36.58m	42.67m	Brown	Clay

Overall Well Depth
42.67m

Bedrock Level
0m

Water Bearing Fracture Zone

Well Log	Depth	Rate
37197	36.58m	136.5 lpm

Setbacks

Well Log	Distance	Setback From
37197	18.29m	Septic Tank
37197	24.38m	Leach Field
37197	22.86m	Right of any Public Way Road
37197	24.38m	Center of road

Drilled by			
Well Use	Work Type	Drill Method	Work Completed
Drinking Water, Domestic	New Well	Rotary	11/08/2018

Casing Information

Casing above ground

Drive Shoe Used?

Well Log	Casing Type	Diameter	From	End	Slotted?
37197	**Steel**	**15.24cm**	**0m**	**21.34m**	

Aquifer Test/Yield

Method	Initial Water Level (BTC)	Pumping Rate	Duration	Final Water Level (BTC)	Estimated Safe Yield	Flowing Well?	Rate
Air	12.19m	136.5 lpm	1hr	12.19m	136.5 lpm	No	0 lpm

(BTC - Below top of casing)

Well Grouting

There is no Grout information.

Drilling Fluids Used
None

Disinfectant
Chlorine pellets
Qty 0L

Pump Installed
Submersible
Intake Setting (BTC)
24.38m

Driller's Log

Well Log	From	End	Colour	Rock Type
37197	**0m**	**5.49m**	**Grey**	**Sandstone**
37197	**5.49m**	**19.81m**	**Brown**	**Clay**
37197	**19.81m**	**36.58m**	**Grey**	**Sandstone**
37197	**36.58m**	**42.67m**	**Brown**	**Clay**

Overall Well Depth
42.67m

Bedrock Level
0m

Water Bearing Fracture Zone

Well Log	Depth	Rate
37197	**36.58m**	**136.5 lpm**

Setbacks

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Drilled by			
Well Use	Work Type	Drill Method	Work Completed
Drinking Water, Domestic	New Well	Rotary	11/08/2018

Casing Information

Casing above ground

Drive Shoe Used?

Well Log	Casing Type	Diameter	From	End	Slotted?
37197	Steel	15.24cm	0m	21.34m	

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Chlorine pellets

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Bedrock Level
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Water Bearing Fracture Zone

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Drilled by

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Casing Information

Casing above ground

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Well Grouting

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Drilling Fluids Used
None

Disinfectant
Chlorine pellets
Qty 0L

Pump Installed
Submersible
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Driller's Log

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Casing Information

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Well Log	From	End	Colour	Rock Type
37197	0m	5.49m	Grey	Sandstone
37197	5.49m	19.81m	Brown	Clay
37197	19.81m	36.58m	Grey	Sandstone
37197	36.58m	42.67m	Brown	Clay

Overall Well Depth
42.67m

Bedrock Level
0m

Water Bearing Fracture Zone

Well Log	Depth	Rate
37197	36.58m	136.5 lpm

Setbacks

Well Log	Distance	Setback From
37197	18.29m	Septic Tank
37197	24.38m	Leach Field
37197	22.86m	Right of any Public Way Road
37197	24.38m	Center of road

New Brunswick Nouveau

Environment

Report Number **45079**

Well Driller's Report

Date printed 4/17/2023

Drilled by

Well Use	Work Type	Drill Method	Work Completed
Drinking Water, Domestic	New Well		05/04/2021

Casing Information

Casing above ground

Drive Shoe Used?

Well Log	Casing Type	Diameter	From	End	Slotted?
45079	Steel	15.24cm	0m	6.10m	

Aquifer Test/Yield

Method	Initial Water Level (BTC)	Pumping Rate	Duration	Final Water Level (BTC)	Estimated Safe Yield	Flowing Well?	Rate
Air	121.92m	22.75 lpm	1hr 01min	6.40m	22.75 lpm	No	0 lpm

(BTC - Below top of casing)

Well Grouting

There is no Grout information.

Drilling Fluids Used
None

Disinfectant
Bleach (Javex)

Qty 0L

Pump Installed
Submersible

Intake Setting (BTC)
109.73m

Driller's Log

Well Log	From	End	Colour	Rock Type
45079	0m	3.05m	Brown	Clay
45079	3.05m	4.57m	Grey	Sand and Gravel
45079	4.57m	121.92m	Grey	Granite

Overall Well Depth
121.92m

Bedrock Level
4.57m

Water Bearing Fracture Zone

Well Log	Depth	Rate
45079	71.63m	2.28 lpm
45079	115.82m	20.48 lpm

Setbacks

Well Log	Distance	Setback From
45079	21.34m	Septic Tank
45079	27.13m	Leach Field
45079	30.48m	Septic Tank
45079	30.48m	Leach Field
45079	40.23m	Center of road

New Nouveau Brunswick

Environment

Report Number **91078500**

Well Driller's Report

Date printed 4/17/2023

Drilled by

Well Use	Work Type	Drill Method	Work Completed
Drinking Water, Municipal	New Well (NEW WELL)	Rotary (ROTARY)	10/30/1997

Casing Information

Casing above ground

Drive Shoe Used?

Well Log	Casing Type	Diameter	From	End	Slotted?
91078500	**Steel**	**15.24cm**	**0m**	**7.32m**	

Aquifer Test/Yield

Method	Initial Water Level (BTC)	Pumping Rate	Duration	Final Water Level (BTC)	Estimated Safe Yield	Flowing Well?	Rate
	0m	0 lpm	0hr	0m	4.55 lpm	No	0 lpm

(BTC - Below top of casing)

Well Grouting

There is no Grout information.

Drilling Fluids Used
None

Disinfectant
N/A

Qty 0L

Pump Installed
N/A

Intake Setting (BTC)
0m

Driller's Log

Well Log	From	End	Colour	Rock Type
91078500	**0m**	**5.49m**	**Brown**	**Clay and Mud**
91078500	**5.49m**	**76.81m**	**Grey**	**Granite**

Overall Well Depth
76.81m

Bedrock Level
5.49m

Water Bearing Fracture Zone

Well Log	Depth	Rate
91078500	**48.77m**	**8.19 lpm**
91078500	**70.10m**	**4.55 lpm**

Setbacks

There is no Setback information.

New Nouveau Brunswick

Environment

Report Number **91095900**

Well Driller's Report

Date printed 4/17/2023

Drilled by

Well Use	Work Type	Drill Method	Work Completed
Drinking Water, Municipal	New Well (NEW WELL)	Rotary (ROTARY)	12/17/1997

Casing Information

Casing above ground

Drive Shoe Used?

Well Log	Casing Type	Diameter	From	End	Slotted?
91095900	Steel	15.24cm	0m	24.69m	

Aquifer Test/Yield

Method	Initial Water Level (BTC)	Pumping Rate	Duration	Final Water Level (BTC)	Estimated Safe Yield	Flowing Well?	Rate
Air	0m	0 lpm	0hr	0m	31.85 lpm	No	0 lpm

(BTC - Below top of casing)

Well Grouting

There is no Grout information.

Drilling Fluids Used
None

Disinfectant
N/A

Qty 13.65L

Pump Installed
N/A

Intake Setting (BTC)
0m

Driller's Log

Well Log	From	End	Colour	Rock Type
91095900	0m	21.34m	Brown	Mud and Till
91095900	21.34m	51.82m	Black	Slate
91095900	51.82m	91.44m	Grey	Granite

Overall Well Depth
91.44m

Bedrock Level
21.34m

Water Bearing Fracture Zone

Well Log	Depth	Rate
91095900	53.34m	1.36 lpm
91095900	60.96m	2.28 lpm
91095900	76.20m	4.55 lpm
91095900	86.87m	24.12 lpm

Setbacks

There is no Setback information.

Environment

Report Number **91127400**

Well Driller's Report

Date printed 4/17/2023

Drilled by

Well Use	Work Type	Drill Method	Work Completed
Non-Drinking Water, Industrial	New Well (NEW WELL)	Rotary (ROTARY)	07/03/1998

Casing Information

Casing above ground

Drive Shoe Used?

Well Log	Casing Type	Diameter	From	End	Slotted?
91127400	Steel	15.24cm	0m	7.62m	

Aquifer Test/Yield

Method	Initial Water Level (BTC)	Pumping Rate	Duration	Final Water Level (BTC)	Estimated Safe Yield	Flowing Well?	Rate
Air	0m	0 lpm	0hr	6.10m	9.1 lpm	No	0 lpm

(BTC - Below top of casing)

Well Grouting

There is no Grout information.

Drilling Fluids Used
None

Disinfectant
N/A

Qty 0L

Pump Installed
N/A

Intake Setting (BTC)
0m

Driller's Log

Well Log	From	End	Colour	Rock Type
91127400	0m	3.66m	Brown	Mud and Rock
91127400	3.66m	5.49m	Brown	Clay and Rock
91127400	5.49m	91.44m	Grey	Rock

Overall Well Depth
91.44m

Bedrock Level
5.49m

Water Bearing Fracture Zone

There is no water bearing fracture zone information.

Setbacks

There is no Setback information.

New Nouveau Brunswick

Environment

Report Number **91322100**

Well Driller's Report

Date printed 4/17/2023

Drilled by

Well Use	Work Type	Drill Method	Work Completed
Drinking Water, Domestic	New Well (NEW WELL)	Rotary (ROTARY)	12/04/1998

Casing Information

Casing above ground | Drive Shoe Used?

Well Log	Casing Type	Diameter	From	End	Slotted?
91322100	**Steel**	**15.24cm**	**0m**	**6.10m**	

Aquifer Test/Yield

Method	Initial Water Level (BTC)	Pumping Rate	Duration	Final Water Level (BTC)	Estimated Safe Yield	Flowing Well?	Rate
Air	0m	0 lpm	0hr	3.05m	22.75 lpm	No	0 lpm

(BTC - Below top of casing)

Well Grouting

There is no Grout information.

Drilling Fluids Used
None

Disinfectant
N/A

Qty 0L

Pump Installed
N/A

Intake Setting (BTC)
0m

Driller's Log

Well Log	From	End	Colour	Rock Type
91322100	**3.66m**	**67.06m**	**Red**	**Granite and Rock**
91322100	**0m**	**3.66m**	**Brown**	**Mud and Rock**

Overall Well Depth
67.06m

Bedrock Level
3.66m

Water Bearing Fracture Zone

There is no water bearing fracture zone information.

Setbacks

There is no Setback information.

New Nouveau Brunswick

Environment

Report Number **91330600**

Well Driller's Report

Date printed 4/17/2023

Drilled by

Well Use	Work Type	Drill Method	Work Completed
Drinking Water, Domestic	Deepened ~~(DEEPENED)~~		09/16/1998

Casing Information	Casing above ground	Drive Shoe Used?
There is no casing information.		

Aquifer Test/Yield

Method	Initial Water Level (BTC)	Pumping Rate	Duration	Final Water Level (BTC)	Estimated Safe Yield	Flowing Well?	Rate
Air	0m	0 lpm	0hr	0m	6.82 lpm	No	0 lpm

(BTC - Below top of casing)

Well Grouting

There is no Grout information.

Drilling Fluids Used
None

Disinfectant
N/A

Qty 0L

Pump Installed
N/A

Intake Setting (BTC)
0m

Driller's Log

Well Log	From	End	Colour	Rock Type
91330600	59.44m	115.82m	Red	Granite and Conglomerate

Overall Well Depth
115.82m

Bedrock Level
59.44m

Water Bearing Fracture Zone

Well Log	Depth	Rate
91330600	115.82m	6.82 lpm

Setbacks

There is no Setback information.

New Nouveau Brunswick

Environment

Report Number **91335900**

Well Driller's Report

Date printed 4/17/2023

Drilled by

Well Use	Work Type	Drill Method	Work Completed
Drinking Water, Domestic	New Well (NEW WELL)	Rotary (ROTARY)	06/30/1999

Casing Information

Casing above ground

Drive Shoe Used?

Well Log	Casing Type	Diameter	From	End	Slotted?
91335900	Steel	15.24cm	0m	6.10m	

Aquifer Test/Yield

Method	Initial Water Level (BTC)	Pumping Rate	Duration	Final Water Level (BTC)	Estimated Safe Yield	Flowing Well?	Rate
Air	0m	0 lpm	0hr	0m	0 lpm	No	0 lpm

(BTC - Below top of casing)

Well Grouting

There is no Grout information.

Drilling Fluids Used
None

Disinfectant
N/A

Qty 0L

Pump Installed
N/A

Intake Setting (BTC)
0m

Driller's Log

Well Log	From	End	Colour	Rock Type
91335900	0m	3.05m	Brown	Mud and Gravel
91335900	3.05m	91.44m	EMPTY VALUE	Clay and boulders

Overall Well Depth
91.44m

Bedrock Level
3.05m

Water Bearing Fracture Zone

Well Log	Depth	Rate
91335900	60.96m	1.36 lpm
91335900	68.58m	6.82 lpm
91335900	82.30m	4.55 lpm
91335900	88.39m	4.55 lpm

Setbacks

There is no Setback information.

New Nouveau Brunswick

Environment

Report Number **92207800**

Well Driller's Report

Date printed 4/17/2023

Drilled by

Well Use	Work Type	Drill Method	Work Completed
Non-Drinking Water, Industrial	New Well	Cable Tool	07/18/2001

Casing Information	Casing above ground	Drive Shoe Used?
There is no casing information.		

Aquifer Test/Yield

Method	Initial Water Level (BTC)	Pumping Rate	Duration	Final Water Level (BTC)	Estimated Safe Yield	Flowing Well?	Rate
Air	0m	0 lpm	0hr	0m	182 lpm	No	0 lpm

(BTC - Below top of casing)

Well Grouting

There is no Grout information.

Drilling Fluids Used
None

Disinfectant
N/A

Qty 0L

Pump Installed
Submersible
Intake Setting (BTC)
1.83m

Driller's Log

Well Log	From	End	Colour	Rock Type
92207800	0m	5.49m	Brown	Gravel and Rock
92207800	5.49m	9.14m	Brown	Clay and Sand
92207800	9.14m	121.92m	Red	Granite

Overall Well Depth
121.92m

Bedrock Level
9.14m

Water Bearing Fracture Zone

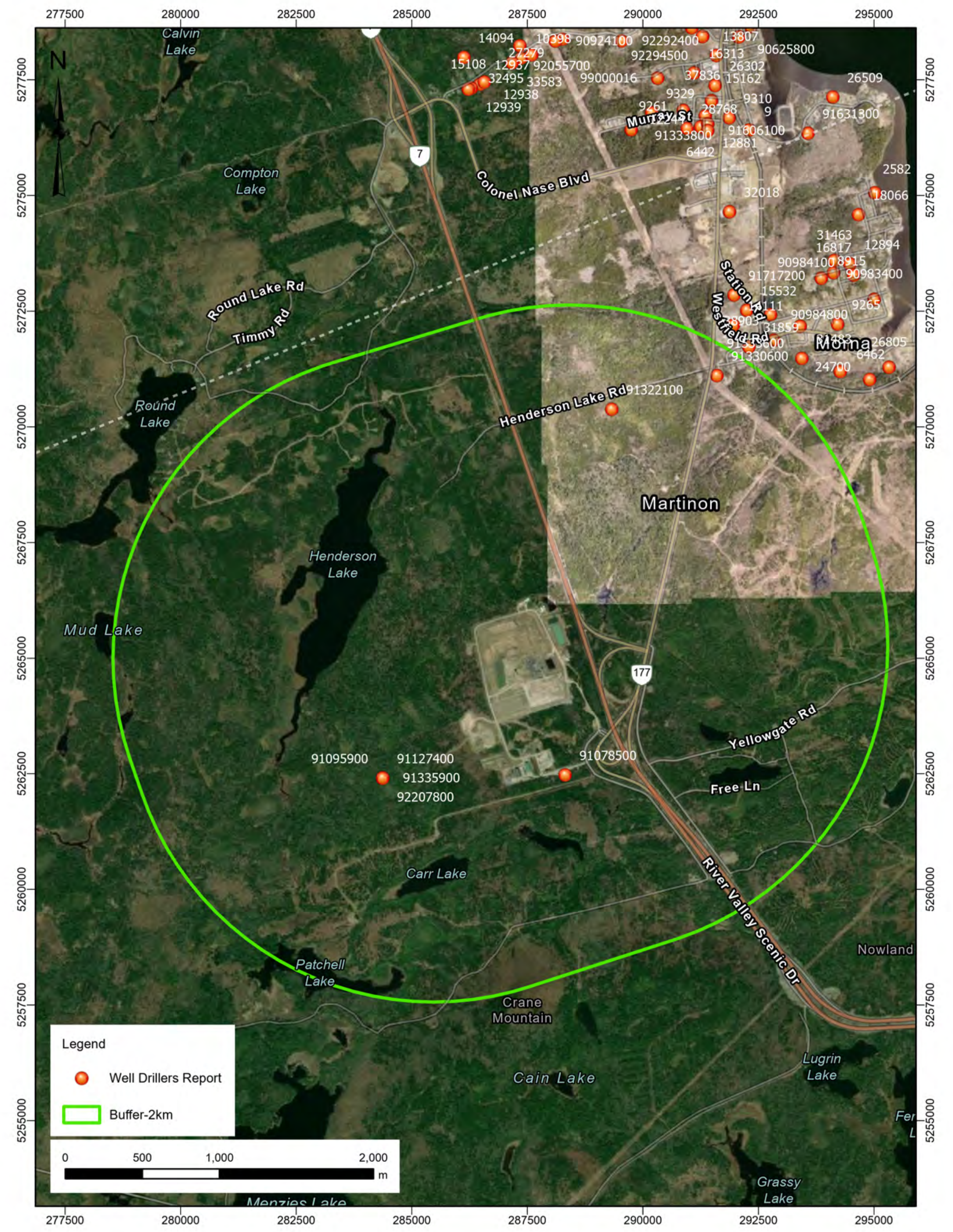
Well Log	Depth	Rate
92207800	80.77m	22.75 lpm
92207800	67.06m	9.1 lpm
92207800	85.34m	104.65 lpm

Setbacks

There is no Setback information.

Sample Information

ALK_T(mg/L)	Al(mg/L)	As(µg/L)	B(mg/L)	Ba(mg/L)	Br(mg/L)	COND(µSIE/cm)	Ca(mg/L)	Cd(µg/L)	Cl(mg/L)	Cr(µg/L)	Cu(µg/L)	F(mg/L)	Fe(mg/L)	HARD(mg/L as CaCO3)	K(mg/L)	Mg(mg/L)	Mn(mg/L)	NO2(mg/L as N)	NO3(mg/L as N)	NOX(mg/L as N)	Na(mg/L)	Pb(µg/L)	SO4(mg/L)	Sb(µg/L)	Se(µg/L)	TURB(NTU)	Tl(µg/L)	Zn(µg/L)	pH(pH)	E.coli P/A(P/A)	TC-P/A(P/A)	U(µg/L)	Þ =COND(µSIE/cm)	Þ =TDS(mg/L)	Þ @B(no units)	Þ @C(no units)	Þ AN(Epm)	Þ CAT(Epm)	Þ CO3(mg/L)	Þ DIFB(%)	Þ DIFC(%)	Þ DIFTDS(%)	Þ HCO3(mg/L)	Þ OH(mg/L)	Þ SIN(no units)
61.90	< 0.0250	47.40	< 0.20	< 0.01	< 0.10	196	17.10	< 0.50	12.10	< 10	< 10	0.2850	0.2740	53.40	0.3370	2.60	< 0.01	< 0.05	0	< 0.05	20.70	1.10	15.80	1.50	< 1	1.50	< 1	< 10	8.31																
																														Ab	Ab														
119	< 0.0250	3.06	< 0.01	0.0180	< 0.10	241	39.50	< 0.50	4.31	< 10	23	0.1010	* 0.6050	106	0.3650	1.90	0.7420	< 0.05	< 0.05	< 0.05	11.60	< 1	5.10	< 1	< 1.50	* 2.35	< 1	< 5	7.73	Ab	Ab	4.62	217.7680	126.8490	2.38	1.8030	2.6170	2.2670	0	7.16	5.0640	-100	119	0	-0.1430
69.40	< 0.0250	< 1.50	< 0.20	0.0130	< 0.10	192	19.10	< 0.50	8.60	< 10	123	0.2280	< 0.05	51.40	0.30	0.90	< 0.0050	< 0.05	0.01	0.06	15.40	< 1	11.10	< 1	< 1.50	0.10	< 1	106	8.09																
																														Ab	Ab														
60.90	< 0.0250	< 1.50	< 0.01	< 0.01	< 0.10	177	23.90	< 0.50	4.55	< 10	< 10	< 0.10	< 0.01	67.40	0.2830	1.90	< 0.0050	< 0.05	< 0.05	< 0.05	8.67	< 1	16.20	< 1	< 1.50	0.40	< 1	< 5	8.22	Ab	Ab	1.38	168.1970	92.4210	-0.33	0.8460	1.6940	1.7370	0	-1.26	2.55	-100	60.90	0	-0.0790



277500
280000
282500
285000
287500
290000
292500
295000
5277500
5275000
5272500
5270000
5267500
5265000
5262500
5260000
5257500
5255000
N
Calvin Lake
Compton Lake
Round Lake Rd
Timmy Rd
Round Lake
Colonel Nase Blvd
Henderson Lake Rd
Henderson Lake
Mud Lake
Carr Lake
Patchell Lake
Crane Mountain
Cain Lake
Lugrin Lake
Grassy Lake
Menzies Lake
Nowland
Martinon
Morna
Murray St
Station Rd
Westfield Rd
Yellowgate Rd
Free Ln
River Valley Scenic Dr
7
177
14094
10398
90924100
92292400
13807
27279
92294500
16313
90625800
15108
12937
92055700
26302
32495
33583
99000016
37836
15162
26509
12938
9329
9310
12939
9261
28768
9
91631300
91333800
91606100
6442
12881
2582
32018
18066
31463
16817
12894
90984100
8915
91717200
90983400
15532
9265
90984800
31859
26805
91330600
6462
24700
91322100
91095900
91127400
91335900
92207800
91078500
Legend
Well Drillers Report
Buffer-2km
0
500
1,000
2,000
m

DATA REPORT 7616: Crane Mountain Landfill, NB

Prepared 3 March 2023
by J. Pender, Conservation Data Analyst

CONTENTS OF REPORT

Map 1. A 100 km buffer around the study area

1.0 PREFACE

The Atlantic Canada Conservation Data Centre (ACCDC) is part of a network of NatureServe data centres and heritage programs serving 50 states in the U.S.A, 10 provinces and 1 territory in Canada, plus several Central and South American countries. The NatureServe network is more than 30 years old and shares a common conservation data methodology. The ACCDC was founded in 1997, and maintains data for the jurisdictions of New Brunswick, Nova Scotia, Prince Edward Island, and Newfoundland and Labrador. Although a non-governmental agency, the ACCDC is supported by 6 federal agencies and 4 provincial governments, as well as through outside grants and data processing fees. For more information please see www.ACCDC.com.

Upon request and for a fee, the AC CDC queries its database and produces customized reports of the rare and endangered flora and fauna known to occur in or near a specified study area. As a supplement to that data, the AC CDC includes locations of managed areas with some level of protection, and known sites of ecological interest or sensitivity.

1.1 DATA LIST

Included datasets:

Filename	Contents
CraneMtLandfNB_7616ob.xls	Rare or legally-protected Flora and Fauna in your study area
CraneMtLandfNB_7616ob100km.xls	A list of Rare and legally protected Flora and Fauna within 100 km of your study area
CraneMtLandfNB_7616msa.xls	Managed and Biologically Significant Areas in your study area
CraneMtLandfNB_7616ff_py.xls	Rare Freshwater Fish in your study area (DFO database)

1.2 RESTRICTIONS

The ACCDC makes a strong effort to verify the accuracy of all the data that it manages, but it shall not be held responsible for any inaccuracies in data that it provides. By accepting ACCDC data, recipients assent to the following limits of use:

a) Data is restricted to use by trained personnel who are sensitive to landowner interests and to potential threats to rare and/or endangered flora and fauna posed by the information provided.
b) Data is restricted to use by the specified Data User; any third party requiring data must make its own data request.
c) The ACCDC requires Data Users to cease using and delete data 12 months after receipt, and to make a new request for updated data if necessary at that time.
d) ACCDC data responses are restricted to the data in our Data System at the time of the data request.
e) Each record has an estimate of locational uncertainty, which must be referenced in order to understand the record's relevance to a particular location. Please see the Data Dictionary for details.
f) ACCDC data holdings are not to be construed as exhaustive inventories of taxa in an area.
g) The absence of a taxon cannot be inferred by its absence in an ACCDC database.

1.3 ADDITIONAL INFORMATION

The accompanying Data Dictionary provides metadata for the data provided.

Please direct any additional questions about AC CDC data to the following individuals:

Plants, Lichens, Ranking Methods, All other Inquiries	Sean Blaney	Senior Scientist / Executive Director	(506) 364-2658	sean.blaney@accdc.ca
Animals (Fauna)	John Klymko	Zoologist	(506) 364-2660	john.klymko@accdc.ca
Data Management, GIS	James Churchill	Conservation Data Analyst / Field Biologist		james.churchill@accdc.ca
Billing	Jean Breau	Financial Manager / Executive Assistant	(506) 364-2657	jean.breau@accdc.ca

Questions on the biology of Federal Species at Risk can be directed to AC CDC: (506) 364-2658, with questions on Species at Risk regulations to: Samara Eaton, Canadian Wildlife Service (NB and PE): (506) 364-5060 or Julie McKnight, Canadian Wildlife Service (NS): (902) 426-4196.

New Brunswick. For information about rare taxa, protected areas, game animals, deer yards, old growth forests, archeological sites, fish habitat etc., or to determine if location-sensitive species (section 4.3) occur near your study site, please contact Hubert Askanas, Energy and Resource Development: (506) 453-5873.

Nova Scotia. For information about Species at Risk or general questions about Nova Scotia location-sensitive species please contact the Biodiversity Program at biodiversity@novascotia.ca. For questions about protected areas, game animals, deer yards, old growth forests, archeological sites, fish habitat etc., or to determine if location-sensitive species (section 4.3) occur near your study site please contact a Regional Biologist:

DIGB, ANNA, KING	Emma Vost	(902) 670-8187	Emma.Vost@novascotia.ca
SHEL, YARM	Sian Wilson	(902) 930-2978	Sian.Wilson@novascotia.ca
QUEE, LUNE	Peter Kydd	(902) 523-0969	Peter.Kydd@novascotia.ca
HALI, HANT	Shavonne Meyer	(902) 893-0816	Shavonne.Meyer@novascotia.ca
Central Region	Jolene Laverty	(902) 324-8953	Jolene.Laverty@novascotia.ca
COLC, CUMB	Kimberly George	(902) 890-1046	Kimberly.George@novascotia.ca
ANTI, GUYS	Harrison Moore	(902) 497-4119	Harrison.Moore@novascotia.ca
INVE, VICT	Maureen Cameron-MacMillan	(902) 295-2554	Maureen.Cameron-MacMillan@novascotia.ca
CAPE, RICH, PICT	Elizabeth Walsh	(902) 563-3370	Elizabeth.Walsh@novascotia.ca

Prince Edward Island. For information about rare taxa, protected areas, game animals, fish habitat etc., please contact Garry Gregory, PEI Department of Environment, Energy and Climate Action: (902) 569-7595.

2.0 RARE AND ENDANGERED SPECIES

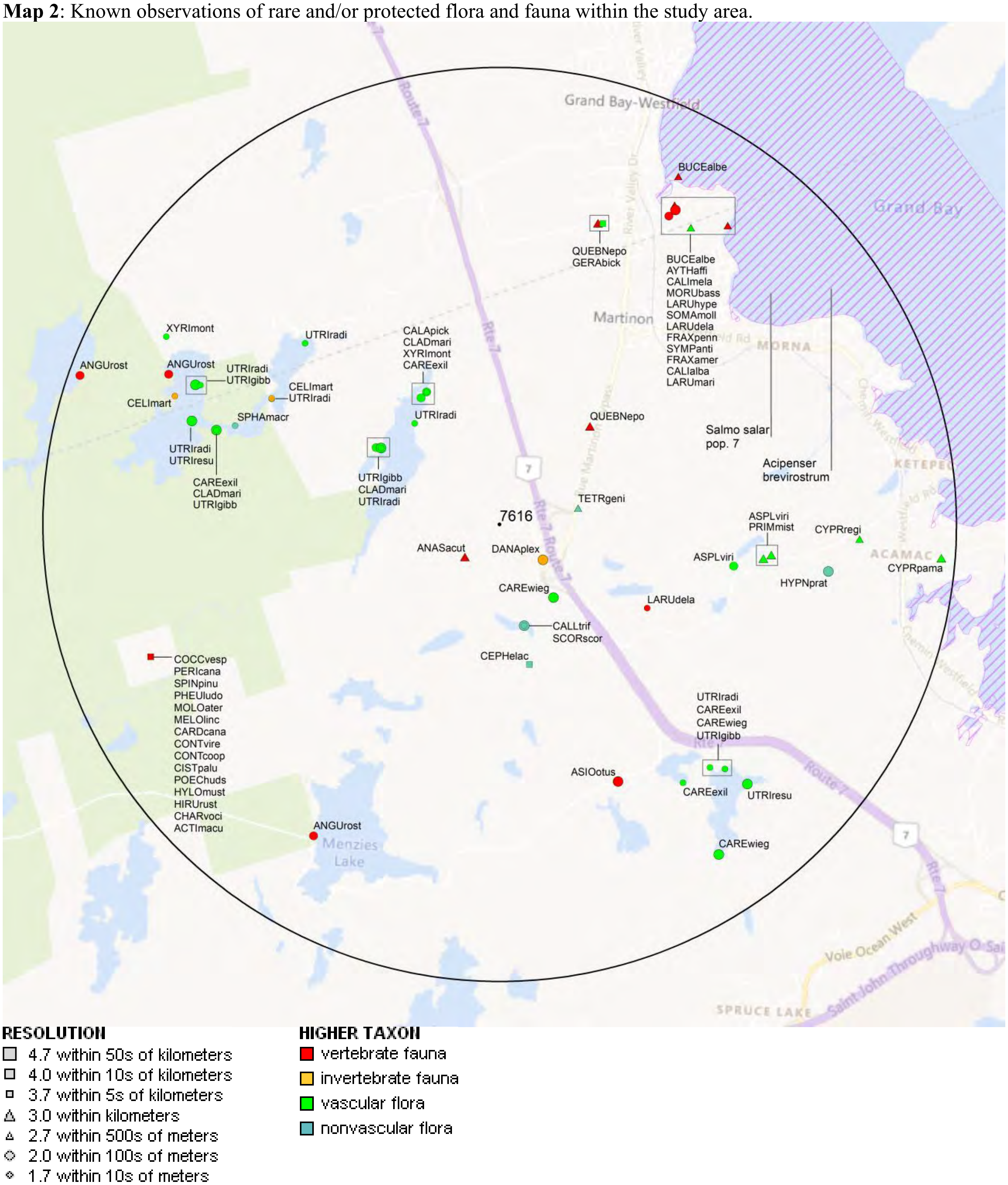
2.1 FLORA

The study area contains 36 records of 16 vascular and 6 records of 6 nonvascular flora (Map 2 and attached: *ob.xls), excluding 'location-sensitive' species.

2.2 FAUNA

The study area contains 38 records of 28 vertebrate and 4 records of 2 invertebrate fauna (Map 2 and attached data files - see 1.1 Data List), excluding 'location-sensitive' species. Please see section 4.3 to determine if 'location-sensitive' species occur near your study site.

Map 2: Known observations of rare and/or protected flora and fauna within the study area.

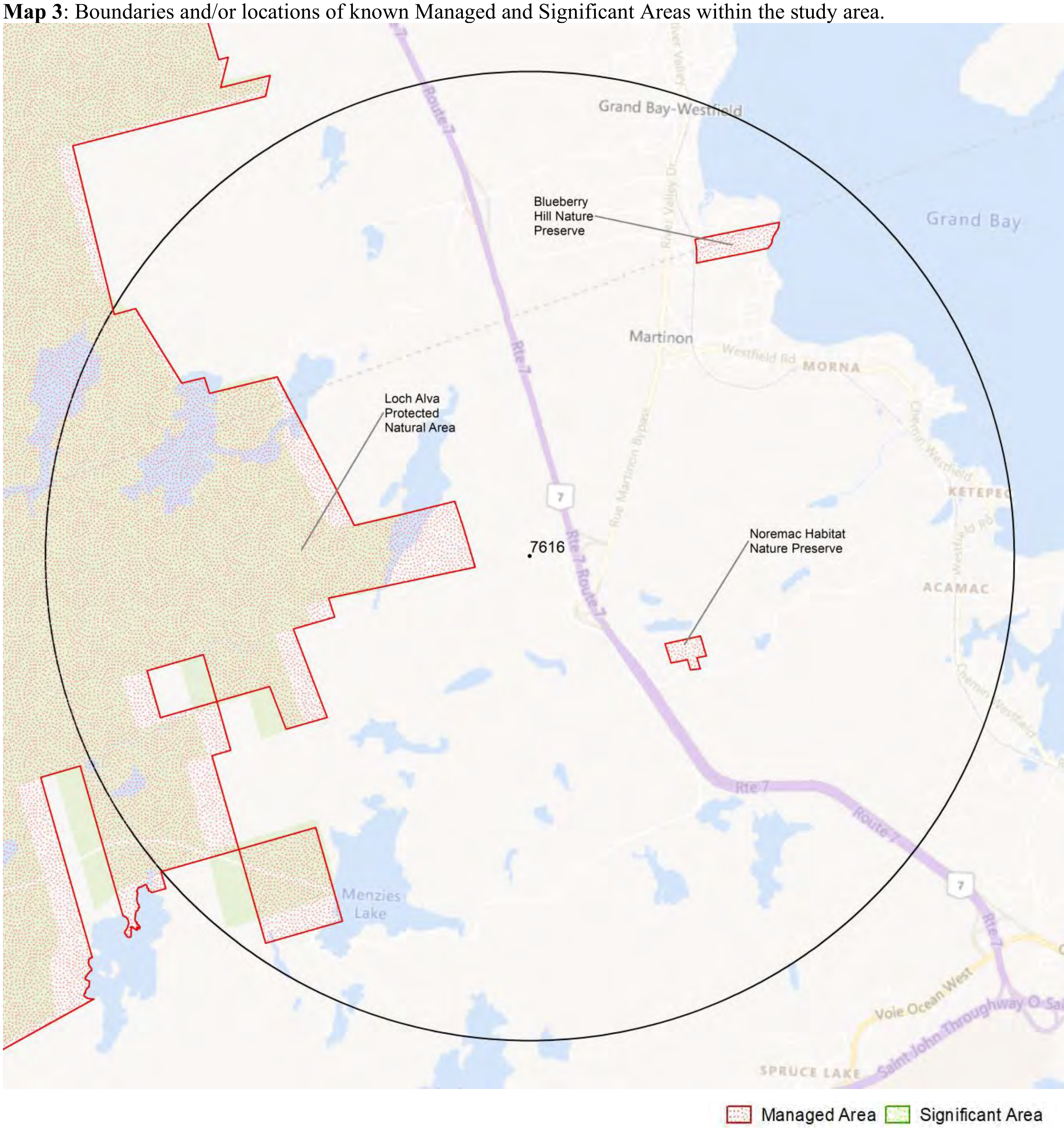


3.0 SPECIAL AREAS

3.1 MANAGED AREAS
The GIS scan identified 3 managed areas in the vicinity of the study area (Map 3 and attached file: *msa.xls).

3.2 SIGNIFICANT AREAS
The GIS scan identified no biologically significant sites in the vicinity of the study area (Map 3).

Map 3: Boundaries and/or locations of known Managed and Significant Areas within the study area.



4.0 RARE SPECIES LISTS

Rare and/or endangered taxa (excluding "location-sensitive" species, section 4.3) within the study area listed in order of concern, beginning with legally listed taxa, with the number of observations per taxon and the distance in kilometers from study area centroid to the closest observation (± the precision, in km, of the record). [P] = vascular plant, [N] = nonvascular plant, [A] = vertebrate animal, [I] = invertebrate animal, [C] = community. Note: records are from attached files *ob.xls/*ob.shp only.

4.1 FLORA

	Scientific *Name*	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)
N	*Sphagnum macrophyllum*	Sphagnum				S1	1	3.1 ± 0.0
N	*Pseudocalliergon trifarium*	Three-ranked Spear Moss				S1?	1	1.1 ± 0.0
N	*Cephaloziella elachista*	Spurred Threadwort				S1S3	1	1.6 ± 5.0
N	*Hypnum pratense*	Meadow Plait Moss				S2	1	3.6 ± 0.0
N	*Scorpidium scorpioides*	Hooked Scorpion Moss				S2S3	1	1.1 ± 0.0
N	*Tetraphis geniculata*	Geniculate Four-tooth Moss				S3S4	1	0.9 ± 0.0
P	*Symphyotrichum anticostense*	Anticosti Aster	Special Concern	Special Concern	Endangered	S3	1	3.9 ± 0.0
P	*Cypripedium parviflorum var. makasin*	Small Yellow Lady's-Slipper				S2	1	4.9 ± 1.0
P	*Geranium bicknellii*	Bicknell's Crane's-bill				S3	1	3.5 ± 5.0
P	*Utricularia resupinata*	Inverted Bladderwort				S3	2	3.6 ± 0.0
P	*Fraxinus pennsylvanica*	Red Ash				S3	1	3.9 ± 0.0
P	*Primula mistassinica*	Mistassini Primrose				S3	1	2.9 ± 1.0
P	*Cypripedium reginae*	Showy Lady's-Slipper				S3	1	3.9 ± 0.0
P	*Utricularia radiata*	Little Floating Bladderwort				S3S4	7	1.4 ± 0.0
P	*Utricularia gibba*	Humped Bladderwort				S3S4	4	1.6 ± 0.0
P	*Fraxinus americana*	White Ash				S3S4	1	3.9 ± 0.0
P	*Carex exilis*	Coastal Sedge				S3S4	5	1.7 ± 0.0
P	*Carex wiegandii*	Wiegand's Sedge				S3S4	3	1.0 ± 0.0
P	*Cladium mariscoides*	Smooth Twigrush				S3S4	3	1.5 ± 0.0
P	*Calamagrostis pickeringii*	Pickering's Reed Grass				S3S4	1	1.6 ± 0.0
P	*Xyris montana*	Northern Yellow-Eyed-Grass				S3S4	2	1.7 ± 0.0
P	*Asplenium viride*	Green Spleenwort				S3S4	2	2.6 ± 0.0

4.2 FAUNA

	Scientific *Name*	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)
A	*Hylocichla mustelina*	Wood Thrush	Threatened	Threatened	Threatened	S1S2B	1	4.1 ± 7.0
A	*Anguilla rostrata*	American Eel	Threatened		Threatened	S4N	3	4.0 ± 0.0
A	*Hirundo rustica*	Barn Swallow	Special Concern	Threatened	Threatened	S2B	1	4.1 ± 7.0
A	*Contopus virens*	Eastern Wood-Pewee	Special Concern	Special Concern	Special Concern	S3B	1	4.1 ± 7.0
A	*Contopus cooperi*	Olive-sided Flycatcher	Special Concern	Threatened	Threatened	S3B	1	4.1 ± 7.0
A	*Coccothraustes vespertinus*	Evening Grosbeak	Special Concern	Special Concern		S3B,S3S4N,SUM	1	4.1 ± 7.0
A	*Cardellina canadensis*	Canada Warbler	Special Concern	Threatened	Threatened	S3S4B	1	4.1 ± 7.0
A	*Desmognathus fuscus pop. 2*	Northern Dusky Salamander - Quebec / New Brunswick population	Not At Risk			S3	2	1.5 ± 1.0
A	*Aythya affinis*	Lesser Scaup				S1B,S4M	1	3.9 ± 0.0
A	*Calidris alba*	Sanderling				S1N,S3S4M	1	4.1 ± 0.0
A	*Cistothorus palustris*	Marsh Wren				S2B	1	4.1 ± 7.0
A	*Larus hyperboreus*	Glaucous Gull				S2N	1	4.1 ± 0.0
A	*Asio otus*	Long-eared Owl				S2S3	1	3.1 ± 0.0
A	*Somateria mollissima*	Common Eider				S2S3B,S2S3N,S4M	1	4.1 ± 0.0
A	*Larus delawarensis*	Ring-billed Gull				S2S3B,S4N,S5M	2	1.9 ± 0.0
A	*Larus marinus*	Great Black-backed Gull				S3	1	4.1 ± 0.0
A	*Spinus pinus*	Pine Siskin				S3	1	4.1 ± 7.0
A	*Charadrius vociferus*	Killdeer				S3B	1	4.1 ± 7.0
A	*Pheucticus ludovicianus*	Rose-breasted Grosbeak				S3B	1	4.1 ± 7.0

	Scientific *Name*	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)
A	*Molothrus ater*	Brown-headed Cowbird				S3B	1	4.1 ± 7.0
A	*Anas acuta*	Northern Pintail				S3B,S5M	1	0.5 ± 1.0
A	*Calidris melanotos*	Pectoral Sandpiper				S3M	1	3.8 ± 0.0
A	*Bucephala albeola*	Bufflehead				S3N	6	3.9 ± 0.0
A	*Perisoreus canadensis*	Canada Jay				S3S4	1	4.1 ± 7.0
A	*Poecile hudsonicus*	Boreal Chickadee				S3S4	1	4.1 ± 7.0
A	*Actitis macularius*	Spotted Sandpiper				S3S4B,S4M	2	4.1 ± 7.0
A	*Melospiza lincolnii*	Lincoln's Sparrow				S3S4B,S4M	1	4.1 ± 7.0
A	*Morus bassanus*	Northern Gannet				SHB	1	4.1 ± 0.0
I	*Danaus plexippus*	Monarch	Endangered	Special Concern	Special Concern	S2S3?B	1	0.6 ± 0.0
I	*Celithemis martha*	Martha's Pennant				S3	3	2.9 ± 0.0

4.3 LOCATION SENSITIVE SPECIES

The New Brunswick and Nova Scotia Provincial Governments consider some species “location sensitive” because of concern about their exploitation. Precise locations of these species are only released upon authorization by the Provincial Government and use of the data is subject to strict conditions:

New Brunswick

Scientific *Name*	Common Name	SARA	Prov Legal Prot	Known within the Study Site?
Chrysemys picta picta	**Eastern Painted Turtle**	**Special Concern**		**YES**
Chelydra serpentina	Snapping Turtle	Special Concern	Special Concern	No
Glyptemys insculpta	**Wood Turtle**	**Threatened**	**Threatened**	**YES**
Haliaeetus leucocephalus	**Bald Eagle**		**Endangered**	**YES**
Falco peregrinus pop. 1	Peregrine Falcon - anatum/tundrius pop.		Endangered	No
Cicindela marginipennis	Cobblestone Tiger Beetle	Endangered	Endangered	No
Coenonympha nipisiquit	Maritime Ringlet	Endangered	Endangered	No
Bat Hibernaculum or bat species occurrence		**[Endangered][1]**	**[Endangered][1]**	**YES**

1 *Myotis lucifugus* (Little Brown Myotis), *Myotis septentrionalis* (Long-eared Myotis), and *Perimyotis subflavus* (Tri-colored Bat or Eastern Pipistrelle) are all Endangered under the Federal Species at Risk Act and the NB Species at Risk Act.

4.4 SOURCE BIBLIOGRAPHY

The recipient of these data shall acknowledge the AC CDC and the data sources listed below in any documents, reports, publications or presentations, in which this dataset makes a significant contribution.

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5.0 RARE SPECIES WITHIN 100 KM

A 100 km buffer around the study area contains 48883 records of 161 vertebrate and 1750 records of 76 invertebrate fauna; 9541 records of 349 vascular and 2307 records of 224 nonvascular flora (attached: *ob100km.xls).

Taxa within 100 km of the study site that are rare and/or endangered in the province in which the study site occurs (including "location-sensitive" species). All ranks correspond to the province in which the study site falls, even for out-of-province records. Taxa are listed in order of concern, beginning with legally listed taxa, with the number of observations per taxon and the distance in kilometers from study area centroid to the closest observation (± the precision, in km, of the record).

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)	Prov
A	*Myotis lucifugus*	Little Brown Myotis	Endangered	Endangered	Endangered	S1	169	3.9 ± 1.0	NB
A	*Myotis septentrionalis*	Northern Myotis	Endangered	Endangered	Endangered	S1	39	6.4 ± 0.0	NB
A	*Perimyotis subflavus*	Tricolored Bat	Endangered	Endangered	Endangered	S1	40	6.4 ± 0.0	NB
A	*Eubalaena glacialis*	North Atlantic Right Whale	Endangered	Endangered	Endangered	S1	8	55.0 ± 0.0	NB
A	*Osmerus mordax pop. 2*	Rainbow Smelt - Lake Utopia Large-bodied population	Endangered	Threatened	Threatened	S1	2	46.2 ± 10.0	NB
A	*Charadrius melodus melodus*	Piping Plover melodus subspecies	Endangered	Endangered	Endangered	S1B	26	8.6 ± 0.0	NB
A	*Sterna dougallii*	Roseate Tern	Endangered	Endangered	Endangered	S1B	3	52.7 ± 0.0	NB
A	*Dermochelys coriacea pop. 2*	Leatherback Sea Turtle - Atlantic population	Endangered	Endangered	Endangered	S1S2N	5	11.4 ± 0.0	NB
A	*Salmo salar pop. 1*	Atlantic Salmon - Inner Bay of Fundy population	Endangered	Endangered	Endangered	S2	55	27.7 ± 0.0	NB
A	*Salmo salar pop. 7*	Atlantic Salmon - Outer Bay of Fundy population	Endangered		Endangered	SNR	358	8.3 ± 1.0	NB
A	*Rangifer tarandus pop. 2*	Caribou - Atlantic-Gasp├⌐sie population	Endangered	Endangered	Extirpated	SX	4	27.1 ± 5.0	NB
A	*Lanius ludovicianus*	Loggerhead Shrike	Endangered	Endangered		SXB	1	83.9 ± 1.0	NB
A	*Sturnella magna*	Eastern Meadowlark	Threatened	Threatened	Threatened	S1B	44	30.4 ± 7.0	NB
A	*Asio flammeus*	Short-eared Owl	Threatened	Special Concern	Special Concern	S1S2B	17	36.9 ± 7.0	NB
A	*Ixobrychus exilis*	Least Bittern	Threatened	Threatened	Threatened	S1S2B	34	12.9 ± 0.0	NB
A	*Hylocichla mustelina*	Wood Thrush	Threatened	Threatened	Threatened	S1S2B	192	4.1 ± 7.0	NB
A	*Hydrobates leucorhous*	Leach's Storm-Petrel	Threatened			S1S2B	130	41.4 ± 32.0	NB
A	*Catharus bicknelli*	Bicknell's Thrush	Threatened	Threatened	Threatened	S2B	24	8.8 ± 1.0	NB
A	*Riparia riparia*	Bank Swallow	Threatened	Threatened		S2B	1200	6.5 ± 7.0	NB
A	*Glyptemys insculpta*	Wood Turtle	Threatened	Threatened	Threatened	S2S3	1742	3.0 ± 10.0	NB
A	*Chaetura pelagica*	Chimney Swift	Threatened	Threatened	Threatened	S2S3B,S2M	1036	9.1 ± 7.0	NB
A	*Acipenser oxyrinchus*	Atlantic Sturgeon	Threatened		Threatened	S3B,S3N	2	35.2 ± 0.0	NB
A	*Tringa flavipes*	Lesser Yellowlegs	Threatened			S3M	672	7.3 ± 0.0	NB
A	*Limosa haemastica*	Hudsonian Godwit	Threatened			S3M	95	8.4 ± 0.0	NB
A	*Anguilla rostrata*	American Eel	Threatened		Threatened	S4N	137	4.0 ± 0.0	NB
A	*Coturnicops noveboracensis*	Yellow Rail	Special Concern	Special Concern	Special Concern	S1?B,SUM	3	58.6 ± 7.0	NB
A	*Histrionicus histrionicus pop. 1*	Harlequin Duck - Eastern population	Special Concern	Special Concern	Endangered	S1B,S1S2N,S2M	164	23.8 ± 17.0	NB
A	*Antrostomus vociferus*	Eastern Whip-Poor-Will	Special Concern	Threatened	Threatened	S2B	86	6.0 ± 7.0	NB
A	*Hirundo rustica*	Barn Swallow	Special Concern	Threatened	Threatened	S2B	1618	4.1 ± 7.0	NB
A	*Balaenoptera physalus*	Fin Whale	Special Concern	Special Concern		S2S3	19	13.4 ± 1.0	NB
A	*Euphagus carolinus*	Rusty Blackbird	Special Concern	Special Concern	Special Concern	S2S3B,S3M	145	8.7 ± 2.0	NB
A	*Bucephala islandica*	Barrow's Goldeneye	Special Concern	Special Concern	Special Concern	S2S3N,S3M	60	9.4 ± 0.0	NB

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)	Prov
A	*Acipenser brevirostrum*	Shortnose Sturgeon	Special Concern	Special Concern	Special Concern	S3	12	5.7 ± 10.0	NB
A	*Chelydra serpentina*	Snapping Turtle	Special Concern	Special Concern	Special Concern	S3	116	28.5 ± 0.0	NB
A	*Contopus virens*	Eastern Wood-Pewee	Special Concern	Special Concern	Special Concern	S3B	937	4.1 ± 7.0	NB
A	*Contopus cooperi*	Olive-sided Flycatcher	Special Concern	Threatened	Threatened	S3B	396	4.1 ± 7.0	NB
A	*Dolichonyx oryzivorus*	Bobolink	Special Concern	Threatened	Threatened	S3B	1660	6.5 ± 7.0	NB
A	*Coccothraustes vespertinus*	Evening Grosbeak	Special Concern	Special Concern		S3B,S3S4N,SUM	316	4.1 ± 7.0	NB
A	*Chordeiles minor*	Common Nighthawk	Special Concern	Threatened	Threatened	S3B,S4M	390	6.5 ± 7.0	NB
A	*Phalaropus lobatus*	Red-necked Phalarope	Special Concern	Special Concern		S3M	223	8.6 ± 0.0	NB
A	*Podiceps auritus*	Horned Grebe	Special Concern	Special Concern	Special Concern	S3N	271	8.4 ± 1.0	NB
A	*Cardellina canadensis*	Canada Warbler	Special Concern	Threatened	Threatened	S3S4B	1387	4.1 ± 7.0	NB
A	*Phocoena phocoena*	Harbour Porpoise	Special Concern		Spec.Concern	S4	244	12.7 ± 0.0	NB
A	*Chrysemys picta picta*	Eastern Painted Turtle	Special Concern	Special Concern		S4	113	1.7 ± 1.0	NB
A	*Anarhichas lupus*	Atlantic Wolffish	Special Concern	Special Concern	Special Concern	SNR	1	71.9 ± 0.0	NB
A	*Hemidactylium scutatum*	Four-toed Salamander	Not At Risk			S1?	12	83.0 ± 0.0	NS
A	*Fulica americana*	American Coot	Not At Risk			S1B	15	8.4 ± 0.0	NB
A	*Falco peregrinus pop. 1*	Peregrine Falcon - anatum/tundrius	Not At Risk	Special Concern	Endangered	S1B,S3M	659	6.5 ± 7.0	NB
A	*Falco peregrinus*	Peregrine Falcon	Not At Risk	Special Concern		S1B,S3M	1	75.5 ± 0.0	NB
A	*Bubo scandiacus*	Snowy Owl	Not At Risk			S1N,S2S3M	33	10.0 ± 6.0	NB
A	*Accipiter cooperii*	Cooper's Hawk	Not At Risk			S1S2B	23	38.8 ± 7.0	NB
A	*Buteo lineatus*	Red-shouldered Hawk	Not At Risk			S1S2B	53	10.7 ± 0.0	NB
A	*Aegolius funereus*	Boreal Owl	Not At Risk			S1S2B,SUM	5	37.1 ± 7.0	NB
A	*Sorex dispar*	Long-tailed Shrew	Not At Risk			S2	2	25.4 ± 1.0	NB
A	*Chlidonias niger*	Black Tern	Not At Risk			S2B	345	31.2 ± 7.0	NB
A	*Podiceps grisegena*	Red-necked Grebe	Not At Risk			S2N,S3M	727	8.8 ± 1.0	NB
A	*Globicephala melas*	Long-finned Pilot Whale	Not At Risk			S2S3	3	15.5 ± 1.0	NB
A	*Desmognathus fuscus pop. 2*	Northern Dusky Salamander - Quebec / New Brunswick population	Not At Risk			S3	61	1.5 ± 1.0	NB
A	*Megaptera novaeangliae*	Humpback Whale	Not At Risk			S3	29	53.2 ± 0.0	NB
A	*Sterna hirundo*	Common Tern	Not At Risk			S3B,SUM	363	7.4 ± 10.0	NB
A	*Lagenorhynchus acutus*	Atlantic White-sided Dolphin	Not At Risk			S3S4	2	15.5 ± 1.0	NB
A	*Haliaeetus leucocephalus*	Bald Eagle	Not At Risk		Endangered	S4	1711	4.1 ± 0.0	NB
A	*Lynx canadensis*	Canada Lynx	Not At Risk		Endangered	S4	17	28.5 ± 1.0	NB
A	*Canis lupus*	Grey Wolf	Not At Risk		Extirpated	SX	4	6.3 ± 1.0	NB
A	*Puma concolor pop. 1*	Cougar - Eastern population	Data Deficient		Endangered	SU	76	15.8 ± 1.0	NB
A	*Calidris canutus rufa*	Red Knot rufa subspecies	E,SC	Endangered	Endangered	S2M	405	7.9 ± 0.0	NB
A	*Morone saxatilis*	Striped Bass	E,SC			S3S4B,S3S4N	13	9.5 ± 0.0	NB
A	*Odobenus rosmarus pop. 5*	Atlantic Walrus - Nova Scotia - Newfoundland - Gulf of St Lawrence population	X			SX	1	79.1 ± 5.0	NS
A	*Thryothorus ludovicianus*	Carolina Wren				S1	35	9.1 ± 7.0	NB
A	*Salvelinus alpinus*	Arctic Char				S1	3	79.1 ± 0.0	NB
A	*Vireo flavifrons*	Yellow-throated Vireo				S1?B	16	9.1 ± 7.0	NB
A	*Tringa melanoleuca*	Greater Yellowlegs				S1?B,S4S5M	1349	7.3 ± 0.0	NB

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)	Prov
A	*Aythya americana*	Redhead				S1B	8	9.1 ± 7.0	NB
A	*Gallinula galeata*	Common Gallinule				S1B	35	12.0 ± 0.0	NB
A	*Grus canadensis*	Sandhill Crane				S1B	12	13.7 ± 0.0	NB
A	*Bartramia longicauda*	Upland Sandpiper				S1B	47	32.3 ± 0.0	NB
A	*Phalaropus tricolor*	Wilson's Phalarope				S1B	61	6.5 ± 7.0	NB
A	*Leucophaeus atricilla*	Laughing Gull				S1B	84	8.8 ± 1.0	NB
A	*Rissa tridactyla*	Black-legged Kittiwake				S1B	64	29.7 ± 0.0	NB
A	*Uria aalge*	Common Murre				S1B	131	23.9 ± 15.0	NB
A	*Alca torda*	Razorbill				S1B	157	8.5 ± 0.0	NB
A	*Fratercula arctica*	Atlantic Puffin				S1B	160	23.9 ± 15.0	NB
A	*Progne subis*	Purple Martin				S1B	240	9.1 ± 7.0	NB
A	*Histrionicus histrionicus*	Harlequin Duck				S1B,S1S2N,S2M	1	75.4 ± 0.0	NB
A	*Aythya marila*	Greater Scaup				S1B,S2N,S4M	43	7.3 ± 0.0	NB
A	*Oxyura jamaicensis*	Ruddy Duck				S1B,S2S3M	52	8.4 ± 1.0	NB
A	*Aythya affinis*	Lesser Scaup				S1B,S4M	208	3.9 ± 0.0	NB
A	*Eremophila alpestris*	Horned Lark				S1B,S4N,S5M	32	8.4 ± 1.0	NB
A	*Sterna paradisaea*	Arctic Tern				S1B,SUM	127	28.2 ± 16.0	NB
A	*Chroicocephalus ridibundus*	Black-headed Gull				S1N,S2M	42	8.8 ± 1.0	NB
A	*Branta bernicla*	Brant				S1N,S2S3M	544	8.4 ± 1.0	NB
A	*Calidris alba*	Sanderling				S1N,S3S4M	945	4.1 ± 0.0	NB
A	*Butorides virescens*	Green Heron				S1S2B	32	14.1 ± 7.0	NB
A	*Nycticorax nycticorax*	Black-crowned Night-heron				S1S2B	66	6.5 ± 7.0	NB
A	*Empidonax traillii*	Willow Flycatcher				S1S2B	138	6.5 ± 7.0	NB
A	*Stelgidopteryx serripennis*	Northern Rough-winged Swallow				S1S2B	25	10.6 ± 7.0	NB
A	*Troglodytes aedon*	House Wren				S1S2B	33	6.5 ± 7.0	NB
A	*Calidris bairdii*	Baird's Sandpiper				S1S2M	138	7.9 ± 0.0	NB
A	*Melanitta americana*	American Scoter				S1S2N,S3M	823	8.4 ± 0.0	NB
A	*Petrochelidon pyrrhonota*	Cliff Swallow				S2B	631	6.5 ± 7.0	NB
A	*Cistothorus palustris*	Marsh Wren				S2B	397	4.1 ± 7.0	NB
A	*Mimus polyglottos*	Northern Mockingbird				S2B	163	6.5 ± 7.0	NB
A	*Pooecetes gramineus*	Vesper Sparrow				S2B	86	13.5 ± 0.0	NB
A	*Mareca strepera*	Gadwall				S2B,S3M	168	6.1 ± 6.0	NB
A	*Tringa solitaria*	Solitary Sandpiper				S2B,S4S5M	278	8.4 ± 1.0	NB
A	*Pinicola enucleator*	Pine Grosbeak				S2B,S4S5N,S4S5 M	40	34.7 ± 7.0	NB
A	*Phalacrocorax carbo*	Great Cormorant				S2N	325	8.3 ± 3.0	NB
A	*Somateria spectabilis*	King Eider				S2N	57	44.1 ± 32.0	NB
A	*Larus hyperboreus*	Glaucous Gull				S2N	161	4.1 ± 0.0	NB
A	*Melanitta perspicillata*	Surf Scoter				S2N,S4M	121	6.3 ± 8.0	NB
A	*Melanitta deglandi*	White-winged Scoter				S2N,S4M	48	28.5 ± 17.0	NB
A	*Asio otus*	Long-eared Owl				S2S3	21	3.1 ± 0.0	NB
A	*Picoides dorsalis*	American Three-toed Woodpecker				S2S3	11	44.0 ± 7.0	NB
A	*Toxostoma rufum*	Brown Thrasher				S2S3B	101	6.5 ± 7.0	NB
A	*Icterus galbula*	Baltimore Oriole				S2S3B	226	8.3 ± 2.0	NB
A	*Somateria mollissima*	Common Eider				S2S3B,S2S3N,S4 M	2042	4.1 ± 0.0	NB
A	*Larus delawarensis*	Ring-billed Gull				S2S3B,S4N,S5M	338	1.9 ± 0.0	NB
A	*Pluvialis dominica*	American Golden-Plover				S2S3M	291	7.9 ± 0.0	NB
A	*Calcarius lapponicus*	Lapland Longspur				S2S3N,SUM	38	7.7 ± 1.0	NB
A	*Larus marinus*	Great Black-backed Gull				S3	576	4.1 ± 0.0	NB
A	*Picoides arcticus*	Black-backed Woodpecker				S3	61	16.0 ± 7.0	NB
A	*Loxia curvirostra*	Red Crossbill				S3	160	6.5 ± 7.0	NB
A	*Spinus pinus*	Pine Siskin				S3	358	4.1 ± 7.0	NB
A	*Prosopium cylindraceum*	Round Whitefish				S3	2	74.5 ± 0.0	NB
A	*Salvelinus namaycush*	Lake Trout				S3	4	9.1 ± 0.0	NB
A	*Sorex maritimensis*	Maritime Shrew				S3	2	83.2 ± 0.0	NS

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A	*Spatula clypeata*	Northern Shoveler				S3B	154	6.5 ± 7.0	NB
A	*Charadrius vociferus*	Killdeer				S3B	905	4.1 ± 7.0	NB
A	*Tringa semipalmata*	Willet				S3B	203	8.6 ± 0.0	NB
A	*Cepphus grylle*	Black Guillemot				S3B	824	8.4 ± 1.0	NB
A	*Coccyzus erythropthalmus*	Black-billed Cuckoo				S3B	211	6.5 ± 7.0	NB
A	*Myiarchus crinitus*	Great Crested Flycatcher				S3B	378	8.7 ± 4.0	NB
A	*Piranga olivacea*	Scarlet Tanager				S3B	140	9.1 ± 7.0	NB
A	*Pheucticus ludovicianus*	Rose-breasted Grosbeak				S3B	863	4.1 ± 7.0	NB
A	*Passerina cyanea*	Indigo Bunting				S3B	124	11.2 ± 7.0	NB
A	*Molothrus ater*	Brown-headed Cowbird				S3B	311	4.1 ± 7.0	NB
A	*Setophaga tigrina*	Cape May Warbler				S3B,S4S5M	163	10.4 ± 7.0	NB
A	*Mergus serrator*	Red-breasted Merganser				S3B,S4S5N,S5M	408	6.3 ± 8.0	NB
A	*Anas acuta*	Northern Pintail				S3B,S5M	60	0.5 ± 1.0	NB
A	*Anser caerulescens*	Snow Goose				S3M	7	8.4 ± 1.0	NB
A	*Numenius phaeopus hudsonicus*	Whimbrel				S3M	456	8.4 ± 1.0	NB
A	*Arenaria interpres*	Ruddy Turnstone				S3M	749	8.4 ± 1.0	NB
A	*Calidris pusilla*	Semipalmated Sandpiper				S3M	2626	7.1 ± 3.0	NB
A	*Calidris melanotos*	Pectoral Sandpiper				S3M	351	3.8 ± 0.0	NB
A	*Limnodromus griseus*	Short-billed Dowitcher				S3M	871	7.9 ± 0.0	NB
A	*Phalaropus fulicarius*	Red Phalarope				S3M	120	41.4 ± 32.0	NB
A	*Bucephala albeola*	Bufflehead				S3N	1146	3.9 ± 0.0	NB
A	*Calidris maritima*	Purple Sandpiper				S3N	262	8.6 ± 0.0	NB
A	*Uria lomvia*	Thick-billed Murre				S3N,S3M	67	19.9 ± 8.0	NB
A	*Perisoreus canadensis*	Canada Jay				S3S4	352	4.1 ± 7.0	NB
A	*Poecile hudsonicus*	Boreal Chickadee				S3S4	278	4.1 ± 7.0	NB
A	*Eptesicus fuscus*	Big Brown Bat				S3S4	51	7.2 ± 1.0	NB
A	*Synaptomys cooperi*	Southern Bog Lemming				S3S4	79	29.3 ± 1.0	NB
A	*Tyrannus tyrannus*	Eastern Kingbird				S3S4B	686	8.7 ± 2.0	NB
A	*Vireo gilvus*	Warbling Vireo				S3S4B	276	10.4 ± 7.0	NB
A	*Actitis macularius*	Spotted Sandpiper				S3S4B,S4M	1164	4.1 ± 7.0	NB
A	*Melospiza lincolnii*	Lincoln's Sparrow				S3S4B,S4M	363	4.1 ± 7.0	NB
A	*Gallinago delicata*	Wilson's Snipe				S3S4B,S5M	1011	8.6 ± 0.0	NB
A	*Setophaga striata*	Blackpoll Warbler				S3S4B,S5M	106	7.3 ± 0.0	NB
A	*Pluvialis squatarola*	Black-bellied Plover				S3S4M	1161	7.3 ± 0.0	NB
A	*Morus bassanus*	Northern Gannet				SHB	844	4.1 ± 0.0	NB
C	*Quercus macrocarpa - Acer rubrum / Onoclea sensibilis - Carex arcta Forest*	Bur Oak - Red Maple / Sensitive Fern - Northern Clustered Sedge Forest				S2	1	67.6 ± 0.0	NB
C	*Acer saccharinum / Onoclea sensibilis - Lysimachia terrestris Forest*	Silver Maple / Sensitive Fern - Swamp Yellow Loosestrife Forest				S3	1	53.4 ± 0.0	NB
C	*Acer saccharum - Fraxinus americana / Polystichum acrostichoides Forest*	Sugar Maple - White Ash / Christmas Fern Forest				S3S4	1	33.3 ± 0.0	NB
I	*Bombus bohemicus*	Ashton Cuckoo Bumble Bee	Endangered	Endangered		S1	16	11.4 ± 5.0	NB
I	*Danaus plexippus*	Monarch	Endangered	Special Concern	Special Concern	S2S3?B	302	0.6 ± 0.0	NB
I	*Bombus affinis*	Rusty-patched Bumble Bee	Endangered	Endangered		SH	1	84.1 ± 5.0	NB
I	*Bombus suckleyi*	Suckley's Cuckoo Bumble Bee	Threatened			SH	1	20.4 ± 5.0	NB
I	*Gomphurus ventricosus*	Skillet Clubtail	Special Concern	Endangered	Endangered	S2	95	55.9 ± 0.0	NB
I	*Cicindela marginipennis*	Cobblestone Tiger Beetle	Special Concern	Endangered	Endangered	S2S3	185	65.6 ± 0.0	NB
I	*Ophiogomphus howei*	Pygmy Snaketail	Special Concern	Special Concern	Special Concern	S2S3	15	46.3 ± 0.0	NB
I	*Alasmidonta varicosa*	Brook Floater	Special Concern	Special Concern	Special Concern	S3	1	84.0 ± 0.0	NB

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I	*Lampsilis cariosa*	Yellow Lampmussel	Special Concern	Special Concern	Special Concern	S3	101	32.6 ± 1.0	NB
I	*Bombus terricola*	Yellow-banded Bumble Bee	Special Concern	Special Concern		S4	142	10.7 ± 5.0	NB
I	*Coccinella transversoguttata richardsoni*	Transverse Lady Beetle	Special Concern			SH	17	6.3 ± 0.0	NB
I	*Appalachina sayana sayana*	Spike-lip Crater Snail	Not At Risk			S3?	1	16.9 ± 1.0	NB
I	*Conotrachelus juglandis*	Butternut Curculio				S1	3	79.6 ± 0.0	NB
I	*Haematopota rara*	Shy Cleg				S1	1	82.4 ± 1.0	NB
I	*Tharsalea dorcas*	Dorcas Copper				S1	1	67.2 ± 0.0	NB
I	*Erora laeta*	Early Hairstreak				S1	6	77.4 ± 2.0	NS
I	*Somatochlora septentrionalis*	Muskeg Emerald				S1	1	99.5 ± 1.0	NB
I	*Polites origenes*	Crossline Skipper				S1?	8	50.0 ± 0.0	NB
I	*Icaricia saepiolus*	Greenish Blue				S1S2	5	43.9 ± 0.0	NB
I	*Pachydiplax longipennis*	Blue Dasher				S1S2	3	30.9 ± 0.0	NB
I	*Encyclops caeruleus*	Cerulean Long-horned Beetle				S2	1	83.9 ± 0.0	NB
I	*Scaphinotus viduus*	Bereft Snail-eating Beetle				S2	2	38.8 ± 0.0	NB
I	*Brachyleptura circumdata*	Dark-shouldered Long-horned Beetle				S2	6	69.7 ± 0.0	NB
I	*Satyrium calanus*	Banded Hairstreak				S2	25	15.3 ± 0.0	NB
I	*Satyrium calanus falacer*	Falacer Hairstreak				S2	1	81.8 ± 1.0	NB
I	*Strymon melinus*	Gray Hairstreak				S2	7	12.1 ± 0.0	NB
I	*Tabanus vivax*	Vivacious Horse Fly				S2S3	1	92.1 ± 0.0	NB
I	*Ophiogomphus colubrinus*	Boreal Snaketail				S2S3	40	24.1 ± 1.0	NB
I	*Sphaeroderus nitidicollis*	Polished Snail-eating Beetle				S3	1	69.7 ± 0.0	NB
I	*Lepturopsis biforis*	Two-spotted Long-horned Beetle				S3	1	13.6 ± 1.0	NB
I	*Orthosoma brunneum*	Moist Long-horned Beetle				S3	3	70.2 ± 5.0	NB
I	*Elaphrus americanus*	Boreal Elaphrus Beetle				S3	1	71.9 ± 0.0	NB
I	*Semanotus terminatus*	Light Long-horned Beetle				S3	1	75.2 ± 0.0	NB
I	*Desmocerus palliatus*	Elderberry Borer				S3	9	13.6 ± 1.0	NB
I	*Agonum excavatum*	Excavated Harp Ground Beetle				S3	1	71.9 ± 0.0	NB
I	*Clivina americana*	America Pedunculate Ground Beetle				S3	1	71.9 ± 0.0	NB
I	*Olisthopus parmatus*	Tawny-bordered Harp Ground Beetle				S3	1	69.7 ± 0.0	NB
I	*Tachys scitulus*	Handsome Riverbank Ground Beetle				S3	1	71.9 ± 0.0	NB
I	*Carabus maeander*	Meander Ground Beetle				S3	1	82.5 ± 0.0	NB
I	*Carabus serratus*	Serrated Ground Beetle				S3	1	87.3 ± 0.0	NB
I	*Coccinella hieroglyphica kirbyi*	a Ladybird Beetle				S3	1	13.6 ± 1.0	NB
I	*Hippodamia parenthesis*	Parenthesis Lady Beetle				S3	5	13.6 ± 1.0	NB
I	*Stenocorus vittiger*	Shrub Long-horned Beetle				S3	1	71.9 ± 0.0	NB
I	*Gnathacmaeops pratensis*	Meadow Flower Longhorn Beetle				S3	5	13.6 ± 1.0	NB
I	*Pogonocherus mixtus*	Mixed-spotted Flatface Sawyer				S3	1	13.6 ± 1.0	NB
I	*Badister neopulchellus*	Red-black Spotted Beetle				S3	1	71.9 ± 0.0	NB
I	*Calathus gregarius*	Gregarious Harp Ground Beetle				S3	1	99.3 ± 1.0	NB
I	*Gonotropis dorsalis*	Birch Fungus Weevil				S3	1	75.1 ± 0.0	NB
I	*Naemia seriata*	Seaside Lady Beetle				S3	6	12.8 ± 0.0	NB
I	*Beckerus appressus*	Compressed Click Beetle				S3	1	94.7 ± 0.0	NB
I	*Saperda lateralis*	Red-edged Long-horned Beetle				S3	2	8.5 ± 0.0	NB

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I	*Epargyreus clarus*	Silver-spotted Skipper				S3	23	6.2 ± 0.0	NB
I	*Hesperia sassacus*	Indian Skipper				S3	19	49.9 ± 1.0	NB
I	*Euphyes bimacula*	Two-spotted Skipper				S3	20	9.7 ± 0.0	NB
I	*Satyrium acadica*	Acadian Hairstreak				S3	20	13.6 ± 5.0	NB
I	*Plebejus idas*	Northern Blue				S3	2	26.8 ± 0.0	NB
I	*Plebejus idas empetri*	Crowberry Blue				S3	26	6.8 ± 2.0	NB
I	*Argynnis aphrodite*	Aphrodite Fritillary				S3	28	11.1 ± 2.0	NB
I	*Boloria bellona*	Meadow Fritillary				S3	62	41.0 ± 0.0	NB
I	*Nymphalis l-album*	Compton Tortoiseshell				S3	36	11.1 ± 2.0	NB
I	*Gomphurus vastus*	Cobra Clubtail				S3	123	38.5 ± 0.0	NB
I	*Celithemis martha*	Martha's Pennant				S3	9	2.9 ± 0.0	NB
I	*Ladona exusta*	White Corporal				S3	13	34.7 ± 0.0	NB
I	*Enallagma pictum*	Scarlet Bluet				S3	10	15.6 ± 0.0	NB
I	*Ischnura kellicotti*	Lilypad Forktail				S3	19	24.4 ± 0.0	NB
I	*Arigomphus furcifer*	Lilypad Clubtail				S3	25	62.1 ± 0.0	NB
I	*Alasmidonta undulata*	Triangle Floater				S3	40	11.5 ± 1.0	NB
I	*Atlanticoncha ochracea*	Tidewater Mucket				S3	154	7.4 ± 1.0	NB
I	*Striatura ferrea*	Black Striate Snail				S3	1	81.9 ± 1.0	NB
I	*Neohelix albolabris*	Whitelip Snail				S3	2	61.5 ± 0.0	NB
I	*Spurwinkia salsa*	Saltmarsh Hydrobe				S3	34	5.3 ± 0.0	NB
I	*Pantala hymenaea*	Spot-Winged Glider				S3B	12	10.8 ± 1.0	NB
I	*Bombus griseocollis*	Brown-belted Bumble Bee				S3S4	3	73.3 ± 5.0	NB
I	*Lanthus vernalis*	Southern Pygmy Clubtail				S3S4	1	99.8 ± 0.0	NB
I	*Somatochlora forcipata*	Forcipate Emerald				S3S4	21	68.1 ± 1.0	NB
I	*Somatochlora tenebrosa*	Clamp-Tipped Emerald				S3S4	12	75.9 ± 0.0	NB
N	*Erioderma mollissimum*	Graceful Felt Lichen	Endangered	Endangered	Endangered	SH	1	95.6 ± 1.0	NB
N	*Erioderma pedicellatum (Atlantic pop.)*	Boreal Felt Lichen - Atlantic pop.	Endangered	Endangered	Endangered	SH	1	70.7 ± 1.0	NB
N	*Pannaria lurida*	Wrinkled Shingle Lichen	Threatened	Threatened		S1?	165	50.9 ± 0.0	NB
N	*Heterodermia squamulosa*	Scaly Fringe Lichen	Threatened			S1?	15	8.9 ± 0.0	NB
N	*Anzia colpodes*	Black-foam Lichen	Threatened	Threatened		S1S2	20	77.5 ± 1.0	NB
N	*Fuscopannaria leucosticta*	White-rimmed Shingle Lichen	Threatened			S2	170	43.3 ± 0.0	NB
N	*Peltigera hydrothyria*	Eastern Waterfan	Threatened	Threatened		S2S3	333	90.9 ± 0.0	NB
N	*Pectenia plumbea*	Blue Felt Lichen	Special Concern	Special Concern	Special Concern	S1	419	42.2 ± 0.0	NB
N	*Sclerophora peronella (Atlantic pop.)*	Frosted Glass-whiskers (Atlantic population)	Special Concern	Special Concern		S1	8	88.4 ± 0.0	NS
N	*Pseudevernia cladonia*	Ghost Antler Lichen	Not At Risk			S2S3	22	19.3 ± 0.0	NB
N	*Imbribryum muehlenbeckii*	Muehlenbeck's Bryum Moss				S1	1	7.9 ± 1.0	NB
N	*Didymodon rigidulus var. gracilis*	a moss				S1	1	98.5 ± 1.0	NB
N	*Sphagnum macrophyllum*	Sphagnum				S1	4	3.1 ± 0.0	NB
N	*Coscinodon cribrosus*	Sieve-Toothed Moss				S1	1	10.8 ± 0.0	NB
N	*Syntrichia ruralis*	a Moss				S1	1	76.8 ± 0.0	NB
N	*Sticta fuliginosa*	Peppered Moon Lichen				S1	2	94.3 ± 0.0	NS
N	*Leptogium hirsutum*	Jellyskin Lichen				S1	26	92.6 ± 0.0	NB
N	*Cladonia straminea*	Reptilian Pixie-cup Lichen				S1	4	92.5 ± 1.0	NB
N	*Coccocarpia palmicola*	Salted Shell Lichen				S1	6	49.8 ± 0.0	NB
N	*Peltigera collina*	Tree Pelt Lichen				S1	3	79.4 ± 10.0	NB
N	*Peltigera malacea*	Veinless Pelt Lichen				S1	2	87.8 ± 0.0	NS
N	*Bryoria bicolor*	Electrified Horsehair Lichen				S1	1	95.0 ± 1.0	NB
N	*Cladonia krogiana*	Krog's Pixie Lichen				S1	1	28.0 ± 0.0	NB
N	*Hygrobiella laxifolia*	Lax Notchwort				S1?	1	92.6 ± 1.0	NB
N	*Atrichum angustatum*	Lesser Smoothcap Moss				S1?	1	89.6 ± 3.0	NS
N	*Bartramia ithyphylla*	Straight-leaved Apple Moss				S1?	1	92.6 ± 0.0	NB
N	*Pseudocalliergon trifarium*	Three-ranked Spear Moss				S1?	1	1.1 ± 0.0	NB
N	*Dichelyma falcatum*	a Moss				S1?	2	21.6 ± 1.0	NB

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N	*Dicranum bonjeanii*	Bonjean's Broom Moss				S1?	1	83.0 ± 1.0	NB
N	*Oxyrrhynchium hians*	Light Beaked Moss				S1?	4	74.2 ± 0.0	NB
N	*Plagiothecium latebricola*	Alder Silk Moss				S1?	2	10.4 ± 0.0	NB
N	*Niphotrichum ericoides*	Dense Rock Moss				S1?	1	76.8 ± 3.0	NB
N	*Rhytidium rugosum*	Wrinkle-leaved Moss				S1?	2	76.3 ± 0.0	NB
N	*Splachnum pensylvanicum*	Southern Dung Moss				S1?	2	85.4 ± 1.0	NB
N	*Platylomella lescurii*	a Moss				S1?	1	68.4 ± 1.0	NB
N	*Enchylium tenax*	Soil Tarpaper Lichen				S1?	1	94.7 ± 0.0	NS
N	*Ephebe hispidula*	Dryside Rockshag Lichen				S1?	1	88.5 ± 0.0	NS
N	*Ephebe perspinulosa*	Thread Lichen				S1?	1	92.3 ± 0.0	NS
N	*Euopsis granatina*	Lesser Rockbud Lichen				S1?	1	85.4 ± 1.0	NS
N	*Pertusaria propinqua*	a Lichen				S1?	2	95.0 ± 1.0	NB
N	*Pilophorus fibula*	New England Matchstick Lichen				S1?	1	34.0 ± 0.0	NB
N	*Rhizocarpon umbilicatum*	a Lichen				S1?	1	91.9 ± 1.0	NB
N	*Spilonema revertens*	Rock Hairball Lichen				S1?	4	84.9 ± 0.0	NS
N	*Peltigera venosa*	Fan Pelt Lichen				S1?	2	35.6 ± 0.0	NB
N	*Cladonia oricola*	Cladonia Lichen				S1?	2	16.2 ± 0.0	NB
N	*Odontoschisma francisci*	Holt's Notchwort				S1S2	1	98.5 ± 1.0	NB
N	*Harpanthus flotovianus*	Great Mountain Flapwort				S1S2	1	94.4 ± 1.0	NB
N	*Pallavicinia lyellii*	Lyell's Ribbonwort				S1S2	3	25.3 ± 1.0	NB
N	*Reboulia hemisphaerica*	Purple-margined Liverwort				S1S2	2	74.0 ± 1.0	NB
N	*Solenostoma obovatum*	Egg Flapwort				S1S2	1	21.0 ± 0.0	NB
N	*Brachythecium acuminatum*	Acuminate Ragged Moss				S1S2	5	65.3 ± 100.0	NB
N	*Ptychostomum salinum*	Saltmarsh Bryum				S1S2	2	29.3 ± 1.0	NB
N	*Pseudocampylium radicale*	Long-stalked Fine Wet Moss				S1S2	1	84.6 ± 1.0	NB
N	*Tortula obtusifolia*	a Moss				S1S2	1	54.9 ± 0.0	NB
N	*Distichium inclinatum*	Inclined Iris Moss				S1S2	5	98.4 ± 0.0	NB
N	*Ditrichum pallidum*	Pale Cow-hair Moss				S1S2	3	76.3 ± 3.0	NS
N	*Drummondia prorepens*	a Moss				S1S2	1	90.7 ± 0.0	NS
N	*Sphagnum platyphyllum*	Flat-leaved Peat Moss				S1S2	3	90.9 ± 1.0	NB
N	*Timmia norvegica*	a moss				S1S2	3	62.2 ± 0.0	NB
N	*Timmia norvegica var. excurrens*	a moss				S1S2	1	98.4 ± 0.0	NB
N	*Tomentypnum falcifolium*	Sickle-leaved Golden Moss				S1S2	1	21.2 ± 1.0	NB
N	*Tortella humilis*	Small Crisp Moss				S1S2	4	93.3 ± 0.0	NB
N	*Pseudotaxiphyllum distichaceum*	a Moss				S1S2	3	29.3 ± 1.0	NB
N	*Hamatocaulis vernicosus*	a Moss				S1S2	3	35.3 ± 100.0	NB
N	*Haplocladium microphyllum*	Tiny-leaved Haplocladium Moss				S1S2	1	76.3 ± 3.0	NS
N	*Umbilicaria vellea*	Grizzled Rocktripe Lichen				S1S2	1	98.6 ± 1.0	NB
N	*Pilophorus cereolus*	Powdered Matchstick Lichen				S1S2	2	34.0 ± 0.0	NB
N	*Calypogeia neesiana*	Nees' Pouchwort				S1S3	1	32.7 ± 1.0	NB
N	*Fuscocephaloziopsis connivens*	Forcipated Pincerwort				S1S3	1	21.8 ± 0.0	NB
N	*Cephaloziella elachista*	Spurred Threadwort				S1S3	1	1.6 ± 5.0	NB
N	*Porella pinnata*	Pinnate Scalewort				S1S3	2	38.6 ± 1.0	NB
N	*Amphidium mougeotii*	a Moss				S2	10	20.5 ± 1.0	NB
N	*Anomodon viticulosus*	a Moss				S2	7	7.5 ± 0.0	NB
N	*Cirriphyllum piliferum*	Hair-pointed Moss				S2	1	79.0 ± 0.0	NB
N	*Cynodontium strumiferum*	Strumose Dogtooth Moss				S2	1	73.6 ± 8.0	NB
N	*Dicranella palustris*	Drooping-Leaved Fork Moss				S2	8	54.8 ± 100.0	NB
N	*Didymodon ferrugineus*	Rusty Beard Moss				S2	2	31.6 ± 1.0	NB
N	*Ditrichum flexicaule*	Flexible Cow-hair Moss				S2	1	20.5 ± 1.0	NB
N	*Anomodon tristis*	a Moss				S2	2	74.8 ± 1.0	NB
N	*Hygrohypnum bestii*	Best's Brook Moss				S2	5	83.8 ± 0.0	NB
N	*Hypnum pratense*	Meadow Plait Moss				S2	1	3.6 ± 0.0	NB

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N	*Isothecium myosuroides*	Slender Mouse-tail Moss				S2	11	20.5 ± 1.0	NB
N	*Meesia triquetra*	Three-ranked Cold Moss				S2	2	65.3 ± 100.0	NB
N	*Physcomitrium immersum*	a Moss				S2	7	38.6 ± 1.0	NB
N	*Platydictya jungermannioides*	False Willow Moss				S2	4	30.9 ± 0.0	NB
N	*Pohlia elongata*	Long-necked Nodding Moss				S2	7	93.3 ± 0.0	NB
N	*Seligeria calcarea*	Chalk Brittle Moss				S2	1	20.5 ± 1.0	NB
N	*Sphagnum lindbergii*	Lindberg's Peat Moss				S2	8	7.6 ± 1.0	NB
N	*Tayloria serrata*	Serrate Trumpet Moss				S2	5	43.0 ± 1.0	NB
N	*Tetrodontium brownianum*	Little Georgia				S2	3	97.9 ± 1.0	NB
N	*Tetraplodon mnioides*	Entire-leaved Nitrogen Moss				S2	3	22.7 ± 0.0	NB
N	*Thamnobryum alleghaniense*	a Moss				S2	9	62.1 ± 0.0	NB
N	*Tortula mucronifolia*	Mucronate Screw Moss				S2	1	10.0 ± 0.0	NB
N	*Ulota phyllantha*	a Moss				S2	7	29.3 ± 1.0	NB
N	*Anomobryum julaceum*	Slender Silver Moss				S2	5	61.5 ± 0.0	NB
N	*Usnea ceratina*	Warty Beard Lichen				S2	1	48.7 ± 0.0	NB
N	*Cladonia incrassata*	Powder-foot British Soldiers Lichen				S2	1	21.0 ± 0.0	NB
N	*Leptogium corticola*	Blistered Jellyskin Lichen				S2	32	80.1 ± 0.0	NB
N	*Leptogium milligranum*	Stretched Jellyskin Lichen				S2	8	79.8 ± 0.0	NB
N	*Nephroma laevigatum*	Mustard Kidney Lichen				S2	12	74.7 ± 0.0	NB
N	*Peltigera lepidophora*	Scaly Pelt Lichen				S2	4	35.6 ± 0.0	NB
N	*Andreaea rothii*	Dusky Rock Moss				S2?	2	31.1 ± 0.0	NB
N	*Ptychostomum pallescens*	Tall Clustered Bryum				S2?	2	10.2 ± 1.0	NB
N	*Dichelyma capillaceum*	Hairlike Dichelyma Moss				S2?	2	94.8 ± 2.0	NB
N	*Dicranum spurium*	Spurred Broom Moss				S2?	4	16.4 ± 0.0	NB
N	*Hygrohypnum montanum*	a Moss				S2?	1	75.9 ± 1.0	NB
N	*Schistostega pennata*	Luminous Moss				S2?	3	54.8 ± 100.0	NB
N	*Seligeria diversifolia*	a Moss				S2?	2	61.5 ± 0.0	NB
N	*Sphagnum angermanicum*	a Peatmoss				S2?	2	19.4 ± 10.0	NB
N	*Plagiomnium rostratum*	Long-beaked Leafy Moss				S2?	6	62.1 ± 0.0	NB
N	*Collema leptaleum*	Crumpled Bat's Wing Lichen				S2?	2	79.6 ± 0.0	NB
N	*Imshaugia placorodia*	Eyed Starburst Lichen				S2?	1	88.3 ± 0.0	NS
N	*Nephroma arcticum*	Arctic Kidney Lichen				S2?	1	95.7 ± 1.0	NB
N	*Ptychostomum cernuum*	Swamp Bryum				S2S3	3	33.1 ± 4.0	NB
N	*Buxbaumia aphylla*	Brown Shield Moss				S2S3	2	72.1 ± 15.0	NB
N	*Calliergonella cuspidata*	Common Large Wetland Moss				S2S3	14	10.4 ± 1.0	NB
N	*Drepanocladus polygamus*	Polygamous Hook Moss				S2S3	1	96.0 ± 0.0	NB
N	*Palustriella falcata*	Curled Hook Moss				S2S3	3	20.5 ± 1.0	NB
N	*Didymodon rigidulus*	Rigid Screw Moss				S2S3	10	7.5 ± 0.0	NB
N	*Ephemerum serratum*	a Moss				S2S3	3	76.5 ± 0.0	NB
N	*Fissidens bushii*	Bush's Pocket Moss				S2S3	7	7.5 ± 0.0	NB
N	*Hypnum cupressiforme var. filiforme*	a Moss				S2S3	1	92.6 ± 0.0	NS
N	*Isopterygiopsis pulchella*	Neat Silk Moss				S2S3	3	97.7 ± 0.0	NB
N	*Neckera complanata*	a Moss				S2S3	5	7.5 ± 0.0	NB
N	*Orthotrichum elegans*	Showy Bristle Moss				S2S3	3	58.4 ± 2.0	NB
N	*Pohlia proligera*	Cottony Nodding Moss				S2S3	2	98.1 ± 1.0	NB
N	*Codriophorus fascicularis*	Clustered Rock Moss				S2S3	2	66.4 ± 0.0	NB
N	*Bucklandiella affinis*	Lesser Rock Moss				S2S3	5	81.0 ± 0.0	NS
N	*Scorpidium scorpioides*	Hooked Scorpion Moss				S2S3	4	1.1 ± 0.0	NB
N	*Seligeria campylopoda*	a Moss				S2S3	1	35.3 ± 100.0	NB
N	*Sphagnum centrale*	Central Peat Moss				S2S3	7	78.6 ± 5.0	NS
N	*Sphagnum subfulvum*	a Peatmoss				S2S3	5	21.2 ± 1.0	NB
N	*Taxiphyllum deplanatum*	Imbricate Yew-leaved Moss				S2S3	1	29.3 ± 1.0	NB
N	*Zygodon viridissimus*	a Moss				S2S3	4	68.2 ± 5.0	NB
N	*Schistidium agassizii*	Elf Bloom Moss				S2S3	4	58.4 ± 2.0	NB

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N	*Loeskeobryum brevirostre*	a Moss				S2S3	11	20.5 ± 1.0	NB
N	*Cyrtomnium hymenophylloides*	Short-pointed Lantern Moss				S2S3	4	74.9 ± 0.0	NB
N	*Sphaerophorus globosus*	Northern Coral Lichen				S2S3	14	15.0 ± 0.0	NB
N	*Chaenotheca xyloxena*					S2S3	2	29.2 ± 0.0	NB
N	*Cladonia acuminata*	Scantily Clad Pixie Lichen				S2S3	2	95.6 ± 1.0	NB
N	*Cladonia ramulosa*	Bran Lichen				S2S3	3	99.8 ± 1.0	NB
N	*Cladonia sulphurina*	Greater Sulphur-cup Lichen				S2S3	4	95.6 ± 0.0	NB
N	*Parmeliopsis ambigua*	Green Starburst Lichen				S2S3	1	93.1 ± 1.0	NB
N	*Polychidium muscicola*	Eyed Mossthorns Woollybear Lichen				S2S3	7	26.1 ± 0.0	NB
N	*Cynodontium tenellum*	Delicate Dogtooth Moss				S3	1	29.3 ± 1.0	NB
N	*Hypnum curvifolium*	Curved-leaved Plait Moss				S3	7	68.2 ± 5.0	NB
N	*Tortella fragilis*	Fragile Twisted Moss				S3	1	98.4 ± 0.0	NB
N	*Schistidium maritimum*	a Moss				S3	9	29.3 ± 1.0	NB
N	*Hymenostylium recurvirostrum*	Curve-beak Beardless Moss				S3	8	86.2 ± 0.0	NS
N	*Solorina saccata*	Woodland Owl Lichen				S3	8	42.7 ± 0.0	NB
N	*Ahtiana aurescens*	Eastern Candlewax Lichen				S3	2	95.9 ± 0.0	NB
N	*Normandina pulchella*	Rimmed Elf-ear Lichen				S3	16	72.9 ± 0.0	NS
N	*Cladonia strepsilis*	Olive Cladonia Lichen				S3	4	39.6 ± 0.0	NB
N	*Hypotrachyna catawbiensis*	Powder-tipped Antler Lichen				S3	19	29.2 ± 0.0	NB
N	*Scytinium lichenoides*	Tattered Jellyskin Lichen				S3	16	31.3 ± 0.0	NB
N	*Nephroma bellum*	Naked Kidney Lichen				S3	1	94.7 ± 1.0	NB
N	*Peltigera degenii*	Lustrous Pelt Lichen				S3	3	95.2 ± 1.0	NB
N	*Leptogium laceroides*	Short-bearded Jellyskin Lichen				S3	3	34.0 ± 0.0	NB
N	*Peltigera membranacea*	Membranous Pelt Lichen				S3	18	34.8 ± 0.0	NB
N	*Cladonia botrytes*	Wooden Soldiers Lichen				S3	1	95.7 ± 0.0	NB
N	*Cladonia deformis*	Lesser Sulphur-cup Lichen				S3	8	66.2 ± 0.0	NB
N	*Aulacomnium androgynum*	Little Groove Moss				S3?	12	20.5 ± 1.0	NB
N	*Ptychostomum inclinatum*	Blunt-tooth Thread Moss				S3?	2	76.3 ± 3.0	NS
N	*Dicranella rufescens*	Red Forklet Moss				S3?	3	83.8 ± 4.0	NB
N	*Rhytidiadelphus loreus*	Lanky Moss				S3?	5	78.5 ± 0.0	NS
N	*Sphagnum lescurii*	a Peatmoss				S3?	9	21.9 ± 0.0	NB
N	*Sphagnum inundatum*	a Sphagnum				S3?	2	36.4 ± 0.0	NB
N	*Rostania occultata*	Crusted Tarpaper Lichen				S3?	3	94.7 ± 0.0	NS
N	*Cystocoleus ebeneus*	Rockgossamer Lichen				S3?	1	85.3 ± 0.0	NS
N	*Scytinium subtile*	Appressed Jellyskin Lichen				S3?	8	40.5 ± 0.0	NB
N	*Peltigera neckeri*	Black-saddle Pelt Lichen				S3?	1	94.4 ± 5.0	NB
N	*Anomodon rugelii*	Rugel's Anomodon Moss				S3S4	4	89.6 ± 3.0	NS
N	*Barbula convoluta*	Lesser Bird's-claw Beard Moss				S3S4	2	86.6 ± 8.0	NB
N	*Brachytheciastrum velutinum*	Velvet Ragged Moss				S3S4	6	67.1 ± 0.0	NB
N	*Calliergon giganteum*	Giant Spear Moss				S3S4	1	93.6 ± 0.0	NS
N	*Dicranella cerviculata*	a Moss				S3S4	5	29.3 ± 1.0	NB
N	*Dicranum majus*	Greater Broom Moss				S3S4	15	22.7 ± 0.0	NB
N	*Dicranum leioneuron*	a Dicranum Moss				S3S4	1	98.1 ± 0.0	NB
N	*Encalypta ciliata*	Fringed Extinguisher Moss				S3S4	1	98.7 ± 0.0	NB
N	*Fissidens bryoides*	Lesser Pocket Moss				S3S4	3	31.6 ± 5.0	NB
N	*Elodium blandowii*	Blandow's Bog Moss				S3S4	1	11.7 ± 0.0	NB
N	*Heterocladium dimorphum*	Dimorphous Tangle Moss				S3S4	1	58.4 ± 2.0	NB
N	*Isopterygiopsis muelleriana*	a Moss				S3S4	13	20.5 ± 1.0	NB
N	*Myurella julacea*	Small Mouse-tail Moss				S3S4	5	20.5 ± 1.0	NB
N	*Orthotrichum speciosum*	Showy Bristle Moss				S3S4	3	90.5 ± 0.0	NB
N	*Physcomitrium pyriforme*	Pear-shaped Urn Moss				S3S4	8	70.7 ± 0.0	NB
N	*Pogonatum dentatum*	Mountain Hair Moss				S3S4	3	29.3 ± 1.0	NB
N	*Sphagnum torreyanum*	a Peatmoss				S3S4	6	8.9 ± 0.0	NB

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N	*Sphagnum austinii*	Austin's Peat Moss				S3S4	2	7.8 ± 1.0	NB
N	*Sphagnum contortum*	Twisted Peat Moss				S3S4	2	18.9 ± 0.0	NB
N	*Sphagnum quinquefarium*	Five-ranked Peat Moss				S3S4	3	20.5 ± 1.0	NB
N	*Splachnum rubrum*	Red Collar Moss				S3S4	1	37.6 ± 1.0	NB
N	*Tetraphis geniculata*	Geniculate Four-tooth Moss				S3S4	8	0.9 ± 0.0	NB
N	*Tetraplodon angustatus*	Toothed-leaved Nitrogen Moss				S3S4	2	29.3 ± 1.0	NB
N	*Weissia controversa*	Green-Cushioned Weissia				S3S4	6	20.9 ± 1.0	NB
N	*Abietinella abietina*	Wiry Fern Moss				S3S4	2	70.5 ± 0.0	NB
N	*Trichostomum tenuirostre*	Acid-Soil Moss				S3S4	7	7.5 ± 0.0	NB
N	*Rauiella scita*	Smaller Fern Moss				S3S4	1	97.5 ± 1.0	NB
N	*Pannaria rubiginosa*	Brown-eyed Shingle Lichen				S3S4	20	40.5 ± 0.0	NB
N	*Pseudocyphellaria holarctica*	Yellow Specklebelly Lichen				S3S4	111	20.6 ± 0.0	NB
N	*Ramalina thrausta*	Angelhair Ramalina Lichen				S3S4	5	91.9 ± 1.0	NB
N	*Hypogymnia vittata*	Slender Monk's Hood Lichen				S3S4	17	91.9 ± 1.0	NB
N	*Scytinium teretiusculum*	Curly Jellyskin Lichen				S3S4	6	74.0 ± 0.0	NB
N	*Montanelia panniformis*	Shingled Camouflage Lichen				S3S4	3	95.0 ± 1.0	NB
N	*Cladonia terrae-novae*	Newfoundland Reindeer Lichen				S3S4	5	16.2 ± 0.0	NB
N	*Cladonia floerkeana*	Gritty British Soldiers Lichen				S3S4	5	39.6 ± 0.0	NB
N	*Cladonia parasitica*	Fence-rail Lichen				S3S4	1	95.8 ± 0.0	NB
N	*Xylopsora friesii*	a Lichen				S3S4	1	98.6 ± 1.0	NB
N	*Nephroma parile*	Powdery Kidney Lichen				S3S4	24	33.0 ± 0.0	NB
N	*Nephroma resupinatum*	a lichen				S3S4	1	94.4 ± 0.0	NS
N	*Protopannaria pezizoides*	Brown-gray Moss-shingle Lichen				S3S4	39	25.8 ± 0.0	NB
N	*Parmelia fertilis*	Fertile Shield Lichen				S3S4	1	32.8 ± 0.0	NB
N	*Usnea strigosa*	Bushy Beard Lichen				S3S4	8	20.5 ± 0.0	NB
N	*Fuscopannaria sorediata*	a Lichen				S3S4	10	34.0 ± 0.0	NB
N	*Stereocaulon condensatum*	Granular Soil Foam Lichen				S3S4	6	28.0 ± 0.0	NB
N	*Stereocaulon paschale*	Easter Foam Lichen				S3S4	1	95.0 ± 1.0	NS
N	*Pannaria conoplea*	Mealy-rimmed Shingle Lichen				S3S4	68	75.9 ± 0.0	NS
N	*Physcia tenella*	Fringed Rosette Lichen				S3S4	1	35.9 ± 0.0	NB
N	*Anaptychia palmulata*	Shaggy Fringed Lichen				S3S4	43	21.3 ± 0.0	NB
N	*Peltigera neopolydactyla*	Undulating Pelt Lichen				S3S4	7	34.0 ± 0.0	NB
N	*Grimmia anodon*	Toothless Grimmia Moss				SH	2	11.6 ± 10.0	NB
N	*Leucodon brachypus*	a Moss				SH	4	60.4 ± 100.0	NB
N	*Thelia hirtella*	a Moss				SH	2	65.3 ± 100.0	NB
N	*Cyrto-hypnum minutulum*	Tiny Cedar Moss				SH	3	96.8 ± 10.0	NB
P	*Juglans cinerea*	Butternut	Endangered	Endangered	Endangered	S1	154	7.5 ± 0.0	NB
P	*Polemonium vanbruntiae*	Van Brunt's Jacob's-ladder	Threatened	Threatened	Threatened	S1	74	25.3 ± 0.0	NB
P	*Fraxinus nigra*	Black Ash	Threatened			S3S4	443	7.5 ± 0.0	NB
P	*Isoetes prototypus*	Prototype Quillwort	Special Concern	Special Concern	Endangered	S1	29	23.1 ± 0.0	NB
P	*Symphyotrichum anticostense*	Anticosti Aster	Special Concern	Special Concern	Endangered	S3	6	3.9 ± 0.0	NB
P	*Pterospora andromedea*	Woodland Pinedrops			Endangered	S1	28	89.7 ± 0.0	NB
P	*Cryptotaenia canadensis*	Canada Honewort				S1	1	74.6 ± 1.0	NB
P	*Antennaria parlinii ssp. fallax*	Parlin's Pussytoes				S1	7	57.1 ± 1.0	NB
P	*Antennaria howellii ssp. petaloidea*	Pussy-Toes				S1	4	7.1 ± 1.0	NB
P	*Bidens discoidea*	Swamp Beggarticks				S1	4	69.6 ± 0.0	NB
P	*Pseudognaphalium obtusifolium*	Eastern Cudweed				S1	2	88.9 ± 0.0	NB
P	*Helianthus decapetalus*	Ten-rayed Sunflower				S1	14	90.8 ± 0.0	NB
P	*Hieracium paniculatum*	Panicled Hawkweed				S1	17	50.8 ± 0.0	NB
P	*Senecio pseudoarnica*	Seabeach Ragwort				S1	18	79.5 ± 0.0	NB

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P	*Barbarea orthoceras*	American Yellow Rocket				S1	3	67.1 ± 1.0	NB
P	*Cardamine parviflora*	Small-flowered Bittercress				S1	17	33.7 ± 0.0	NB
P	*Cardamine concatenata*	Cut-leaved Toothwort				S1	3	60.5 ± 0.0	NB
P	*Draba arabisans*	Rock Whitlow-Grass				S1	24	20.1 ± 0.0	NB
P	*Draba cana*	Lance-leaved Draba				S1	10	91.5 ± 0.0	NB
P	*Draba glabella*	Rock Whitlow-Grass				S1	12	8.1 ± 1.0	NB
P	*Mononeuria groenlandica*	Greenland Stitchwort				S1	5	13.1 ± 0.0	NB
P	*Chenopodiastrum simplex*	Maple-leaved Goosefoot				S1	9	80.5 ± 1.0	NB
P	*Blitum capitatum*	Strawberry-Blite				S1	4	12.8 ± 1.0	NB
P	*Callitriche terrestris*	Terrestrial Water-Starwort				S1	1	97.0 ± 0.0	NB
P	*Hypericum virginicum*	Virginia St. John's-wort				S1	10	15.4 ± 0.0	NB
P	*Viburnum acerifolium*	Maple-leaved Viburnum				S1	11	86.8 ± 1.0	NB
P	*Corema conradii*	Broom Crowberry				S1	1	11.0 ± 10.0	NB
P	*Vaccinium boreale*	Northern Blueberry				S1	1	27.0 ± 0.0	NB
P	*Vaccinium corymbosum*	Highbush Blueberry				S1	3	77.0 ± 5.0	NB
P	*Euphorbia polygonifolia*	Seaside Spurge				S1	8	75.3 ± 0.0	NB
P	*Hylodesmum glutinosum*	Large Tick-trefoil				S1	1	94.3 ± 1.0	NB
P	*Lespedeza capitata*	Round-headed Bush-clover				S1	11	70.8 ± 0.0	NB
P	*Gentiana rubricaulis*	Purple-stemmed Gentian				S1	17	43.0 ± 0.0	NB
P	*Lomatogonium rotatum*	Marsh Felwort				S1	3	54.8 ± 0.0	NB
P	*Proserpinaca pectinata*	Comb-leaved Mermaidweed				S1	3	29.3 ± 0.0	NB
P	*Lycopus virginicus*	Virginia Bugleweed				S1	2	87.8 ± 0.0	NB
P	*Pycnanthemum virginianum*	Virginia Mountain Mint				S1	4	40.7 ± 0.0	NB
P	*Polygonum douglasii*	Douglas Knotweed				S1	1	77.0 ± 0.0	NB
P	*Lysimachia hybrida*	Lowland Yellow Loosestrife				S1	17	88.0 ± 0.0	NB
P	*Lysimachia quadrifolia*	Whorled Yellow Loosestrife				S1	16	8.8 ± 1.0	NB
P	*Primula laurentiana*	Laurentian Primrose				S1	46	71.9 ± 2.0	NS
P	*Crataegus jonesiae*	Jones' Hawthorn				S1	5	68.6 ± 0.0	NB
P	*Potentilla canadensis*	Canada Cinquefoil				S1	1	50.9 ± 0.0	NB
P	*Rubus flagellaris*	Northern Dewberry				S1	4	5.4 ± 1.0	NB
P	*Galium brevipes*	Limestone Swamp Bedstraw				S1	2	7.5 ± 0.0	NB
P	*Saxifraga paniculata ssp. laestadii*	Laestadius' Saxifrage				S1	38	20.5 ± 1.0	NB
P	*Agalinis tenuifolia*	Slender Agalinis				S1	9	78.6 ± 0.0	NB
P	*Gratiola lutea*	Golden Hedge-hyssop				S1	3	8.5 ± 5.0	NB
P	*Pedicularis canadensis*	Canada Lousewort				S1	23	51.7 ± 0.0	NB
P	*Viola sagittata var. ovata*	Arrow-Leaved Violet				S1	37	74.6 ± 0.0	NB
P	*Carex atlantica ssp. atlantica*	Atlantic Sedge				S1	1	79.2 ± 0.0	NB
P	*Carex backii*	Rocky Mountain Sedge				S1	6	76.3 ± 0.0	NB
P	*Carex merritt-fernaldii*	Merritt Fernald's Sedge				S1	4	70.4 ± 0.0	NB
P	*Carex salina*	Saltmarsh Sedge				S1	2	9.1 ± 1.0	NB
P	*Carex scirpoidea*	Scirpuslike Sedge				S1	6	73.9 ± 0.0	NB
P	*Carex waponahkikensis*	Dawn-land Sedge				S1	2	74.2 ± 0.0	NB
P	*Carex sterilis*	Sterile Sedge				S1	1	93.4 ± 0.0	NB
P	*Carex grisea*	Inflated Narrow-leaved Sedge				S1	13	45.3 ± 0.0	NB
P	*Carex saxatilis*	Russet Sedge				S1	14	9.2 ± 10.0	NB
P	*Cyperus diandrus*	Low Flatsedge				S1	7	78.5 ± 1.0	NB
P	*Eleocharis flavescens var. olivacea*	Bright-green Spikerush				S1	4	86.7 ± 1.0	NB
P	*Rhynchospora capillacea*	Slender Beakrush				S1	3	91.4 ± 0.0	NB
P	*Scirpus pendulus*	Hanging Bulrush				S1	1	74.2 ± 0.0	NB
P	*Sisyrinchium angustifolium*	Narrow-leaved Blue-eyed-grass				S1	12	13.4 ± 1.0	NB
P	*Juncus greenei*	Greene's Rush				S1	1	39.4 ± 0.0	NB
P	*Juncus subtilis*	Creeping Rush				S1	1	47.3 ± 5.0	NB
P	*Allium canadense*	Canada Garlic				S1	11	40.9 ± 0.0	NB
P	*Goodyera pubescens*	Downy Rattlesnake-Plantain				S1	10	74.5 ± 0.0	NB

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P	*Malaxis monophyllos var. brachypoda*	North American White Adder's-mouth				S1	4	78.5 ± 10.0	NB
P	*Platanthera flava var. herbiola*	Pale Green Orchid				S1	14	52.9 ± 1.0	NB
P	*Platanthera macrophylla*	Large Round-Leaved Orchid				S1	11	43.6 ± 0.0	NB
P	*Spiranthes casei*	Case's Ladies'-Tresses				S1	6	90.0 ± 0.0	NB
P	*Bromus pubescens*	Hairy Wood Brome Grass				S1	6	67.5 ± 0.0	NB
P	*Cinna arundinacea*	Sweet Wood Reed Grass				S1	55	50.1 ± 0.0	NB
P	*Danthonia compressa*	Flattened Oat Grass				S1	7	76.8 ± 0.0	NS
P	*Dichanthelium dichotomum*	Forked Panic Grass				S1	20	31.9 ± 1.0	NB
P	*Glyceria obtusa*	Atlantic Manna Grass				S1	14	33.9 ± 0.0	NB
P	*Sporobolus compositus*	Rough Dropseed				S1	17	91.0 ± 0.0	NB
P	*Potamogeton friesii*	Fries' Pondweed				S1	6	6.7 ± 5.0	NB
P	*Potamogeton nodosus*	Long-leaved Pondweed				S1	8	61.1 ± 0.0	NB
P	*Potamogeton strictifolius*	Straight-leaved Pondweed				S1	2	27.1 ± 0.0	NB
P	*Xyris difformis*	Bog Yellow-eyed-grass				S1	11	15.3 ± 0.0	NB
P	*Asplenium ruta-muraria var. cryptolepis*	Wallrue Spleenwort				S1	4	20.1 ± 0.0	NB
P	*Cystopteris laurentiana*	Laurentian Bladder Fern				S1	1	75.9 ± 1.0	NB
P	*Huperzia selago*	Northern Firmoss				S1	1	95.0 ± 1.0	NS
P	*Sceptridium oneidense*	Blunt-lobed Moonwort				S1	4	51.9 ± 0.0	NB
P	*Sceptridium rugulosum*	Rugulose Grapefern				S1	1	74.2 ± 1.0	NB
P	*Selaginella rupestris*	Rock Spikemoss				S1	45	76.0 ± 1.0	NB
P	*Cuscuta campestris*	Field Dodder				S1?	3	72.2 ± 10.0	NB
P	*Polygonum aviculare ssp. neglectum*	Narrow-leaved Knotweed				S1?	6	82.4 ± 0.0	NB
P	*Alisma subcordatum*	Southern Water Plantain				S1?	4	37.2 ± 0.0	NB
P	*Carex laxiflora*	Loose-Flowered Sedge				S1?	2	78.1 ± 5.0	NS
P	*Wolffia columbiana*	Columbian Watermeal				S1?	7	68.5 ± 0.0	NB
P	*Euphrasia farlowii*	Farlow's Eyebright				S1S2	1	62.4 ± 1.0	NB
P	*Spiranthes ochroleuca*	Yellow Ladies'-tresses				S1S2	11	44.9 ± 0.0	NB
P	*Potamogeton bicupulatus*	Snailseed Pondweed				S1S2	5	24.3 ± 0.0	NB
P	*Spiranthes cernua*	Nodding Ladies'-Tresses				S1S3	32	39.3 ± 0.0	NB
P	*Spiranthes arcisepala*	Appalachian Ladies'-tresses				S1S3	7	20.1 ± 0.0	NB
P	*Neottia bifolia*	Southern Twayblade			Endangered	S2	16	82.6 ± 0.0	NB
P	*Sanicula trifoliata*	Large-Fruited Sanicle				S2	1	42.0 ± 5.0	NB
P	*Sanicula odorata*	Clustered Sanicle				S2	1	97.0 ± 0.0	NB
P	*Hieracium robinsonii*	Robinson's Hawkweed				S2	7	92.4 ± 0.0	NB
P	*Betula minor*	Dwarf White Birch				S2	1	99.3 ± 0.0	NB
P	*Atriplex glabriuscula var. franktonii*	Frankton's Saltbush				S2	5	53.1 ± 1.0	NB
P	*Hypericum x dissimulatum*	Disguised St. John's-wort				S2	7	45.2 ± 1.0	NB
P	*Viburnum dentatum*	Southern Arrow-Wood				S2	1	80.4 ± 1.0	NS
P	*Viburnum dentatum var. lucidum*	Northern Arrow-Wood				S2	171	50.4 ± 0.0	NB
P	*Astragalus eucosmus*	Elegant Milk-vetch				S2	10	31.5 ± 0.0	NB
P	*Quercus macrocarpa*	Bur Oak				S2	177	7.5 ± 0.0	NB
P	*Nuphar x rubrodisca*	Red-disk Yellow Pond-lily				S2	11	11.6 ± 1.0	NB
P	*Polygaloides paucifolia*	Fringed Milkwort				S2	21	51.0 ± 1.0	NB
P	*Persicaria amphibia var. emersa*	Long-root Smartweed				S2	61	34.8 ± 0.0	NB
P	*Micranthes virginiensis*	Early Saxifrage				S2	14	89.8 ± 0.0	NB
P	*Scrophularia lanceolata*	Lance-leaved Figwort				S2	5	30.5 ± 5.0	NB
P	*Carex cephaloidea*	Thin-leaved Sedge				S2	2	95.9 ± 0.0	NB
P	*Carex albicans var. emmonsii*	White-tinged Sedge				S2	6	19.7 ± 0.0	NB
P	*Cyperus lupulinus ssp. macilentus*	Hop Flatsedge				S2	69	66.1 ± 0.0	NB

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P	*Calypso bulbosa var. americana*	Calypso				S2	5	15.7 ± 0.0	NB
P	*Coeloglossum viride*	Long-bracted Frog Orchid				S2	5	43.9 ± 5.0	NB
P	*Cypripedium parviflorum var. makasin*	Small Yellow Lady's-Slipper				S2	5	4.9 ± 1.0	NB
P	*Platanthera huronensis*	Fragrant Green Orchid				S2	4	86.1 ± 1.0	NB
P	*Puccinellia nutkaensis*	Alaska Alkaligrass				S2	8	8.6 ± 1.0	NB
P	*Schizaea pusilla*	Little Curlygrass Fern				S2	30	8.2 ± 0.0	NB
P	*Coryphopteris simulata*	Bog Fern				S2	10	71.2 ± 0.0	NB
P	*Toxicodendron radicans var. radicans*	Eastern Poison Ivy				S2?	14	31.7 ± 0.0	NB
P	*Symphyotrichum novi-belgii var. crenifolium*	New York Aster				S2?	9	11.8 ± 0.0	NB
P	*Humulus lupulus var. lupuloides*	Common Hop				S2?	4	79.4 ± 0.0	NB
P	*Rubus x recurvicaulis*	arching dewberry				S2?	5	19.8 ± 5.0	NB
P	*Osmorhiza longistylis*	Smooth Sweet Cicely				S2S3	3	71.6 ± 0.0	NB
P	*Symphyotrichum racemosum*	Small White Aster				S2S3	11	42.5 ± 0.0	NB
P	*Alnus serrulata*	Smooth Alder				S2S3	36	49.0 ± 0.0	NB
P	*Cuscuta cephalanthi*	Buttonbush Dodder				S2S3	1	19.9 ± 0.0	NB
P	*Gentiana linearis*	Narrow-Leaved Gentian				S2S3	5	84.2 ± 5.0	NB
P	*Hedeoma pulegioides*	American False Pennyroyal				S2S3	62	6.6 ± 0.0	NB
P	*Aphyllon uniflorum*	One-flowered Broomrape				S2S3	23	19.2 ± 1.0	NB
P	*Polygala senega*	Seneca Snakeroot				S2S3	2	96.1 ± 1.0	NB
P	*Persicaria careyi*	Carey's Smartweed				S2S3	17	31.3 ± 5.0	NB
P	*Hepatica americana*	Round-lobed Hepatica				S2S3	39	43.2 ± 1.0	NB
P	*Ranunculus sceleratus*	Cursed Buttercup				S2S3	8	7.3 ± 0.0	NB
P	*Cephalanthus occidentalis*	Common Buttonbush				S2S3	49	61.8 ± 0.0	NB
P	*Galium obtusum*	Blunt-leaved Bedstraw				S2S3	5	7.5 ± 0.0	NB
P	*Euphrasia randii*	Rand's Eyebright				S2S3	42	14.3 ± 0.0	NB
P	*Dirca palustris*	Eastern Leatherwood				S2S3	16	71.6 ± 1.0	NB
P	*Phryma leptostachya*	American Lopseed				S2S3	4	94.5 ± 1.0	NB
P	*Verbena urticifolia*	White Vervain				S2S3	17	89.8 ± 2.0	NB
P	*Viola novae-angliae*	New England Violet				S2S3	16	33.8 ± 0.0	NB
P	*Carex comosa*	Bearded Sedge				S2S3	5	76.8 ± 0.0	NS
P	*Carex rostrata*	Narrow-leaved Beaked Sedge				S2S3	3	42.1 ± 0.0	NB
P	*Carex vacillans*	Estuarine Sedge				S2S3	4	61.6 ± 1.0	NB
P	*Scirpus atrovirens*	Dark-green Bulrush				S2S3	2	95.4 ± 0.0	NB
P	*Juncus ranarius*	Seaside Rush				S2S3	1	7.5 ± 0.0	NB
P	*Allium tricoccum*	Wild Leek				S2S3	60	32.5 ± 0.0	NB
P	*Corallorhiza maculata var. occidentalis*	Spotted Coralroot				S2S3	5	70.4 ± 0.0	NB
P	*Corallorhiza maculata var. maculata*	Spotted Coralroot				S2S3	6	54.6 ± 1.0	NB
P	*Elymus canadensis*	Canada Wild Rye				S2S3	18	7.5 ± 0.0	NB
P	*Piptatheropsis canadensis*	Canada Ricegrass				S2S3	6	48.5 ± 0.0	NB
P	*Puccinellia phryganodes ssp. neoarctica*	Creeping Alkali Grass				S2S3	18	25.5 ± 0.0	NB
P	*Poa glauca*	Glaucous Blue Grass				S2S3	18	10.8 ± 2.0	NB
P	*Potamogeton vaseyi*	Vasey's Pondweed				S2S3	6	6.7 ± 1.0	NB
P	*Isoetes tuckermanii ssp. acadiensis*	Acadian Quillwort				S2S3	9	37.2 ± 0.0	NB
P	*Botrychium tenebrosum*	Swamp Moonwort				S2S3	1	86.2 ± 0.0	NB
P	*Panax trifolius*	Dwarf Ginseng				S3	27	16.3 ± 0.0	NB
P	*Artemisia campestris ssp. caudata*	Tall Wormwood				S3	148	7.5 ± 0.0	NB

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P	*Artemisia campestris*	Field Wormwood				S3	5	71.4 ± 0.0	NB
P	*Nabalus racemosus*	Glaucous Rattlesnakeroot				S3	85	6.6 ± 0.0	NB
P	*Solidago racemosa*	Racemose Goldenrod				S3	14	90.6 ± 0.0	NB
P	*Tanacetum bipinnatum ssp. huronense*	Lake Huron Tansy				S3	25	17.3 ± 1.0	NB
P	*Pseudognaphalium macounii*	Macoun's Cudweed				S3	7	10.8 ± 0.0	NB
P	*Impatiens pallida*	Pale Jewelweed				S3	6	74.3 ± 0.0	NB
P	*Turritis glabra*	Tower Mustard				S3	2	7.5 ± 0.0	NB
P	*Arabis pycnocarpa*	Cream-flowered Rockcress				S3	18	9.9 ± 0.0	NB
P	*Cardamine maxima*	Large Toothwort				S3	46	7.5 ± 0.0	NB
P	*Boechera stricta*	Drummond's Rockcress				S3	21	9.9 ± 1.0	NB
P	*Sagina nodosa*	Knotted Pearlwort				S3	28	7.5 ± 0.0	NB
P	*Sagina nodosa ssp. borealis*	Knotted Pearlwort				S3	2	14.2 ± 0.0	NB
P	*Stellaria humifusa*	Saltmarsh Starwort				S3	8	8.1 ± 0.0	NB
P	*Stellaria longifolia*	Long-leaved Starwort				S3	9	7.5 ± 0.0	NB
P	*Oxybasis rubra*	Red Goosefoot				S3	4	6.8 ± 0.0	NB
P	*Hudsonia tomentosa*	Woolly Beach-heath				S3	4	7.5 ± 0.0	NB
P	*Cornus obliqua*	Silky Dogwood				S3	243	32.0 ± 0.0	NB
P	*Lonicera oblongifolia*	Swamp Fly Honeysuckle				S3	22	8.7 ± 6.0	NB
P	*Triosteum aurantiacum*	Orange-fruited Tinker's Weed				S3	6	91.5 ± 0.0	NB
P	*Viburnum lentago*	Nannyberry				S3	90	77.1 ± 0.0	NB
P	*Rhodiola rosea*	Roseroot				S3	97	7.5 ± 0.0	NB
P	*Astragalus alpinus*	Alpine Milk-vetch				S3	2	7.5 ± 0.0	NB
P	*Astragalus alpinus var. brunetianus*	Alpine Milk-Vetch				S3	3	90.6 ± 0.0	NB
P	*Oxytropis campestris var. johannensis*	Field Locoweed				S3	10	19.7 ± 50.0	NB
P	*Bartonia paniculata*	Branched Bartonia				S3	1	29.3 ± 0.0	NB
P	*Bartonia paniculata ssp. iodandra*	Branched Bartonia				S3	42	7.7 ± 0.0	NB
P	*Gentianella amarella ssp. acuta*	Northern Gentian				S3	6	9.5 ± 5.0	NB
P	*Geranium bicknellii*	Bicknell's Crane's-bill				S3	17	3.5 ± 5.0	NB
P	*Myriophyllum farwellii*	Farwell's Water Milfoil				S3	29	15.8 ± 0.0	NB
P	*Myriophyllum humile*	Low Water Milfoil				S3	10	7.9 ± 0.0	NB
P	*Myriophyllum quitense*	Andean Water Milfoil				S3	71	7.4 ± 0.0	NB
P	*Proserpinaca palustris*	Marsh Mermaidweed				S3	51	38.9 ± 0.0	NB
P	*Utricularia resupinata*	Inverted Bladderwort				S3	19	3.6 ± 0.0	NB
P	*Fraxinus pennsylvanica*	Red Ash				S3	155	3.9 ± 0.0	NB
P	*Rumex pallidus*	Seabeach Dock				S3	17	15.5 ± 0.0	NB
P	*Rumex occidentalis*	Western Dock				S3	1	77.5 ± 1.0	NB
P	*Podostemum ceratophyllum*	Horn-leaved Riverweed				S3	24	42.8 ± 0.0	NB
P	*Primula mistassinica*	Mistassini Primrose				S3	13	2.9 ± 1.0	NB
P	*Pyrola minor*	Lesser Pyrola				S3	5	26.0 ± 0.0	NB
P	*Anemone multifida*	Cut-leaved Anemone				S3	1	91.8 ± 0.0	NB
P	*Clematis occidentalis*	Purple Clematis				S3	32	7.5 ± 0.0	NB
P	*Ranunculus flabellaris*	Yellow Water Buttercup				S3	21	25.8 ± 0.0	NB
P	*Amelanchier canadensis*	Canada Serviceberry				S3	20	7.5 ± 0.0	NB
P	*Crataegus scabrida*	Rough Hawthorn				S3	7	20.1 ± 0.0	NB
P	*Rubus occidentalis*	Black Raspberry				S3	27	42.1 ± 0.0	NB
P	*Salix candida*	Sage Willow				S3	2	92.0 ± 1.0	NB
P	*Salix myricoides*	Bayberry Willow				S3	8	70.6 ± 0.0	NB
P	*Salix nigra*	Black Willow				S3	183	6.7 ± 1.0	NB
P	*Salix interior*	Sandbar Willow				S3	34	7.5 ± 0.0	NB
P	*Comandra umbellata*	Bastard's Toadflax				S3	2	7.5 ± 0.0	NB
P	*Agalinis purpurea var. parviflora*	Small-flowered Purple False Foxglove				S3	11	30.5 ± 1.0	NB

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P	*Valeriana uliginosa*	Swamp Valerian				S3	1	84.3 ± 1.0	NB
P	*Viola adunca*	Hooked Violet				S3	9	7.5 ± 0.0	NB
P	*Symplocarpus foetidus*	Eastern Skunk Cabbage				S3	106	13.5 ± 1.0	NB
P	*Carex adusta*	Lesser Brown Sedge				S3	7	7.2 ± 1.0	NB
P	*Carex arcta*	Northern Clustered Sedge				S3	57	7.5 ± 0.0	NB
P	*Carex conoidea*	Field Sedge				S3	36	6.9 ± 1.0	NB
P	*Carex garberi*	Garber's Sedge				S3	4	31.0 ± 0.0	NB
P	*Carex granularis*	Limestone Meadow Sedge				S3	8	74.5 ± 5.0	NB
P	*Carex gynocrates*	Northern Bog Sedge				S3	5	77.0 ± 1.0	NB
P	*Carex hirtifolia*	Pubescent Sedge				S3	3	48.6 ± 0.0	NB
P	*Carex livida*	Livid Sedge				S3	2	10.8 ± 2.0	NB
P	*Carex ormostachya*	Necklace Spike Sedge				S3	8	60.5 ± 1.0	NB
P	*Carex plantaginea*	Plantain-Leaved Sedge				S3	5	88.0 ± 0.0	NB
P	*Carex prairea*	Prairie Sedge				S3	1	81.8 ± 5.0	NS
P	*Carex rosea*	Rosy Sedge				S3	36	7.5 ± 0.0	NB
P	*Carex sprengelii*	Longbeak Sedge				S3	4	70.2 ± 0.0	NB
P	*Carex tenuiflora*	Sparse-Flowered Sedge				S3	17	68.7 ± 0.0	NB
P	*Carex vaginata*	Sheathed Sedge				S3	15	78.5 ± 0.0	NB
P	*Cyperus esculentus*	Perennial Yellow Nutsedge				S3	2	71.0 ± 0.0	NB
P	*Cyperus esculentus var. leptostachyus*	Perennial Yellow Nutsedge				S3	82	7.5 ± 0.0	NB
P	*Cyperus squarrosus*	Awned Flatsedge				S3	46	38.9 ± 0.0	NB
P	*Eriophorum gracile*	Slender Cottongrass				S3	9	13.3 ± 0.0	NB
P	*Blysmopsis rufa*	Red Bulrush				S3	4	7.5 ± 0.0	NB
P	*Elodea nuttallii*	Nuttall's Waterweed				S3	11	33.1 ± 0.0	NB
P	*Juncus vaseyi*	Vasey Rush				S3	1	51.6 ± 0.0	NB
P	*Najas gracillima*	Thread-Like Naiad				S3	11	34.0 ± 0.0	NB
P	*Cypripedium reginae*	Showy Lady's-Slipper				S3	24	3.9 ± 0.0	NB
P	*Neottia auriculata*	Auricled Twayblade				S3	10	5.4 ± 1.0	NB
P	*Platanthera grandiflora*	Large Purple Fringed Orchid				S3	76	6.1 ± 1.0	NB
P	*Platanthera orbiculata*	Small Round-leaved Orchid				S3	18	7.5 ± 0.0	NB
P	*Spiranthes lucida*	Shining Ladies'-Tresses				S3	13	31.3 ± 0.0	NB
P	*Agrostis mertensii*	Northern Bent Grass				S3	1	62.4 ± 1.0	NB
P	*Bromus latiglumis*	Broad-Glumed Brome				S3	3	45.9 ± 0.0	NB
P	*Dichanthelium linearifolium*	Narrow-leaved Panic Grass				S3	13	42.9 ± 0.0	NB
P	*Leersia virginica*	White Cut Grass				S3	42	45.8 ± 0.0	NB
P	*Muhlenbergia richardsonis*	Mat Muhly				S3	9	90.8 ± 0.0	NB
P	*Schizachyrium scoparium*	Little Bluestem				S3	54	32.7 ± 0.0	NB
P	*Zizania aquatica*	Southern Wild Rice				S3	2	7.5 ± 0.0	NB
P	*Zizania aquatica var. aquatica*	Eastern Wild Rice				S3	5	50.0 ± 0.0	NB
P	*Adiantum pedatum*	Northern Maidenhair Fern				S3	18	6.6 ± 1.0	NB
P	*Asplenium trichomanes*	Maidenhair Spleenwort				S3	22	6.8 ± 0.0	NB
P	*Anchistea virginica*	Virginia chain fern				S3	24	73.1 ± 1.0	NB
P	*Dryopteris goldieana*	Goldie's Woodfern				S3	7	94.2 ± 5.0	NB
P	*Woodsia alpina*	Alpine Cliff Fern				S3	11	20.5 ± 1.0	NB
P	*Woodsia glabella*	Smooth Cliff Fern				S3	62	40.1 ± 1.0	NB
P	*Isoetes tuckermanii ssp. tuckermanii*	Tuckerman's Quillwort				S3	29	6.8 ± 0.0	NB
P	*Diphasiastrum x sabinifolium*	Savin-leaved Ground-cedar				S3	11	6.0 ± 1.0	NB
P	*Huperzia appressa*	Mountain Firmoss				S3	38	11.6 ± 1.0	NB
P	*Sceptridium dissectum*	Dissected Moonwort				S3	28	7.5 ± 0.0	NB
P	*Botrychium lanceolatum ssp. angustisegmentum*	Narrow Triangle Moonwort				S3	10	6.9 ± 0.0	NB
P	*Botrychium simplex*	Least Moonwort				S3	11	70.3 ± 0.0	NB
P	*Ophioglossum pusillum*	Northern Adder's-tongue				S3	9	7.4 ± 1.0	NB
P	*Selaginella selaginoides*	Low Spikemoss				S3	12	8.4 ± 6.0	NB
P	*Crataegus submollis*	Quebec Hawthorn				S3?	19	9.5 ± 1.0	NB

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P	*Crataegus succulenta*	Fleshy Hawthorn				S3?	1	84.7 ± 5.0	NB
P	*Platanthera hookeri*	Hooker's Orchid				S3?	31	7.5 ± 0.0	NB
P	*Bidens hyperborea*	Estuary Beggarticks				S3S4	1	7.5 ± 0.0	NB
P	*Solidago altissima*	Tall Goldenrod				S3S4	6	30.9 ± 1.0	NB
P	*Symphyotrichum boreale*	Boreal Aster				S3S4	20	18.9 ± 0.0	NB
P	*Betula pumila*	Bog Birch				S3S4	25	7.5 ± 0.0	NB
P	*Mertensia maritima*	Sea Lungwort				S3S4	55	7.3 ± 0.0	NB
P	*Subularia aquatica ssp. americana*	American Water Awlwort				S3S4	14	24.8 ± 0.0	NB
P	*Lobelia cardinalis*	Cardinal Flower				S3S4	381	7.5 ± 0.0	NB
P	*Callitriche hermaphroditica*	Northern Water-starwort				S3S4	6	35.9 ± 1.0	NB
P	*Viburnum edule*	Squashberry				S3S4	16	7.5 ± 0.0	NB
P	*Crassula aquatica*	Water Pygmyweed				S3S4	12	47.2 ± 0.0	NB
P	*Penthorum sedoides*	Ditch Stonecrop				S3S4	85	36.0 ± 0.0	NB
P	*Elatine americana*	American Waterwort				S3S4	8	9.2 ± 1.0	NB
P	*Hedysarum americanum*	Alpine Hedysarum				S3S4	3	7.5 ± 0.0	NB
P	*Fagus grandifolia*	American Beech				S3S4	298	6.8 ± 0.0	NB
P	*Geranium robertianum*	Herb Robert				S3S4	44	7.5 ± 0.0	NB
P	*Stachys hispida*	Smooth Hedge-Nettle				S3S4	12	32.9 ± 0.0	NB
P	*Stachys pilosa*	Hairy Hedge-Nettle				S3S4	7	7.5 ± 0.0	NB
P	*Teucrium canadense*	Canada Germander				S3S4	6	77.2 ± 1.0	NB
P	*Utricularia radiata*	Little Floating Bladderwort				S3S4	84	1.4 ± 0.0	NB
P	*Utricularia gibba*	Humped Bladderwort				S3S4	32	1.6 ± 0.0	NB
P	*Fraxinus americana*	White Ash				S3S4	190	3.9 ± 0.0	NB
P	*Epilobium strictum*	Downy Willowherb				S3S4	25	11.6 ± 5.0	NB
P	*Fallopia scandens*	Climbing False Buckwheat				S3S4	40	7.5 ± 0.0	NB
P	*Rumex persicarioides*	Peach-leaved Dock				S3S4	1	82.2 ± 0.0	NB
P	*Littorella americana*	American Shoreweed				S3S4	32	22.2 ± 0.0	NB
P	*Thalictrum confine*	Northern Meadow-rue				S3S4	87	7.5 ± 0.0	NB
P	*Drymocallis arguta*	Tall Wood Beauty				S3S4	36	7.5 ± 0.0	NB
P	*Rosa palustris*	Swamp Rose				S3S4	140	6.0 ± 1.0	NB
P	*Rubus pensilvanicus*	Pennsylvania Blackberry				S3S4	24	17.2 ± 0.0	NB
P	*Sanguisorba canadensis*	Canada Burnet				S3S4	1	100.0 ± 0.0	NB
P	*Galium boreale*	Northern Bedstraw				S3S4	9	7.5 ± 0.0	NB
P	*Galium labradoricum*	Labrador Bedstraw				S3S4	19	50.6 ± 1.0	NB
P	*Salix pedicellaris*	Bog Willow				S3S4	76	7.5 ± 0.0	NB
P	*Geocaulon lividum*	Northern Comandra				S3S4	13	7.5 ± 0.0	NB
P	*Parnassia glauca*	Fen Grass-of-Parnassus				S3S4	2	7.5 ± 0.0	NB
P	*Agalinis neoscotica*	Nova Scotia Agalinis				S3S4	58	8.1 ± 0.0	NB
P	*Limosella australis*	Southern Mudwort				S3S4	11	77.8 ± 0.0	NB
P	*Ulmus americana*	White Elm				S3S4	169	7.5 ± 0.0	NB
P	*Boehmeria cylindrica*	Small-spike False-nettle				S3S4	151	43.4 ± 7.0	NB
P	*Juniperus horizontalis*	Creeping Juniper				S3S4	41	7.5 ± 0.0	NB
P	*Carex capillaris*	Hairlike Sedge				S3S4	17	7.5 ± 0.0	NB
P	*Carex eburnea*	Bristle-leaved Sedge				S3S4	17	36.4 ± 0.0	NB
P	*Carex exilis*	Coastal Sedge				S3S4	112	1.7 ± 0.0	NB
P	*Carex haydenii*	Hayden's Sedge				S3S4	102	8.8 ± 1.0	NB
P	*Carex lupulina*	Hop Sedge				S3S4	129	28.3 ± 0.0	NB
P	*Carex tenera*	Tender Sedge				S3S4	69	7.5 ± 0.0	NB
P	*Carex wiegandii*	Wiegand's Sedge				S3S4	68	1.0 ± 0.0	NB
P	*Carex recta*	Estuary Sedge				S3S4	10	11.2 ± 0.0	NB
P	*Carex atratiformis*	Scabrous Black Sedge				S3S4	2	7.5 ± 0.0	NB
P	*Cladium mariscoides*	Smooth Twigrush				S3S4	117	1.5 ± 0.0	NB
P	*Cyperus dentatus*	Toothed Flatsedge				S3S4	241	7.5 ± 0.0	NB
P	*Eleocharis quinqueflora*	Few-flowered Spikerush				S3S4	10	18.7 ± 0.0	NB
P	*Rhynchospora capitellata*	Small-headed Beakrush				S3S4	21	44.1 ± 0.0	NB
P	*Trichophorum clintonii*	Clinton's Clubrush				S3S4	51	15.0 ± 0.0	NB
P	*Bolboschoenus fluviatilis*	River Bulrush				S3S4	59	11.0 ± 0.0	NB

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)	Prov
P	*Triglochin gaspensis*	Gasp├⌐ Arrowgrass				S3S4	23	7.3 ± 0.0	NB
P	*Lilium canadense*	Canada Lily				S3S4	98	7.5 ± 0.0	NB
P	*Triantha glutinosa*	Sticky False-Asphodel				S3S4	10	7.5 ± 0.0	NB
P	*Corallorhiza maculata*	Spotted Coralroot				S3S4	20	7.5 ± 0.0	NB
P	*Liparis loeselii*	Loesel's Twayblade				S3S4	19	6.6 ± 0.0	NB
P	*Neottia cordata*	Heart-leaved Twayblade				S3S4	22	5.8 ± 1.0	NB
P	*Platanthera obtusata*	Blunt-leaved Orchid				S3S4	41	7.5 ± 0.0	NB
P	*Platanthera obtusata ssp. obtusata*	Blunt-leaved Orchid				S3S4	1	87.4 ± 0.0	NB
P	*Calamagrostis pickeringii*	Pickering's Reed Grass				S3S4	120	1.6 ± 0.0	NB
P	*Calamagrostis stricta*	Slim-stemmed Reed Grass				S3S4	4	7.1 ± 2.0	NB
P	*Eragrostis pectinacea*	Tufted Love Grass				S3S4	17	7.5 ± 0.0	NB
P	*Stuckenia filiformis*	Thread-leaved Pondweed				S3S4	7	10.8 ± 0.0	NB
P	*Potamogeton praelongus*	White-stemmed Pondweed				S3S4	12	10.8 ± 1.0	NB
P	*Potamogeton richardsonii*	Richardson's Pondweed				S3S4	41	10.8 ± 1.0	NB
P	*Xyris montana*	Northern Yellow-Eyed-Grass				S3S4	31	1.7 ± 0.0	NB
P	*Cryptogramma stelleri*	Steller's Rockbrake				S3S4	4	7.5 ± 0.0	NB
P	*Asplenium viride*	Green Spleenwort				S3S4	22	2.6 ± 0.0	NB
P	*Dryopteris fragrans*	Fragrant Wood Fern				S3S4	44	6.8 ± 0.0	NB
P	*Equisetum palustre*	Marsh Horsetail				S3S4	11	15.2 ± 0.0	NB
P	*Polypodium appalachianum*	Appalachian Polypody				S3S4	20	7.5 ± 0.0	NB
P	*Montia fontana*	Water Blinks				SH	1	52.1 ± 1.0	NB
P	*Solidago caesia*	Blue-stemmed Goldenrod				SX	2	12.8 ± 1.0	NB
P	*Celastrus scandens*	Climbing Bittersweet				SX	2	88.0 ± 100.0	NB
P	*Carex swanii*	Swan's Sedge				SX	77	76.2 ± 0.0	NS

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The recipient of these data shall acknowledge the AC CDC and the data sources listed below in any documents, reports, publications or presentations, in which this dataset makes a significant contribution.

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2	Cameron, R.P. 2009. Cyanolichen database. Nova Scotia Environment & Labour, 1724 recs.
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1	Allen, Cory. 2021. Email to John Klymko regarding Glyptemys insculpta observation. Personal communication.
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1	Forbes, G.J. 2020. Email regarding a Snapping Turtle (Chelydra serpentina) occurrence in New Brunswick, from Graham Forbes to John Klymko. pers. comm, 1 record.
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1	Hill, N.M., Myra, M. 2017. Email to Sean Blaney regarding rich intervale flora on Nictaux River. Fern Hill Institute, 3 records.
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1	Oldham, M.J. 2000. Oldham database records from Maritime provinces. Oldham, M.J; ONHIC, 487 recs.
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1	Robicheau, C. 2019. Atlantic Canada Conservation Data Centre Fieldwork 2019. Atlantic Canada Conservation Data Centre.
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1	Sabine, D.L. 2004. Specimen data: Whittaker Lake & Marysville NB. Pers. comm. to C.S. Blaney, 2pp, 4 recs.
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1	Tummer, Kevin. 2016. Email communication (April 30, 2016) to John Klymko regarding Snapping Turtle observation in Nova Scotia. Pers. Comm.
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1	Vinson, Neil. 2020. Email - additional Peltigera hydrothyria records, Fundy National Park. Chapman-Lam, Colin J. (ed.) Fundy National Park, 2.
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1	Wallace, S. 2022. Email to Sean Blaney regarding NB DNRED Ranger Wood Turtle sightings from 2021. NB DNRED, 5 records.
1	Wallace, Shaylyn. 2022. Canada Lynx observation in New Brunswick. , 1 record.
1	Watts, T. 2021. Emails to Sean Blaney regarding Black Tern colony at King Brook Lake, Charlotte Co. and Third Lake, York Co., NB. Peskotomuhkati Nation at Skutik, 2 records.
1	Webster, R.P. Email to John Klymko detailing records of butterflies collected by Reggie Webster in June 2017. Webster, R.P. 2017.
1	Webster, R.P. Reggie Webster's records of Encyclops caerulea . pers. collection. 2018.
1	White, S. 2018. Notable species sightings, 2016-2017. East Coast Aquatics.
1	Wissink, R. 2000. Four-toed Salamander Survey results, 2000. Fundy National Park, Internal Documents, 1 rec.
1	Wong, Sarah. 2020. Two Chimney Swift observation made by Sarah Wong. pers. comm. to Sean Blaney.

GeoNB Wetland Layer

5/3/2023, 11:14:39 AM

Property

2

30 meters

Water Bodies

Water Courses

1:9,028

0 0.1 0.2 0.4 mi

0 0.17 0.35 0.7 km

Department of Environment & Local Government/
Ministère de l'Environnement et Gouvernements locaux

Web AppBuilder for ArcGIS

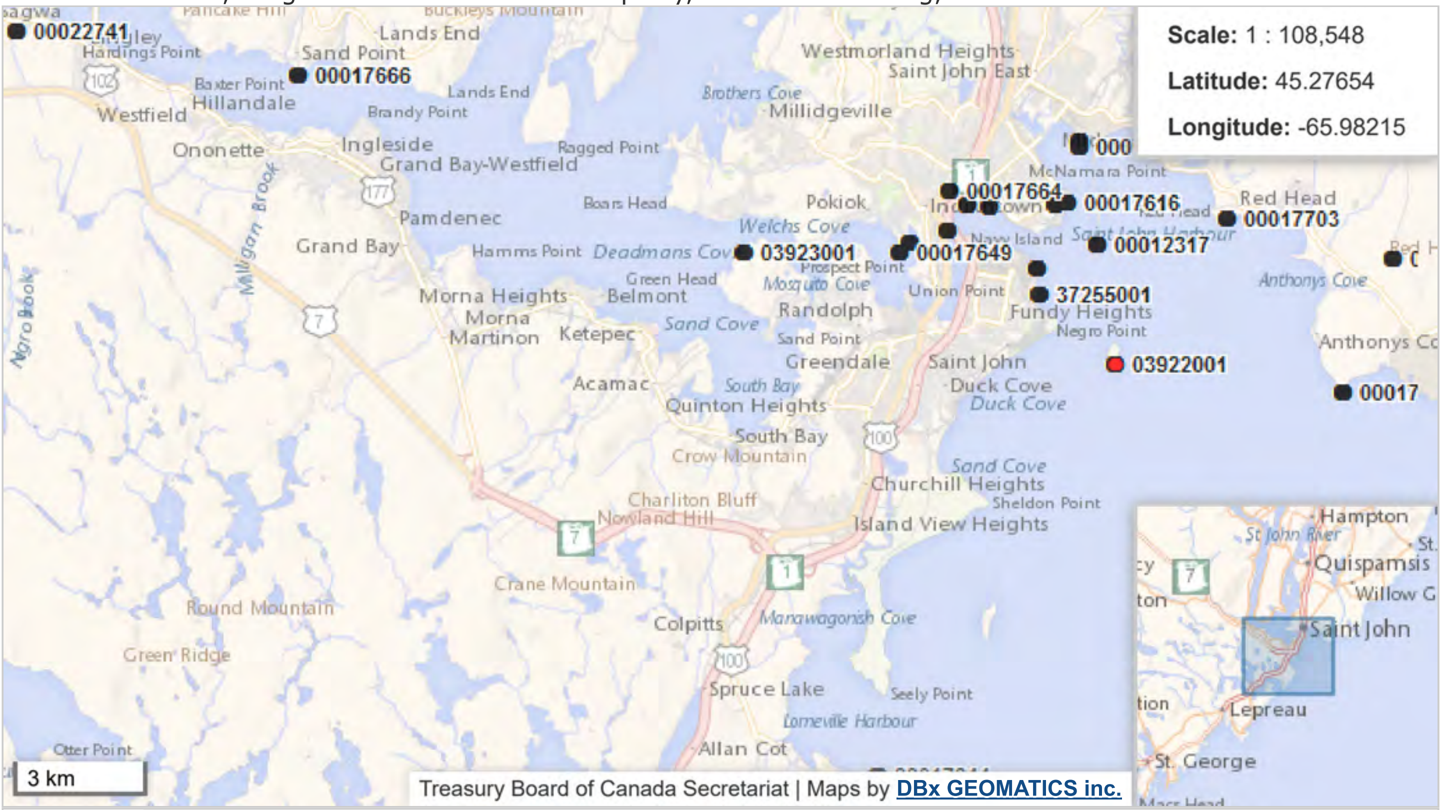
Service New Brunswick/Service Nouveau Brunswick | Department of Public Safety / Ministère de la Sécurité publique | Government of New Brunswick / Gouvernement du Nouveau-Brunswick | Department of Environment and Local Government/Ministère de l'Environnement et des Gouvernements locaux, Department

Treasury Board of Canada Secretariat

Home > OCG > Real Property Management > FCSI > DFRP/FCSI - Map Navigator

DFRP/FCSI - Map Navigator

Area: Saint John, Kings **Content:** 0 Federal Property, 0 Federal Building, 38 Federal Contaminated Sites



Layers

Federal Properties

Federal Buildings

Federal Contaminated Sites

Economic Region

Census Divisions

Census Subdivisions

Metropolitan Areas

Federal Electoral Districts

Treaty Areas

1 This layer is visible only when the map scale is smaller than 1:3,000,000.

2 Suspected Active Closed

3 Google base maps are only available when the map scale is smaller than 1:60,000.

IMPORTANT NOTE: The tables below are currently not synchronized with the map content.
Please click on the following button if you want to update the tables content: UPDATE TABLES

Federal Properties (0) / Parcels (0) | **Federal Buildings (0)** | **Federal Contaminated Sites (0)**

No record found.

SCHEDULE A-26
ANNEXE A-26

Protected Areas - East And West Musquash Watershed - The City of Saint John

Secteurs Protégés - Bassin Hydrographique Du Musquash Est et Ouest - The City of Saint John

The City of Saint John, N.B.

The City of Saint John (N.-B.)

Legend / Légende

Protected Area A
Secteur protégé A

Boundary of a Protected Area B
(Protected Area B does not include any Protected Area A)
Limites d'un secteur protégé B
(Le secteur protégé B n'englobe aucun secteur protégé A)

Boundary of a Protected Area C
(Protected Area C does not include any Protected Area A or Protected Area B)
Limites d'un secteur protégé C
(Le secteur protégé C n'englobe aucun secteur protégé A ou secteur protégé B)

Water Intake
Prise d'eau

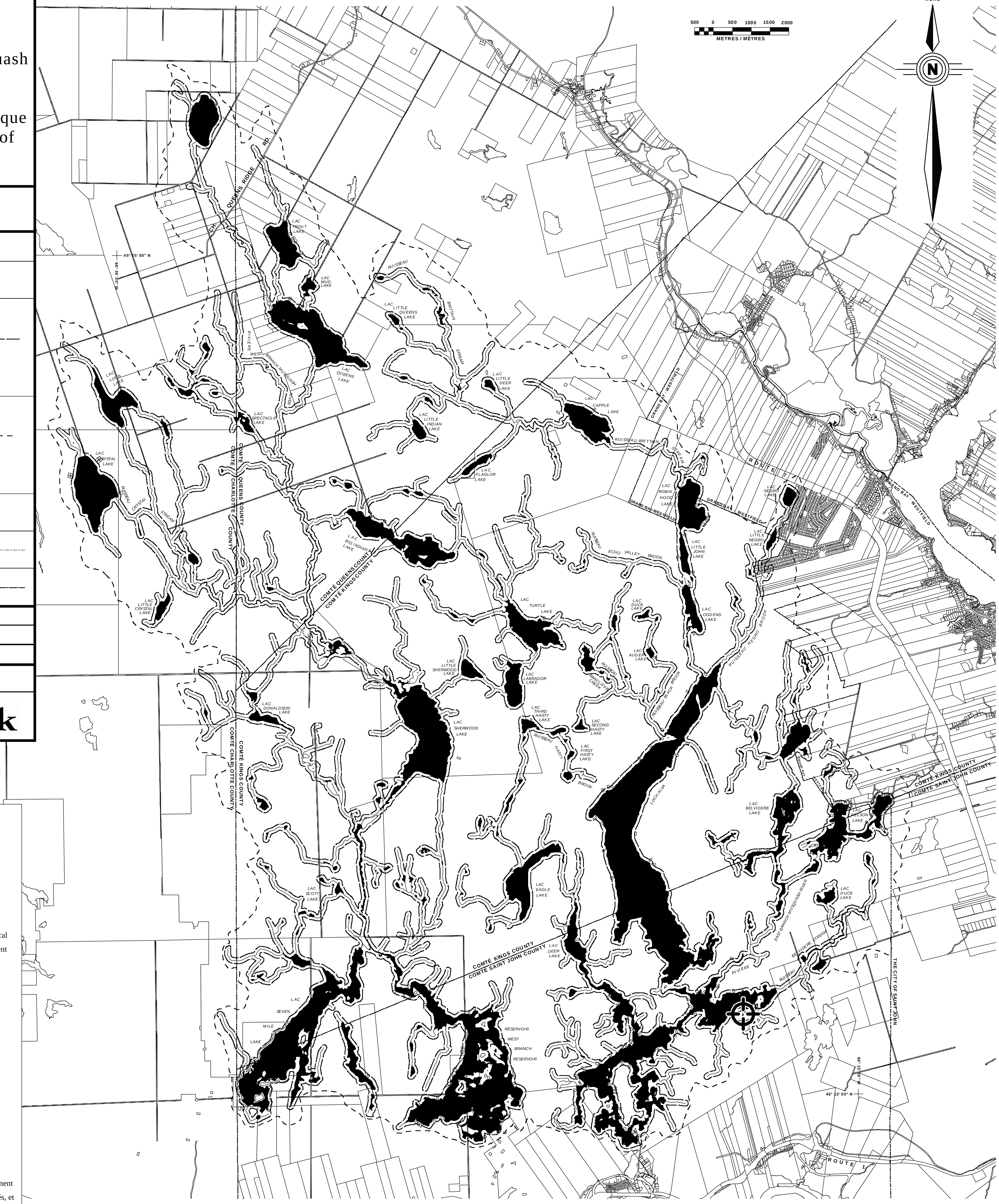
Municipal Boundary
Limites d'une municipalité

County Boundary
Limites d'un comté

Plan:	A-26
Scale: / Échelle :	1 / 40 000
Date:	2001 / 07 / 12

Department of the Environment and Local Government
Ministère de l'Environnement et des Gouvernements locaux

New Nouveau Brunswick



NOTES:

1 The property lines shown on this plan were transferred from Service New Brunswick property maps. The property lines are shown on this plan to aid in the identification of individual properties within the watershed protected areas. Please refer to the actual Service New Brunswick property maps for complete property and ownership information.

2 A copy of the *Watershed Protected Area Designation Order* that designates the watersheds or portions of watersheds shown on this plan as protected areas

(a) is filed in the head office of the Department of the Environment and Local Government, and in the regional office of the Department of the Environment and Local Government situated most closely to the protected areas, and

(b) is registered in the registry office or registry offices of Service New Brunswick for the county or counties in which the protected areas are situated.

NOTES :

1 Les limites de propriétés figurant sur le présent plan ont été décalquées des cartes foncières de Services Nouveau-Brunswick. Elles y figurent pour faciliter l'identification des propriétés particulières se trouvant à l'intérieur des secteurs protégés du bassin hydrographique. Veuillez vous reporter aux véritables cartes foncières de Services Nouveau-Brunswick pour obtenir des renseignements complets à l'égard des propriétés et des propriétaires.

2 Un exemplaire du *Décret de désignation du secteur protégé des bassins hydrographiques* qui désigne les bassins hydrographiques ou des parties des bassins hydrographiques figurant sur ce plan comme secteurs protégés

a) est déposé au bureau principal du ministère de l'Environnement et des Gouvernements locaux, et au bureau régional du ministère de l'Environnement et des Gouvernements locaux qui est le plus rapproché des secteurs protégés, et

b) est enregistré au bureau de l'enregistrement ou aux bureaux de l'enregistrement de Services Nouveau-Brunswick du comté ou des comtés où sont situés les secteurs protégés.

PLAN: A-26

May 15, 2018 MON-00235280-A1 / 70.1

Fundy Regional Service Commission
P.O. Box 3032
Grand Bay-Westfield NB
E5K 4V3

Attention: Marc MacLeod – Executive Director

Re: Final Report Submission - Fundy Regional Service Commission, *Development of Numerical Model (Part 2 Study re: Crane Mountain Landfill)*

Dear Mr. MacLeod:

EXP Services Inc (EXP) in association with Matrix Solutions Inc. (Matrix) are pleased to provide the **Part 2** Numerical Model Final Report (rev 1) for the above referenced study. This revision updates the original final report issued March 6, 2018 by including EXP/ Matrix's response to the peer review comments provided in WSP's letter dated April 18, 2018. Our response to the review comments is summarized as follows.

1) The Executive Summary has been revised to reflect the WSP comment(s) essentially suggesting a more succinct or direct answer to the specific questions in the TOR is warranted. It is our opinion that the **Part 2** work and report addressed the questions and objectives outlined in the original TOR. However, to address WSP's review comment(s) regarding this matter, the revised Executive Summary reiterates the individual questions and summarizes the key findings in the report that answer each of these questions.

2) Regarding the remaining comments provided in WSP's peer review, it is EXP/ Matrix's opinion that they relate to work beyond that supported and funded within the context and scope of the **Part 2** Numerical Model study. The **Part 2** Numerical Model and report as currently developed within EXP/ Matrix's scope of work speaks directly to the key questions posed by the FRSC Steering Committee, and will serve as a tool for further refinement as additional information is gathered, or further funding is allotted to refine the model and/or focus on specific items of interest. In this context, it is suggested that the FRSC Steering Committee may wish to revisit the remaining peer review comments in prioritizing and developing possible future scope(s) of work.

We appreciate the opportunity to have assisted in addressing the FRSC Steering Committee's objectives and requirements for this study.

Sincerely,

John Sims, M.Sc., P.Geo., P.Eng.
Project Manager - EXP

EXP Services Inc.

Attach: Final Report (rev 1)

40 Henri Dunant Street, Moncton, NB E1E 1E5, Canada
T: +1.506.857.8889 F: +1.506.857.8315 EXP.com

Crane Mountain Landfill Groundwater Flow Model: Part 2 – Numerical Model

Fundy Regional Service Commission

Type of Document:
Final (rev. 1)

Project Name:
FRSC - Part 2 Numerical Groundwater Flow

Project Number:
MON-00235280-A1

Prepared By:
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Fred Baechler, M.Sc., P.Geo

Reviewed By:
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Date Submitted:
2018-05-15

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Legal Notification

This report was prepared by EXP Services Inc. in association with Matrix Solutions Inc. for the account of **Fundy Regional Service Commission**.

Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. EXP Services Inc. and/or Matrix Solutions Inc. accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

EXP Quality System Checks	
Project No.: MON-00235280-A1	Date: May 15, 2018
Type of Document: Final	Revision No.: 1
Prepared By: Don Haley, M.Sc. Fred Baechler, P.Geo.	Donald Haley Baechler
Reviewed By: John Sims, M.Sc., P.Geo., P.Eng.	John Sims

Matrix Solutions Inc.
ENVIRONMENT & ENGINEERING

exp.

List of Tables – Included in Appendix 1

List of Figures – Included in Appendix 2

Executive Summary

A Numerical Groundwater Flow Model was developed for the Fundy Regional Service Commission (FRSC) Crane Mountain Landfill, an engineered municipal solid waste containment landfill located in the northwestern part of the City of Saint John near the community of Grand Bay-Westfield, NB.

The Numerical Groundwater Flow Model represents **Part 2** of a two-part process recommended to provide for a better understanding of the landfill site and surrounding area regarding: A) transport pathways if a contaminant was released from the site; B) refine the existing monitoring program to provide the first indication of such a release; C) maximize the time frame to implement remedial protocols; D) the potential to impact down gradient domestic wells; and E) development of long term closure plans. **Part 1** (EXP Services Inc., 2017) consisted of development of the Conceptual Groundwater Flow Model and related GIS database information which was used as the basis to proceed with development of the numerical flow mode.

The conceptual model developed in **Part 1** of the study formed the basis for developing the **Part 2** numerical groundwater flow model using the finite element based FEFLOW groundwater modelling system. A base case model and 8 further scenario analysis simulations were developed that predicted groundwater levels, flow patterns and interaction between the groundwater and surface water systems throughout the model domain. The scenario analyses addressed key areas where uncertainty in model parameters or boundary conditions were thought more likely to exist. Particle tracking analyses were completed for all model simulations to determine the advective transport component of potential leakage from the active landfill cells to potential downstream receptors.

Key findings of the Part 2 Numerical Model included the following:

1. RE: GROUNDWATER FLOW RATE: Average groundwater flow velocities within the upper bedrock zone were predicted to range between 0.7 and 1.2 m/year in the area of the landfill. The times of first arrival at the downstream discharge locations from various scenarios were predicted to be on the order of 20 to 100 years. The results from this study suggest that even if there is a leak under the landfill, groundwater seepage rates under and adjacent the landfill are relatively slow. Therefore, there is time to monitor – react – design – implement mitigation measures/remediation schemes.
2. RE: FAULTS: Faults are understood to be prevalent within the bedrock in the vicinity of the site. One is interpreted to underlie the site and intersect another in the southwest corner of the site. The model indicates that if these fault zones are hydraulically active, they will play an important role in focusing groundwater flow patterns downstream from the landfill, especially since they are aligned with surface water drainage features. Hence, they are potentially important as “Quick-release-Pathways” in transporting any plume off site. The landfill groundwater monitoring program should be reviewed and refined to incorporate these potential pathways.
3. RE: STREAMS: All particles simulating a release of contamination under the landfill exited the groundwater system at stream boundaries downstream of the landfill. The landfill facility monitoring program should be reviewed and possibly revised to incorporate the potential of impacted groundwater discharging to the surface water drainage network.
4. RE: DOMESTIC WELLS: Modelling of a wide variety of scenarios indicates that, for the assumptions used in the study, none of the particles which simulate a release of contamination from beneath the landfill liner system, migrate to the domestic wells at Grand Bay. Instead they are diverted into select stream channels in proximity to the landfill.
5. RE: ADAPATIVE MANAGEMENT: The numerical model now serves as a tool to allow for future adaptive management of the facility. By incorporating new data from the annual monitoring

programs it will provide for the ability to test the validity of the model results, incorporate new predictions regarding the impact of changing climate and refine as appropriate.

One concern of the FRSC Steering Committee and its stakeholders (e.g. Crane Mountain Enhancement Inc., CMEI, who represent the host community) is the potential for impact on downstream domestic water supply wells in the event of a potential contaminant release from the landfill operation. Pertinent questions related to CMEI's concerns are listed below, along with findings from the numerical modelling study that address them.

Question 1:
How long will it take for leachate within the landfill to move through the liner and enter the bedrock groundwater flow system beneath the landfill?

Seepage of leachate through the engineered liner system was assigned as a model boundary condition and was considered in the scenario analysis to account for uncertainty. Values ranged from 0.2 mm/year (6 L/ha/day) to 34 mm/year (940 L/ha/day). These values were based on values reported in the literature. The time required for the leachate to seep through the underlying till beneath the engineered liner and enter the bedrock groundwater flow system will also depend on the hydraulic conductivity of the till, which was also considered in the scenario analysis. Times ranged between 500 and 80 years for the base case and high till hydraulic conductivity scenarios, respectively.

Question 2:
Which direction (horizontal and vertical) will a potential contaminant plume move given natural flow conditions and pumping operations from on-site landfill facility water supply wells?

All simulations predicted impacted groundwater beneath the landfill would move vertically downward beneath the landfill, then eastward, until eventually moving vertically upward to discharge at surface watercourses downstream of the landfill. Pumping of the landfill's on-site water supply wells was not examined as pumping frequency and yields remain to be confirmed.

Question 3:
Are existing groundwater monitoring wells in the correct locations to a) detect the first signs of plume transport off site and b) to represent background conditions?

Many of the existing monitoring wells are in appropriate locations to detect the first signs of plume transport off site while a small number of wells are located up gradient and are useful for determining background conditions.

Question 4:
Identify if and where additional monitoring wells could be sited to supplement the previous question.

Model results indicate an interpreted fault system near the landfill, if hydraulically active, may play an important role in focusing groundwater flow patterns downstream of the landfill. The south-southeast perimeter of the landfill is an area that should be considered for installing additional monitoring wells. The operator's ongoing data management program, along with the groundwater model results, can be used to re-evaluate the monitoring network and suggest modifications to the system (also see response to the next question).

Question 5:
Identify existing monitoring wells or locations for proposed monitoring wells that would serve as "Trigger Locations" where response to elevated analytical results should warrant remedial actions.

FRSC's on-going data management project, (being completed concurrently with the numerical modelling study reported herein), to compile existing water level and water chemistry data from the site monitoring network will be used to develop appropriate "triggers" that will indicate when significant changes in water chemistry become apparent. Results from the groundwater model can be used along with information from the data management tool to modify the groundwater monitoring network over the life of the landfill, including the identification of potential monitoring wells that could act as "Trigger Locations".

Question 6:
How long would the first conservative tracers from a contaminant plume emanating from the landfill take to reach the domestic wells?

Model simulations and assumptions to date predicted that groundwater originating from the landfill would discharge to surface watercourses east of the facility and would not migrate to the domestic wells.

It is important to realize, however, that although valuable tools for identifying data gaps, designing remediation systems etc. uncertainty remains in all model predictions. Consequently, ongoing monitoring will continue over the long term to validate the model and provide early indication of any off-site migration of impacted groundwater.

The data management tool can be used to assess model performance and the model can be periodically updated with new data and used to inform decisions on how the landfill monitoring network should be modified over time (eg., where new wells should be installed, monitoring frequency etc.).

Question 7:
Are there any short circuits to plume transport through groundwater stream interaction e.g. via springs flowing into nearby streams?

Model results suggest groundwater discharges to the surface watercourses downstream of the landfill. However, travel times to the discharge locations are predicted to be on the order of decades to hundreds of years.

Question 8:
What are the impacts of a changing climate on the above results?

Effects of climate change were assessed in the model by increasing the recharge by 25%. Results were similar to the base case with a slight decrease in the median time of travel to the downstream surface watercourse discharge locations.

It must be appreciated that the conceptual and numerical models of the site and related findings suggested from the work (e.g. as summarized above) are subject to the limitations inherent in characterizing a complex hydrogeological flow system into more simplified models that can be used to aid in understanding site setting and assess sensitivity of input parameters regarding flow and transport within the system. It is the intent that the combined work will serve as a framework for the continued refinement and ongoing application of the conceptual and numerical models as new information is obtained in order to better understand the physical flow system and related aspects of hydrogeochemical evolution, and potential impacts on subsurface water quality.

Should future refinement of the model proceed, it is recommended that future work include hydrological and groundwater field programs to assist in refining the Base Case Model and constrain model parameters and boundary conditions. Suggested field programs could include measuring flows of watercourses in the model area to improve the understanding and estimate of groundwater baseflow (and thus constrain groundwater recharge applied in the model); and completion of field work (e.g. geophysics to refine fault trace(s), pumping tests of the upper bedrock and the inferred fault zone(s)) to determine if these hydrostratigraphic units may act as preferential groundwater flow paths. It is also recommended that once the landfill site monitoring data compilation tool has been completed that a more comprehensive model calibration exercise be considered to augment the calibration effort that was completed for the current project.

1 Introduction

The Fundy Regional Service Commission (FRSC) operates the Crane Mountain Landfill, an engineered municipal solid waste containment landfill located in a fractured bedrock setting and up gradient of a number of domestic supply wells in the northwestern part of the City of Saint John. Nearby communities downgradient of the landfill include Martinon, Ketepec, Morna, Morna Heights and Belmont. The facility is approved and operated in accordance to the Province of New Brunswick municipal solid waste management framework and regulatory requirements, and includes a regular groundwater and surface water monitoring program. The presence and operation of the landfill is reviewed on an ongoing basis by Crane Mountain Enhancement Inc. (CMEI) who represent the citizens in the host community, and meet on an ongoing basis with the landfill operator. Figure 1.1 shows the location of the landfill, topography, surface drainage features and watershed boundaries.

Based on on-going review and operational considerations, FRSC in cooperation with CMEI determined that additional work was warranted to develop a numerical groundwater flow model to serve as a tool in better understanding the hydrogeological system in which the landfill is located. This would aid the landfill operator in design and operation of the facility, and provide guidance to CMEI in understanding water related environmental risk posed by the landfill during operations and closure.

A request for proposals (RFP) from qualified consulting firms to initiate this work was issued by FRSC in June 2016. The RFP identified the objectives of the modelling to provide a tool to assist both the operator, and CMEI. As indicated in the RFP document, the development of the numerical model was to be implemented through a two-step process:

1) **Part 1** requires the development of a Geospatial Database using Geographic Information System (GIS) technology to consolidate all relevant data, to provide thematic mapping to support analysis, and to perform spatial analysis in support of development of a 3-D Conceptual Flow Model.

2) **Part 2 (future work)** develops a Numerical Model based upon the Conceptual Model.

Subsequent to the RFP evaluation process, FRSC retained EXP Services Inc. (EXP) to complete the above noted GIS work and develop a 3-D conceptual model of groundwater flow of the study area. This work was presented in a **Part 1** report (EXP, 2017). Following review of that report the FRSC retained EXP in association with personnel from Matrix Environmental Solutions Inc.(Matrix) to proceed with the Part 2 Numerical Groundwater Flow Model. Results of the Part 2 work are summarized herein.

Project objectives are outlined in **Section 2** and the most pertinent elements of the conceptual model developed in Part 1 of the project for developing the numerical model are summarised in **Section 3**. **Section 4** describes the modelling approach, data sources and construction of the numerical model. The approach taken for calibration of a Base Case model and groundwater flow and pathline analysis results are presented in **Section 5**. The sensitivity analysis completed for the project is described in **Section 6** and model assumptions and limitations summarised in **Section 7**. A summary of results and conclusions from the study are discussed in **Section 8** and recommendations presented in **Section 9**. Closing statements and project references are provided in **Section 10** and **Section 11**, respectively.

2 Project Objectives

The project objective was to develop a numerical groundwater flow modelling tool that would provide for a better understanding of the landfill site and surrounding area regarding: A) transport pathways if a contaminant was released from the site, B) refine the existing monitoring program to provide the first indication of such a release, C) maximize the time frame to implement remedial protocols, D) the potential to impact down gradient domestic wells, and E) development of long term closure plans.

3 Summary of Hydrogeological Conceptual Model Developed During Part 1

The main elements of the hydrogeological conceptual model developed during Phase 1 of the study are summarized in this section. This summary focuses on elements most pertinent to developing the numerical model. Additional details are provided in the Part 1 report (EXP Services Inc., 2017).

3.1 Climate

Precipitation in the study area is estimated to be on the order of 1,300 mm/year.

3.2 Topography and Surface Water Drainage

The landfill facility is located within the New Brunswick Highlands physiographic region. Topographic elevations within the study area are shown on Figure 1 and range from sea level, at Grand Bay on the east side of the study area) to 180 masl in upland areas of watersheds. Ground elevations range between 60 and 80 masl in the area of the landfill facility (shown in the centre of Figure 1). There are several lakes situated at various elevations ranging from approximately 80 masl to 20 masl. Lakes are connected to a network of streams that generally flow from the west to the east (toward Grand Bay).

3.3 Geological and Hydrostratigraphic Setting

The interpreted bedrock hydrostratigraphic units (HUs) are shown on Figure 2. In the north half of the study area bedrock is comprised of lower hydraulic conductivity igneous-plutonic rock, with metamorphic rock present to the south. The contact between these units was inferred to dip approximately 60 to 70 degrees to the south. The figure also shows fault lines and the inferred structural HUs that extend 100 m on either side of the faults. The northern faults are strike-slip faults that were assumed to be vertical. The southern faults are thrust faults that were assumed to dip 45 degrees to the south.

Figure 3 shows the surficial geology of the study area. Most of the area is covered with low permeable glacial till of varying thickness. Bedrock outcrops are present in places where the till cover pinches out. Glaciomarine littoral and nearshore sediments are found along the coast to the southeast and northeast. More permeable alluvial sediments are generally found along the surface water drainage network and glaciofluvial subaqueous outwash fan deposits are present near the mouth of Henderson Brook in the northeast part of the study area.

A thickness map of the surficial materials was developed from provincial surficial geology data and is shown on Figure 4. Most of the study area is inferred to be covered by less than 2 m of Quaternary sediments, with thicker deposits occurring in the sub-aqueous outwash fan to the northeast and thicker glacial till present beneath the landfill. The presence of thicker till beneath the landfill is based on examination of borehole records of the site. It is currently unknown how far from the facility these thicker till deposits might extend, so the extent shown on Figure 4 is conjectural.

3.4 Groundwater Flow Systems

The conceptual model developed in Part 1 of the study describes four major hydrostratigraphic units (HUs), namely:

- Till HU – till is the most predominant material covering the study area
- Igneous-Plutonic HU – this bedrock unit occurs over the north part of the study area
- Metamorphic HU – this bedrock unit occurs over the south part of the study area
- Structural HU – these units consist of zones along either strike-slip or thrust faults

Additionally, the conceptual model includes an upper bedrock hydrostratigraphic rock domain (HRD) which may potentially be more permeable than the deeper bedrock zones.

The Structural HUs are envisioned as being a potentially important control on the groundwater flow system in the vicinity of the landfill.

The water table is interpreted to be relatively close to surface. Figure 5 shows a conceptual map of the depth to the water table over the study area provided by University of New Brunswick Wet Area Mapping.

4 Numerical Groundwater Flow Model Development

This section describes the construction of the groundwater flow model, including: the modelling approach, data sources, the numerical groundwater modelling software used, and model construction. Model calibration is described in Section 7 and sensitivity analysis in Section 6.

4.1 Modelling Approach

The numerical flow model was constructed based on the conceptual hydrogeological model developed during Part 1 of the project. A Base Case model was developed that used the middle of hydrogeological parameter ranges from Part 1. Suggested recharge rates from Part 1 were initially applied and adjusted during model calibration of the Base Case until a reasonable match to the calibration targets was obtained.

Once the Base Case model was calibrated, a set of sensitivity scenarios was completed to determine how changing parameter values and boundary conditions affect model results, including:

- changes to the model water budget;
- changes to how the groundwater and surface water systems interact;
- changes to groundwater flow patterns; and,
- changes to the time of travel of particles released beneath the landfill to downstream groundwater discharge locations.

Rather than simply changing hydraulic conductivity values for a particular sensitivity scenario and processing the results, effort was spent adjusting the recharge rates applied over the model in order to reasonably reproduce the calibration target in the area of the landfill. The rationale for this approach was to obtain a set of sensitivity scenarios where model parameters were varied but the result was still supported by the measured hydraulic head data.

All simulations were completed in steady-state mode. The data loggers that have recently been installed in landfill monitoring wells will measure any temporal changes in water levels (i.e., seasonal effects, future pumping tests etc.) that could be investigated with transient versions of the existing model.

4.2 Data Sources

Data compiled for the Part 1 GIS map were the main sources for constructing the numerical model. These data were supplemented with information on the design of the landfill liner system, recently completed provincial surficial geology mapping and additional reports received since the completion of Part 1. Table 1 summarises the data sources, with highlighted rows indicating data of particular importance in developing the numerical model.

4.3 FEFLOW Software Description

The three-dimensional numerical groundwater flow model for the project site was constructed using FEFLOW 7.0, a finite element modelling package developed by the WASY Institute in Germany (Diersch, 2014). FEFLOW is capable of simulating steady-state or transient groundwater flow and solute and heat transport in three-dimensional heterogeneous and anisotropic media under a variety of hydrogeologic boundaries and stresses. It is extensively used throughout the world and is an industry standard groundwater modelling software package.

4.4 Model Construction

4.4.1 Domain and Grid Design

Figure 6 shows the extent of the model domain and the numerical mesh. The domain corresponds to the study area delineated in Part 1 of the project and consists of the Grand Bay shoreline along the eastern perimeter and watershed divides along the south, west and northeast perimeters. Ground surface topography defines the upper surface of the model except over the landfill where the base of the landfill liner system is the top of the model. The base of the model was set to 300 m below topography.

Local refinement of the 3D triangular prism mesh was completed over the landfill facility and along the Structural HUs, as illustrated on Figure 6. The inset figure shows a zoomed in view of the mesh at the landfill and the delineation of the active landfill cells over the northern half of the facility. Mesh refinement was completed in these areas to provide higher resolution of the calculated flow field where particles are released at the landfill and along the zones of higher hydraulic conductivity contrasts, i.e., between the Structural HUs and the bedrock HUs. The higher mesh resolution over the landfill area will also facilitate future model revisions that may want to investigate changes to the landfill configuration over time and near field transient hydraulic design changes such as incorporating pumping wells, ditching etc. Telescopic mesh coarsening was used between the high-resolution zones and regions progressively more distant.

Each grid slice and model layer consisted of 13,129 nodes and 25,923 elements, respectively. Over the entire 13 slices and 12 layers of the model, there were 170,677 nodes and 311,076 elements, respectively. Elemental diameters over the refined landfill area ranged from 20 m to 48 m, with an average diameter of 31 m and standard deviation of 4.5 m. The Structural HUs had elemental diameters ranging from 20 m to 140 m with an average diameter of 38 m and a standard deviation of 7.3 m.

Elements outside the refined mesh areas had elemental diameters that varied between 70 m and 220 m, with an average diameter of 140 m and a standard deviation of 23 m.

4.4.2 Hydrostratigraphic Framework and Vertical Discretization

The hydrostratigraphic framework was based on the conceptual model developed in Part 1 (refer to Table 4.1 of that report (EXP Services Inc., 2017)) and consisted of the following model mesh/hydrostratigraphic layers:

Layer 1: Till Hydrostratigraphic Unit (HU) and Other Surficial Materials

This layer consists of the unconsolidated surficial materials that overlie the bedrock, as shown on Figure 3. The thickness of this layer was developed using the surficial sediments thickness map, presented on Figure 4. The layer occupies the vertical interval from ground surface to the top of bedrock, except under the landfill where it includes the native till material that underlies the landfill liner system.

Layer 2: Exfoliation/Exhumation Hydrostratigraphic Rock Domain (HRD)

This layer consists of a uniformly thick 5 m interval at the top of the bedrock that accounts for a potentially weathered upper bedrock zone that has higher hydraulic conductivity than the deeper bedrock.

Layers 3 to 12: Igneous-Plutonic/Metamorphic Bedrock HUs and Structural HUs

These layers consist of the deeper bedrock with the Igneous-Plutonic HU present in the north, the Metamorphic HU in the south and the Structural HUs cutting through the model along interpreted fault lines, as shown on Figure 2.

Layers 3 to 7 are 20 m thick and layers 8 to 12 are 40 m thick, resulting in a total thickness of 300 m of the deeper bedrock units. Vertical mesh discretization is illustrated on cross-section AA' of Figure 9. The thickness selected for these HUs was chosen to allow for potential deep groundwater seepage predicted with the model from upland areas to Grand Bay.

4.4.3 Parameterization

Hydraulic conductivity parameter values assigned for the Base Case model were generally selected so the most conductive component of the hydraulic conductivity was in the mid-range of values presented in Table 4.1 of the Part 1 report (EXP Services Inc., 2017). The least conductive component of the hydraulic conductivity was selected to honour any suggested values of the anisotropy parameter (the hydraulic conductivity anisotropy is the ratio between the horizontal and vertical components of this parameter). If the Part 1 suggested anisotropy was listed as either much less than 1 (<<1) or much greater than 1 (>>1) a factor of 100 was used. Table 2 presents the suggested range of values from Table 4.1 of the Part 1 report and the Base Case model values selected for this study.

The horizontal and vertical hydraulic conductivity distributions for the Base Case model layer 1 are presented on Figure 7. Note that the figures show the numerical value of the hydraulic conductivity parameter and not distinct lithology zones. The reason the horizontal and vertical component images differ, therefore, is because the vertical component of the hydraulic conductivity for the glaciomarine sediments is the same value as for the till (1×10^{-7} m/s), whereas the glaciomarine horizontal component of hydraulic conductivity is an order of magnitude higher than the till value (i.e., 1×10^{-6} m/s versus 1×10^{-7} m/s).

The horizontal and vertical components of the hydraulic conductivity were assigned uniform values over the Exfoliation/Exhumation zone (model layer 2).

The hydraulic conductivity distribution for the uppermost bedrock layer below the Exfoliation/Exhumation zone in the Base Case model is shown on Figure 8. The lines shown on the figure refer to locations of cross-sections shown on subsequent figures. Note that the contact between the Igneous-Plutonic and Metamorphic HUs was conceptualized to dip approximately 70 degrees to the south and the thrust faults conceptualized to dip 45 degrees to the south. Consequently, if a deeper horizontal plane through the 3D hydraulic conductivity field was presented, the contact between the two bedrock HUs and the trace of the thrust fault zones would both be shifted southward but by different amounts.

For the Base Case model, both bedrock HUs have the same value for the horizontal component of hydraulic conductivity, whereas the vertical component of hydraulic conductivity for the Metamorphic HU is a factor of 100x greater than the Igneous-Plutonic value. The thrust faults are more conductive than the strike-slip faults in the horizontal direction but the reverse is true for the vertical component of hydraulic conductivity.

Figure 9 shows west to east cross-sections through the vertical component of the hydraulic conductivity field and Figure 10 shows south to north cross-sections. The figures illustrate the complex interaction of the Structural HUs conceptualized in the vicinity of the landfill. Note there is a vertical exaggeration of 3x in these cross-section figures, which is why the thrust faults do not appear to be dipping 45 degrees to the south. Additionally, the thrust fault does not cut through the entire vertical model domain on Figure 9 b) because cross-section location BB' is not sufficiently south to capture where this occurs.

4.4.4 Boundary Conditions

Boundary conditions were applied to the model to introduce and remove water to the groundwater system consistent with the conceptual model developed in Part 1, and consisted of no flow, recharge, surface water and landfill flux boundaries.

No Flow Boundaries

No flow boundaries exist along the northeast, west and southern model perimeters. These boundaries represent watershed divides, which implies negligible groundwater seepage moves across these boundaries compared to the amount of groundwater recharge, derived from precipitation, that enters through the top of the model domain. The base of the model (set at 300 m below the top of the bedrock surface) was also assumed to be a no flow boundary, implying the active groundwater flow zone occurs above this depth.

Groundwater Recharge

A specified areal recharge flux boundary is applied over the uppermost layer of the model to simulate recharging water derived from precipitation. Figure 11 shows the recharge distribution for the Base Case model. The recharge distribution was developed by first assigning recharge values based on the different surficial materials (refer to Figure 3) and then adding additional zones during model calibration (discussed in the next section). Ranges of recharge rates for the different surficial materials incorporated into the Base Case model are included in Table 2.

Surface Water Boundaries

Lakes and streams were simulated using specified head boundaries at nodes inferred to form part of the surface water drainage network. These boundary nodes determine how the surface water and groundwater systems interact with each other. This type of boundary fixes the hydraulic head at assigned elevations, representative of lake water levels or river stage elevations. The elevations assigned to these boundary nodes were extracted from the digital elevation model developed for the project in Part 1. Ideally, surveyed elevations along the surface water drainage network would be used to assess the accuracy of the digital elevation model. However, this data was not available at the time the numerical model was developed.

Two variations of the specified head boundary were used for lakes and streams, respectively. Lake boundary nodes were “unconstrained”, meaning these nodes could introduce or remove water from the groundwater system as required to maintain the specified water level. Consequently, lakes could either be “gaining” (groundwater discharges to the lake) or “losing” (the lake feeds water into the groundwater system). Lakes can also be gaining over one area and losing over another area, depending on the relative values of the simulated hydraulic heads of surrounding nodes in the groundwater system compared to the specified surface water boundary node hydraulic heads.

Lake boundaries included in the model are shown on Figure 11, where their water levels are also tabulated. Lake levels range from 77 masl (Patchell Lake at the extreme southwest corner of the model) to 20 masl (Red Bridge Lake close to Grand Bay in the east). No special lake bed “impedance” zone was incorporated into the model to simulate possible biofilms or other low conductivity “skins” that may form beneath a lake. Consequently, leakage into or out of the lake boundary conditions is entirely determined by the hydraulic conductivity of the material beneath the lakes and the difference between the specified lake levels and the simulated hydraulic heads at adjacent groundwater system nodes. The model could be easily refined in the future to include such effects if data is collected through stream gauging field programs to support such a decision.

Stream boundary nodes were “constrained” so these nodes could only drain water from the groundwater system. If the simulated hydraulic heads at surrounding groundwater system nodes are lower than the simulated surface water level, the boundary condition is inactive and does not alter groundwater flow conditions. The choice of adding constraints to the stream boundaries was based on the lack of detailed stream elevations at spot elevations throughout the domain. It was felt that using unconstrained stream boundaries could potentially introduce unrealistic volumes of water into the groundwater flow system, given the uncertainty that may exist in the underlying digital elevation model data.

Landfill Cells Flux Boundary

Consistent with the approach outlined in Section 3.6.3 of the Part 1 report (EXP Services Inc., 2017), the internal workings of the landfill liner and collection system were not incorporated into the numerical model. Instead, the top of the model under the landfill represents the base of the liner system and the thickness of model layer 1 under the landfill corresponds to the thickness of till that underlies the landfill facility. Areal recharge was applied over the footprint of the landfill cells (refer to Figure 11) at the Best Estimate rate suggested in the Part 1 report (6 litres/hectare/day). One of the sensitivity scenarios discussed in Section 6 considers the upper end of the range discussed in the Part 1 report.

5 Model Calibration

5.1 Approach

Ideally when calibrating a numerical model, hydraulic testing programs have been carried out on the key hydrostratigraphic units and hydrological field programs completed to gauge stream flows and make estimates of groundwater baseflow to the surface water drainage network. With these data, appropriate bounds can be placed on:

- the range of hydraulic conductivity values of the various aquifer units; and,

- the range of recharge rates applied over each of the different watersheds that have gauges installed at their mouths of the watersheds.

For the project site, however, no stream flow measurements (and corresponding estimates of groundwater baseflow to the stream network) were available. Hydraulic testing data of the upper bedrock (i.e., the Exfoliation/Exhumation HRD), in the form of 22 slug tests conducted at 16 different monitoring well locations (6 of the locations tested both shallow and deeper intervals into the bedrock) were available (GEMTEC Ltd., 2006). However no hydraulic testing data for the other main hydrostratigraphic units (Till, Igneous-Plutonic bedrock, Metamorphic bedrock and Structural) were available. The results of hydraulic testing in the shallow bedrock gave a geometric mean for the hydraulic conductivity of 1.5×10^{-6} m/s with a range between 2.5×10^{-8} and 5.3×10^{-5} m/s. These data were collected during field programs conducted in November 1993 (2 tests), June 1994 (6 tests) and August 2006 (14 tests).

A robust calibration exercise uses multiple calibration targets consisting of measured hydraulic head data (i.e., water levels) from all the key hydrostratigraphic units, augmented by baseflow estimates derived from stream gauge data collected over the various watershed contained within the model domain. Ideally, the hydraulic head measurements would be from monitoring wells scattered throughout the model domain. Unfortunately, these ideal conditions are often not met in practice. For the present study, hydraulic head data were only available from the same field programs discussed above. The GEMTEC report includes a map of the interpreted hydraulic head distribution in the upper bedrock (Figure 4 of that report). This map was the main calibration target used for the present study. The other calibration target included simulating the water table to be reasonably close to ground surface, consistent with Figure 5.

It is our understanding that a program of installing data loggers in the landfill monitoring wells has recently been completed and a database is being developed to house these transient hydraulic head data. The availability of these data, hopefully augmented with data collected from additional field programs discussed in Section 11 (Recommendations) will greatly improve the robustness of future model calibration efforts as the model is refined in the future.

Given the limitations discussed above, the following approach was taken during the model calibration exercise:

- The hydraulic conductivity was assigned as described in Section 4.4.3, generally using the mid-range values suggested from the Part 1 report, Table 4.1 (EXP Services Inc., 2017) but the geometric mean determined from the GEMTEC study (GEMTEC Ltd., 2006) for the upper bedrock Exfoliation/Exhumation HRD. Table 2 presents the suggested ranges of the hydraulic conductivity parameters and the values selected for the Base Case scenario.
- The recharge distribution was adjusted using a trial-and-error approach until a reasonable match was obtained to the interpreted hydraulic head map presented in the GEMTEC report over the landfill area.

Preliminary simulation results showed leakage from the landfill discharged to downstream surface water features and did not migrate all the way to Grand Bay. For this reason, and also because measured data were not available from more distal locations, the main calibration effort was focused on achieving a reasonable fit in the immediate area of the landfill.

Although outside the scope of the present study, it is noted that water quality results collected as part of the landfill monitoring program could also be used as a future calibration target. If elevated concentrations of solutes are detected in monitoring wells or surface water samples, pathline analysis results (or alternatively mass transport simulation results) should indicate some seepage emanating from the landfill should reach these locations over the period that the landfill has been operating. The converse, however, is not true. The fact that no water quality sample test results indicate the presence of landfill-impacted seepage does not necessarily mean a contaminant plume emanating from the land has not reached the sampling location – it could simply be the case that heterogeneity inherent in any groundwater flow system results in the plume "missing" the sampling location.

5.2 Base Case Model Results

A comparison of the simulated Base Case hydraulic heads and the interpreted GEMTEC hydraulic head distribution is presented on Figure 12. The figure shows both the simulated and interpreted range of hydraulic heads over the landfill facility is between 65 and 75 masl. The simulated head distribution shows a distortion of the contours around the surface water boundary nodes, which is expected if groundwater is discharging to surface in this area. It is possible that elevations along the streams shown on the GEMTEC figure were not used to constrain the interpreted hydraulic head distribution on the figure. Simulated horizontal hydraulic head gradients ranged between 1.3% and 2.3%, consistent with what is reported in the GEMTEC report. The model also simulates upward vertical gradients at the MW48 and MW49 locations, consistent with what is reported by GEMTEC. Vertical hydraulic head distributions overlain on the vertical component of hydraulic conductivity distribution for the four cross-sections presented earlier are shown on Figures 13 and 14.

Water budget results for the Base Case are presented in Table 3. The lake boundary nodes introduce twice as much water into the groundwater system than they remove. Lakes located along the southern thrust fault HU (Carr, Kelly and Red Bridge) together contribute 70% of all the water introduced into the groundwater system from the lakes. The Grand Bay boundary nodes remove approximately half as much water from the groundwater system as the combined stream drainage network. This indicates the model simulates multiple local scale flow systems where recharge over an area moves through the groundwater system and discharges to local streams, as opposed to moving deep into the bedrock and travelling far greater distances to discharge at Grand Bay. The hydrology program recommended in Section 9 would provide data to constrain simulated groundwater baseflow rates discharging to the different streams.

Recharge rates applied over the model domain range from 17 mm/year over till blanket areas at lower elevations to 128 mm/year over the higher elevation till area in the south of the model (Figure 11). The total recharge flux introduced over the entire model footprint averages to 37 mm/year, or approximately 3% of the estimated 1300 mm/year precipitation for the area. This percentage is 40% of the lower end of the range suggested in the Part 1 report. Possible reasons for the simulated recharge being lower than anticipated include:

- Assigned hydraulic conductivities for the Till and Exfoliation/Exhumation HRD units are lower than they actually are. If so, higher recharge rates would need to be applied to achieve a reasonable calibration. This effect was investigated in the sensitivity scenarios discussed below.
- Recharge rates could be further adjusted in the model, especially under topographic highs to produce more water table mounding in these areas. Additional calibration effort in future model refinements could investigate this factor.

These factors would increase the overall average recharge rate over the model to be consistent with the range presented in the Part 1 report.

Results of the pathline analysis for the calibrated Base Case model are shown on Figure 15. The upper image shows the pathline traces of particles released over the active landfill cells, coloured by the time travelled along the particle's path. The colour scale is truncated at 500 years for visualization purposes. Significant numbers of particles travel for much longer times until reaching downstream discharge locations. This is illustrated with the histogram shown on the figure, which shows the frequency of particle travel times to reach the stream boundary nodes. The first particles arrive at the stream between 50 and 75 years. The median travel time is approximately 500 years. Some particles travel for more than 1,800 years before discharging to the stream boundary nodes.

The lower image shows a 3D view looking north of the particle pathlines. The cross-section shown on the figure is a slice through the vertical hydraulic conductivity field along cross-section AA', which goes through the landfill cells (refer to Figure 8). The figure illustrates how many of the particles are migrating close to surface – through the Till HU and the Exfoliation/Exhumation HRD. The influence of the Structural HU is clearly shown on the figure where significant numbers of the pathlines initially bend downward but then reverse direction and go to surface. These particles are initially moving through the Igneous-Plutonic HU but then are focused toward the Structural HU through which they migrate vertically upward to discharge at the stream boundary nodes which are aligned along the Structural HU. This same process is observed in the upper plan view image, where particle traces are seen to deflect toward the Structural HUs and then migrate along the fault zones until coming to surface to discharge at the surface water boundary nodes. Some of the particles bypass the Structural HU and move through the low hydraulic conductivity, deeper bedrock HUs. These particles require many hundreds of years to move through the groundwater system until discharging to stream boundary nodes further downstream from the landfill.

6 Sensitivity Analysis

6.1 Approach

A sensitivity analysis was completed to investigate the sensitivity of model results from changing different elements of the conceptual model. Table 4 summarises the eight different sensitivity scenarios completed, providing the rationale for each scenario and a description of how the model was changed from the Base Case. Table 5 lists values of the hydraulic conductivity and ranges of recharge values applied for each scenario, along with the Base Case values and the ranges suggested in Table 4.1 of the Part 1 report (EXP Services Inc., 2017). The choice of values assigned to the hydraulic conductivity parameters for the different scenarios was guided by the ranges provided in the Part 1 report. Table 6 summarises the water budget results for the sensitivity scenarios, along with the Base Case results for comparison. Pathline traces for the different scenarios are illustrated on Figure 16. Figure 17 shows frequency histograms of when particles reach downstream surface water drainage boundary nodes for each of the scenarios. Lastly, Figure 18 compares the time of travel to surface water boundaries for the Base Case and all sensitivity scenarios.

As discussed in Section 4.1, rather than simply changing hydraulic conductivity values for a particular sensitivity scenario and processing the results, effort was spent (where appropriate) adjusting the recharge rates applied over the model in order to reasonably reproduce the inferred hydraulic head distribution developed by GEMTEC (GEMTEC Ltd., 2006) in the area of the landfill. The rationale for this approach was to obtain a set of sensitivity scenarios where model parameters were varied but the result was still supported by the measured hydraulic head data. Exceptions to this general rule were for scenarios:

- SENS-7 where the landfill source flux term was increased (by a factor of 170 times) to the upper range cited in the Part 1 report as a worst-case scenario. For this scenario, the Base Case recharge distribution was left unchanged, which resulted in simulated heads in the landfill area being approximately 5 m higher than the GEMTEC interpreted result.

- SENS-8 which simulated possible effects of climate change by uniformly increasing the recharge rates across the model by 25%.

6.2 Sensitivity Results

Sensitivity Scenario SENS-1: Increased Till Hydraulic Conductivity

Scenario SENS-1 increases the hydraulic conductivity of the Till HU by a factor of 10 from the Base Case in both the horizontal and vertical directions. The purpose of this scenario was to assess uncertainty of the Till hydraulic conductivity because slug test data are not available for this unit and this parameter will be a key factor in determining leakage rates through these surficial materials.

After adjusting recharge to improve the match to the interpreted head map developed by GEMTEC, the applied recharge over the model increased by 17% from the Base Case. The groundwater recharge supplied from the lakes decreased while more groundwater discharged to the lakes and streams. Groundwater discharge to Grand Bay increased marginally.

Review of the pathline traces showed more particles discharged to stream boundaries that were closer to the landfill (Figure 16(a)) relative to the Base Case. The time of travel histogram shows that the particles reach the stream boundaries within a much tighter time interval than for the Base Case, with more particles arriving earlier. The median arrival time to downstream boundaries was in the range of 200 years for the SENS-1 scenario compared to between 500 and 600 years for the Base Case. These results indicate the Till HU not only allows more leakage through to the Exfoliation/Exhumation HRD, but becomes an important lateral seepage pathway connecting the area beneath the landfill to the downstream surface water boundaries.

Sensitivity Scenario SENS-2: Fractured Till Anisotropy

Scenario SENS-2 increases the vertical component of the Till HU hydraulic conductivity (K_v) by a factor of 10 while keeping the horizontal component (K_h) fixed at the Base Case value. Consequentially, the Till material changes from isotropic ($K_h = K_v$) for the Base Case to anisotropic with $K_h < K_v$. This scenario simulates fractured till conditions where the vertical fractures allow more seepage down through the till. Similar to scenario SENS-1, the purpose of this scenario was to assess uncertainty of the Till hydraulic conductivity.

After adjusting recharge to improve the match to the interpreted head map developed by GEMTEC, the applied recharge over the model increased by 12% from the Base Case. The groundwater recharge supplied from the lakes decreased while more groundwater discharged to the lakes and streams, similar to scenario SENS-1. Groundwater discharge to Grand Bay increased marginally.

Review of the pathline traces showed a very similar pattern to the Base Case (Figure 16(a)). The time of travel histogram for this scenario is similar to that of the Base Case with the median times of travel being similar (500 to 600 years). These results indicate that increasing only the vertical component of the Till HU hydraulic conductivity does not materially affect the behaviour of how groundwater originating from beneath the landfill discharges to downstream boundaries. It is inferred that the Exfoliation/Exhumation HRD is the limiting hydrostratigraphic unit controlling lateral flow from the landfill. This is in contrast to scenario SENS-1 where the till horizontal hydraulic conductivity ($1x10^{-6}$ m/s is of the same order of magnitude as the Exfoliation/Exhumation HRD ($1.5x10^{-6}$ m/s).

Sensitivity Scenario SENS-3: Increased Upper Bedrock Hydraulic Conductivity

Scenario SENS-3 increases both the horizontal and vertical components of the Exfoliation/Exhumation zone hydraulic conductivity by a factor of 10 from the Base Case (i.e., 1.5×10^{-5} m/s). The purpose of this scenario was to assess uncertainty in this hydraulic conductivity parameter because slug test data presented in the GEMTEC report (GEMTEC Ltd., 2006) indicate an upper range of test results of 5.3×10^{-5} m/s.

After adjusting recharge to improve the match to the interpreted head map developed by GEMTEC, the applied recharge over the model increased by 370% from the Base Case, by far the largest change of all the sensitivity scenarios considered. The groundwater recharge supplied from the lakes did not materially change from the Base Case while groundwater discharged to the lakes and streams increased by a factor of 4.5. Groundwater discharge to Grand Bay decreased marginally.

Review of the pathline traces show the Structural HUs play a much less important role in focusing groundwater seepage into these zones (Figure 16(b)). Particles are essentially staying within the Exfoliation/Exhumation zone until coming to surface to discharge at the stream boundaries.

This scenario showed the fastest times of arrival to the downstream boundaries, with the first particles discharging to surface after approximately 20 years. The median time of travel was between 100 and 200 years, or less than half the Base Case value. The bi-modal nature of the time of travel histogram is caused by some particles terminating at stream boundaries that are significantly closer to the landfill while other particles (those moving through the area between the two Structural HUs) have much longer flow paths and consequently take significantly more time to discharge at surface.

Sensitivity Scenario SENS-4: No Active Fault Zones

Scenario SENS-4 removes the Structural HUs from the conceptual model by reassigning the hydraulic conductivity parameter over these zones to either the Igneous-Plutonic or Metamorphic HU values, depending on where the fault zone is located. The purpose of this scenario was to assess how the groundwater flow behaviour might change if the Structural HUs are not significantly different from the background bedrock HUs.

After adjusting recharge to improve the match to the interpreted head map developed by GEMTEC, the applied recharge over the model decreased by 40% from the Base Case, indicating these zones play an important role in collecting seepage from surrounding HUs and directing it to the surface water discharge locations. The groundwater recharge supplied from the lakes decreased by 90% from the Base Case while groundwater discharged to the lakes and streams decreased by 40%. Groundwater discharge to Grand Bay decreased by 75%.

As expected, the pathline traces for this scenario show a smooth downgradient pattern with particles now discharging only to the stream to the northeast of the landfill when the Structural HUs are not present to focus flow north and south (Figure 16(c)). This scenario showed the slowest times of arrival to the downstream boundaries, with the first particles discharging to surface after approximately 100 years. The median time of travel was approximately 900 years, or less than double the Base Case value.

Sensitivity Scenario SENS-5: Increased Bedrock Hydraulic Conductivity

Scenario SENS-5 increases the hydraulic conductivity of the Igneous-Plutonic and Metamorphic HUs by a factor of 10 from the Base Case in both the horizontal and vertical directions. The purpose of this scenario was to assess uncertainty of the bedrock hydraulic conductivity because hydraulic test data were not available for the deeper bedrock.

After adjusting recharge to improve the match to the interpreted head map developed by GEMTEC, the applied recharge over the model increased by 43% from the Base Case. The groundwater recharge supplied from the lakes was essentially unchanged while groundwater discharged to the lakes and streams increased by 55% and 40%, respectively. Groundwater discharge to Grand Bay increased by 18%.

Review of the pathline traces showed essentially no deflection of the flow paths toward the strike-slip fault that trends southwest-northeast from the landfill (Figure 16(d)) relative to the Base Case. For this scenario, the hydraulic conductivity of the strike-slip fault zone and the Metamorphic HU are the same. There is still significant deflection of the flow paths toward the west-east trending thrust fault zones that run along the southern edge of the landfill because the horizontal component of hydraulic conductivity for the thrust fault zones is still two orders of magnitude higher than for the Metamorphic HU.

The time of travel histogram for the SENS-5 scenario is more spread out than for the Base Case and the median time of travel to downstream boundaries is actually longer (approximately 700 years) than for the Base Case. This is interpreted to be due to the fact that the northern strike-slip fault is not focusing seepage toward this zone and particles that migrate northward take longer flow paths through the bedrock HUs (refer to Figure 16 (b)).

Sensitivity Scenario SENS-6: Reduced SW-GW Hydraulic Connection

Scenario SENS-6 decreases the hydraulic conductivity of the surficial material that underlies the surface water drainage system by a factor of 10 from the Base Case. The purpose of this scenario was to assess if the presence of low permeability streambed sediments might impede groundwater discharge sufficiently to alter where groundwater sourced from beneath the landfill might discharge at surface.

Recharge did not have to be adjusted for sensitivity scenario in order to reasonable match the GETMTEC interpreted head map. The groundwater recharge supplied from the lakes decreased by 33% while discharge to the lakes remained essentially the same. Discharge to streams decreased by 14% to compensate for the reduced recharge from the lakes. Groundwater discharge to Grand Bay was unaffected.

Review of the pathline traces showed a small number of particles did discharge to stream boundaries further downstream compared to the Base Case (Figure 16 (e)), but generally the pathline traces were fairly similar to the Base Case. The time of travel histogram also illustrates how some of the particles are taking longer to discharge at surface. The median arrival time to downstream boundaries was in the range of 550 to 600 years, slightly higher than for the Base Case. These results indicate that a streambed impedance layer would have to be very much lower than the nearby in situ sediments in order to significantly affect where groundwater originating from beneath the landfill discharges to surface.

Sensitivity Scenario SENS-7: Landfill Source Flux

Scenario SENS-7 increases the landfill source flux to the high end of the range presented in the Part 1 report (EXP Services Inc., 2017), i.e., 34 mm/year. This scenario was completed to assess if a higher leakage flux from the landfill might cause groundwater to migrate through deeper seepage pathways and discharge to surface close to Grand Bay.

Recharge was not adjusted for this scenario and hydraulic heads were found to be approximately 5 m higher than what is shown on the interpreted head map prepared by GEMTEC (GEMTEC Ltd., 2006). Components of the water budget were not materially changed for this scenario.

Review of the pathline traces showed a small number of particles discharging to stream boundaries further downstream compared to the Base Case (Figure 16 (f)), but generally the pathline traces were fairly similar to the Base Case. The time of travel histogram, however, showed a significant increase in the number of particles that arrive at downstream surface water boundaries sooner; in the range of 50 to 75 years. A small number of particles arrive at stream discharge locations later than for the Base Case. These are inferred to be migrating longer through the bedrock HUs before they are deflected toward either of the Structural HUs before eventually discharging to surface (Figure 16 (f)). The median arrival time to downstream boundaries was in the range of 200 years, compared to a median time of arrival for the Base Case of 500 years. These results indicate that if leakage from the landfill is higher, the current Base Case conceptual model suggests travel times to downstream surface water receptors will be shorter (although still spanning decades) but the location of the discharging groundwater will not be materially different from the Base Case.

Sensitivity Scenario SENS-8: Climate Change (Increased Recharge)

Scenario SENS-8 increases recharge across the site by 25% to assess the potential effects of climate change.

Recharge was not adjusted for this scenario and hydraulic heads were found to be approximately 5 m higher than what is shown on the interpreted head map prepared by GEMTEC (GEMTEC Ltd., 2006). The groundwater recharge supplied from the lakes decreased by 9% while groundwater discharged to the lakes and streams increased by between 22% and 24%. Groundwater discharge to Grand Bay increased by 5%.

Review of the pathline traces showed a very similar pattern to the Base Case, but with particles not migrating as far along the strike-slip fault zone to the northeast (Figure 16 (a)). The time of travel histogram is also similar to that of the Base Case, with a small number of particles arriving at downstream surface water boundaries sooner. The median arrival time to downstream boundaries was slightly shorter than for the Base Case.

6.3 Summary of Sensitivity Analysis

Times of travel to downstream surface water boundaries results for all scenarios are shown on Figure 18. The upper figure shows the frequency of when particles arrive at the stream nodes and the lower figure shows the cumulative percent of when particles arrive. Sensitivity scenarios SENS-2 (fractured till anisotropy) and SENS-8 (climate change) are most similar to the Base Case. Scenario SENS-6 is also very similar to the Base Case except for this case there are a small number of particles that take very long times to discharge to surface water nodes, as evidenced by the lag in in the cumulative percent graph to reach 100%.

Scenarios SENS-1 (increased till conductivity), SENS-3 (increased upper bedrock conductivity) and SENS-7 (higher landfill source flux) exhibited the shortest median times of travel to downstream discharge locations; a time of approximately 100 years. The increased till conductivity scenario (SENS-1) showed the narrowest range of arrival times, indicating the most uniform flow paths taken by the particles as they migrate from beneath the landfill to the stream boundary discharge locations. This is inferred to be due to most of the particles migrating laterally through the higher permeability till which blankets the landfill area.

The increased upper bedrock conductivity scenario (SENS-3) showed the quickest breakthrough of particles at the discharge locations; approximately 20 years. This scenario also exhibited a bi-modal pattern to both the frequency and cumulative percent curves. Approximately 30% of the particles discharge between 20 and 50 years while the remainder discharge between 100 and 500 years. This behaviour is attributed to the upper bedrock zone becoming a more effective under drain in the hydraulic system, conveying some of the seepage laterally through this zone to discharge locations. For the other particles, there is sufficient driving head to push the particles deeper, into the bedrock HUs, where seepage is eventually directed to the either of the Structural HU fault zones to eventually discharge to the stream networks that are aligned with the faults.

Scenarios SENS-4 (no active fault zone) and SENS-5 (increased bedrock conductivity) exhibited the longest interval over which particles discharge to streams, from approximately 100 years to 1,600 years, with median arrival times of 700 years (SENS-5) and 900 years (SENS-4). Both of these scenarios decrease the impact of the Structural HUs on the hydraulics of the groundwater system. The results from these scenarios demonstrate the importance of understanding how different the hydraulic nature of the Structural HUs is from the surrounding bedrock HUs.

7 Model Assumptions and Limitations

The following assumptions and limitations are implicit in the development and application of the numerical model developed for this study:

- Groundwater flow was simulated using the “equivalent porous media” approach. Flow is assumed to be laminar and steady, and governed by Darcy’s Law. Although Structural HUs were incorporated into the numerical model, consistent with the conceptual model developed in Part 1 of the study, no discrete fracture network modelling was attempted because no data currently available support this type of modelling effort.
- Horizontal mesh discretization was considered to provide good mesh refinement for simulating groundwater flow and pathline analysis. If mass transport simulations are completed in the future the mesh resolution should be re-evaluated and possibly refined.
- Vertical discretization was based on the conceptual hydrostratigraphy, with no internal subdivision of the mesh within Till HU and the Exfoliation/Exhumation HRD units.
- The model was calibrated against the interpreted upper bedrock hydraulic head map presented in the GEMTEC report (GEMTEC Ltd., 2006). Dataloggers have recently been installed, or are being installed, in the landfill monitoring wells. However, the Base Case model results presented herein were not able to be compared against these data.
- No water level data from a regional monitoring well network was available for calibration at the time this report was prepared. Consequently, calibration focused on using the GEMTEC interpretation which is limited to the vicinity of the landfill.

8 Summary and Conclusions

The key findings from the study are presented below, grouped by conceptual model element.

Surface Water Drainage Network

- Stream boundary nodes had to be extended further upstream, closer to the landfill, than what is shown in the Watercourse GIS data layer in order to get a reasonable match to the GEMTEC hydraulic head map.
- A sensitivity scenario was attempted where the boundary conditions along the extended surface drainage network were removed, but this dramatically altered the entire hydraulic head contour pattern and this scenario was dropped from further consideration.
- Note that the surface drainage network shown in the GEMTEC report also extends much closer to the landfill than what is indicated in the New Brunswick watercourse GIS data layer.
- All particles released beneath the landfill exited the groundwater system at stream boundaries downstream of the landfill. The landfill facility monitoring program should be reviewed and possibly revised to incorporate the potential of impacted groundwater discharging to the surface water drainage network.

Grand Bay/Domestic wells

- As discussed above, the pathline analysis predicted none of the particles released beneath the landfill liner system exit the groundwater system at Grand Bay, and consequently the model results predict no water quality impacts to the domestic wells clustered along the shore.
- It is important to note, however, that the model uses an equivalent porous media approach. Although the conceptual model for the site has been extensively revised by the inclusion of higher

hydraulic conductivity Structural HUs, a discrete fracture network modelling approach has not been simulated with the current model because current data does not warrant such an approach. There is, however, the possibility that an, as yet undetected, discrete fracture network is present that could act as a preferential flow path hydraulically connecting the landfill area with Grand Bay.

- Consequently, it is prudent to continue existing monitoring programs that test water quality of wells in the Grand Bay area.

Upper Bedrock Exfoliation Zone

- The hydraulic conductivity of the upper bedrock zone is a sensitive parameter, and resulted in by far the largest increase in the simulated recharge required to approximately match heads in the area of the landfill when this parameter was increased.
- This scenario also predicted the fastest time of travel to downstream boundaries. Significant numbers of particles reached the stream boundaries between 20 and 50 years and the median arrival time was 200 years, compared to 500 years for the Base Case.

Structural Hydrostratigraphic Unit (Fault Zones)

- Comparing the Base Case to the no-active-faults scenario indicates if fault zones are hydraulically active, they may play an important role in focusing groundwater flow patterns downstream from the landfill and determining where groundwater potentially impacted from the landfill discharges to surface.
- This is because the faults are aligned with the surface water drainage features, and the model predicts the fault zones act to drain the surrounding bedrock HUs and convey the collected groundwater to the surface drainage network.
- The no-active-fault scenario (SENS-4) predicted median time of travel almost double the Base Case, which includes higher hydraulic conductivity Structural HUs.
- Several monitoring wells are located along the inferred southwest-northeast trending strike-slip fault and along the west-east trending thrust faults (refer to Figure 12). Logs from these wells should be reviewed prior to any hydraulic testing programs to determine if they are good candidates for future hydraulic testing programs targeting the Structural HUs, either as monitoring wells for the testing program or as locations for installing pumping wells.
- Many of the monitoring wells that are within the Structural HU (refer to Figure Figure 12) are not downstream of the landfill. Particular attention should be paid to those wells that are downstream when considering which wells to test for water quality.

Till Hydrostratigraphic Unit

- Increasing both the horizontal and vertical components of the Till hydraulic conductivity significantly reduced the time of travel to downstream boundaries and resulted in a narrower range of travel times. Median time of travel to downstream boundaries was more than halved compared to the Base Case.
- However, increasing only the vertical component of the Till hydraulic conductivity resulted in only minor changes from the Base Case. These results are inferred to be due to increased lateral migration through the Till when both components of conductivity are increased, whereas when only the vertical component of the Till conductivity is increased the conductivity of the upper bedrock becomes the controlling factor affecting off-site seepage.

Groundwater Flow Rates and Times of Travel

- Specific discharge rates (Darcy velocity) within the upper bedrock zone were predicted to be in the range of 0.7 to 1.2 m/year for the Base Case. Assuming an effective porosity of 0.02, this translates to an average linear groundwater velocity (the velocity a solute plume would migrate) of between 35 and60 m/year.

- With the exception of the increased hydraulic conductivity of the upper bedrock sensitivity scenario (SENS-3), times of first arrival at the downstream discharge locations were predicted to be on the order of 50 to 100 years.
- Times of first arrival for the SENS-3 scenario were predicted to range between 20 to 30 years.
- Based on model assumptions the results from this study indicate that even if there is a leak under the landfill, groundwater seepage rates under and suggest adjacent the landfill are relatively slow. Therefore, there is time to monitor – react – design – implement mitigation measures/remediation schemes.

9 Recommendations

Based on the key findings discussed above, the following recommendations are presented for the FRSC's consideration.

Future Hydrological Field Program(s):

- Ground truthing of groundwater discharge conditions immediately downstream (east) of the landfill. The objective of this portion of the field program would be to collect data that would aid in answering the question: *could groundwater sourced from the landfill be daylighting in this area?* The answer to this question will dictate possible changes to the monitoring network of the landfill.
- Collecting surveyed spot elevation measurements of the streambeds in the area taken during the field program could be used to refine the boundary conditions assigned in the model.
- Observations of the lithological type and thickness of sediments and collection of soil samples for geotechnical analysis would help refine the distribution of surficial materials and appropriate values of hydraulic conductivity to use in a refined model for this area.
- Install stream gauges in sub-watersheds in the area and make estimates of baseflow. This information will help constrain estimates of groundwater recharge and, through future model calibration effort, along with hydraulic conductivity testing, provide insight into the regional nature of the till and upper bedrock hydraulic conductivity.

Future Groundwater Field Program(s):

- Pumping test program for the upper bedrock. The sensitivity analysis identified the hydraulic conductivity of this zone as being a particularly important parameter. A properly designed pumping test with hydraulic response measured at multiple monitoring wells situated at different distances and along different directions from the pumping well (which is screened over the upper bedrock zone). Detailed examination of existing borehole records should be used to identify the best options for placing the pumping well. The numerical model could be used to aid in designing a range of suitable pumping rates, pumping durations and good candidates for monitoring well selection.
- Pumping test program for the inferred fault zones. The sensitivity analysis suggests the interpreted faults can influence groundwater flow patterns, focusing groundwater flow from beneath the landfill toward the faults. A key question for designing future modifications to the monitoring program is therefore to determine if the interpreted fault zones are present and if so, are they hydraulically significant.

Future Modelling Studies:

Model refinements are suggested to further investigate seepage through the Till HU, based on the results of the SENS-1 sensitivity scenario presented herein. Seepage through the till groundwater pathway will be sensitive to till thickness, recharge rates through the till, landfill seepage flux, distance to the nearest surface water drainage features, the thickness and hydraulic conductivity of the sediments underlying the drainage features and the elevations of stream beds where groundwater is expected to discharge. It is recommended these model refinements be completed after additional data is collected during the recommended hydrological field program discussed above. Additional vertical discretization of the till HU is also recommended for this future modelling study so the flow field can be resolved vertically across the till unit.

10 Closure

This report was prepared by Don Haley, B.Math, M.Sc. and Fred Baechler, M.Sc., P.Geo and reviewed by John Sims, M.Sc., P. Geo., P. Eng. (hydrogeology).

11 References

Diersch. (2014). *FEFLOW - Finite Element Modeling of Flow, Mass and Heat Transport in Porous and Fractured Media.* Springer.

EXP Services Inc. (2017). *Development of GIS Map and Conceptual Hydrogeological Model.* Report prepared for the Fundy Regional Services Commission.

GEMTEC Ltd. (2006). *Update of Bedrock Hydrogeology - Crane Mountain Landfill, Saint John, New Brunswick.* Report prepared for the Fundy Regional Services Commission.

Appendix 1 – REPORT TABLES

ID	Data Class	Type	File Name	Notes
1	Base Map	Vector	CM_civic_addresses_U19_w84.shp	
2	Base Map	Vector	CM_Domestic_wells_u19_w84.shp	
3	Base Map	Vector	CM_rail_u19_w84.shp	
4	Base Map	Vector	CM_roads_major_u19_w84.shp	
5	Base Map	Vector	CM_roads_u19_w84.shp	
6	Bedrock Geology/Hydrogeology	PDF	Update of Bedrock Hydrogeology Nov 2006 Final.pdf	Report discusses bedrock geology, slug test results and water levels near the landfill facility. Slug test results used to assign conductiivty of the upper bedrock and the interpreted water level surface used as the main calibration target near the landfill.
7	Digital Elevation Model	Raster	CM_elevation_20m_grid_u19_w84.tif	
8	Digital Elevation Model	Raster	CM_geology_20k_lidar_merge_8bit_u19_w84.tif	
9	Digital Elevation Model	Raster	CM_LiDAR_detail_u19_w84.tif.tif	
10	Digital Elevation Model	Raster	CM_LiDAR_Large_u19_w84 DEM_Hillshade.tif	
11	Digital Elevation Model	Raster	CM_LiDAR_Large_u19_w84.tif.tif	
12	Digital Elevation Model	Raster	CM_TIN_convert_topo_grid_20m_u19_w84.tif	
13	Digital Elevation Model	Raster	CM_topo_rev1_NN20_u19_w84.tif	
14	Digital Elevation Model	Vector	CM_contour_10m_u19_w84.shp	
15	Digital Elevation Model	Vector	CM_elevation_20m_grid_u19_w84.shp	
16	Digital Elevation Model	Vector	CM_SNB_Elevation_points_u19_w84_Feb_5_2018.shp	Revised DEM refining elevation along the shore of Grand Bay. Used to define ground surface in the model.
17	Digital Elevation Model	Vector	revised_DEM_breaklines_shift_u19_w84.shp	Shore breakline used in developing revised DEM
18	Geology - Bedrock	Raster	CM_Bedrock_Elevation_NN2m_u19_w84.tif	Interpreted elevation of bedrock calculated from DEM, surficial geology thickness and site specific data from the landfill. Defines top of bedrock in the model.
19	Geology - Bedrock	Raster	CM_TIN_convert_bedrock_surface_20m_u19_w84.tif	
20	Geology - Bedrock	Raster	Crane_mtn_aeromag_correct_u19_w84.tif.tif	
21	Geology - Bedrock	Vector	CM_1_20k_Geology_outcrops_u19_w84.shp	
22	Geology - Bedrock	Vector	CM_Bedrock_Elevation_NN2m_points_u19_w84.shp	Extracted top of bedrock surface points from the raster data set for importing into the numerical modelling software.
23	Geology - Bedrock	Vector	CM_bedrock_geology_1_20k_revised_McCloud_2106_u19_w84.shp	
24	Geology - Bedrock	Vector	CM_Geology_structure_Faults_u19_w84.shp	Interpreted strike-slip and thrust fault lines used to define hydraulic zones along major faults in the model.
25	Geology - Bedrock	Vector	CM_Geology_structure_Strike_dip_u19_w84.shp	
26	Geology - Bedrock	Vector	CM_Interpreted_Lineaments_u19_w84.shp	
27	Geology - Bedrock	Vector	CM_Outcrops_Field_mapping_2016_u19_w84.shp	
28	Geology - Bedrock	Vector	CM_Structural_Hydrogeological_Units_Baechler_2016_u19_w84.shp	Intrepreted zones of higher hydraulic conductivity along the main faults. Used to assign fault zone hydraulic conductivity in the model.
29	Geology - Surficial	Vector	CM_Liner_minus_Bedrock_elevation_points_u19_w84.shp	Extracted Till thickness points under the landfill liner system from the raster data set.
30	Geology - Surficial	Vector	CM_Surficial_Geology_Lines.shp	
31	Geology - Surficial	Vector	CM_surficial_Geology_Polygons.shp	Zones of different sediments at surface. Used to assign initial groundwater recharge distribution in the model (recharge distribution refined during model calibration).
32	Geology - Surficial	Raster	CM_Liner_minus_Bedrock_elevation_u19_w84.tif	Thickness of Till beneath landfill liner system. Used to locally refine till thickness at the landfill facility.
33	Geology - Surficial	Raster	Surficial_geology_depth_clip_Feb_9_2018.tif	Interpreted thickness of surficial sediiments. Used to develop top of bedrock surface used in the model.
34	Hydrogeology	Vector	CM_Hydrogeological_units_Baechler_2016_u19_w84.shp	Interpreted delineation of different bedrock HUs used to assign bedrock hydraulic conductivity zones in the model.
35	Hydrogeology	Vector	CM_wet_areas_mapping_Depth_to_Watertable_u19_w84.shp	Interpreted depth to water used as a guide during model calibration.
36	Hydrology	Vector	CM_Regulated_Wetlands_NB_Environment_u19_w84.shp	Wetland areas used as a guide during model calibration to infer areas where the water table is at or above ground surface.
37	Hydrology	Vector	CM_Waterbodies_NBHN_u19_w84.shp	Locations of lakes used to assign lake boundary conditions in the model.
38	Hydrology	Vector	CM_watercourses_NBHN_u19_w84.shp	Locations of streams/creeks used to assign surface water drainage features in the model.
39	Hydrology	Vector	CM_watersheds_u19_w84.shp	Watershed boundaries used to define the conceptual study area in Phase 1 and the extent of the numerical model.
40	Landfill Facility	PDF	Various files containing information on borehole logs etc.	
41	Landfill Facility	Raster	cad_90421506_cad_liner_contours_2m_grid_u19_w84	Used to interpret the Till thickness beneath the landfill liner system.
42	Landfill Facility	Vector	90421507-AS BUILT SUBDRAINS.dwg	
43	Landfill Facility	Vector	AS BUILT GEOMEMBRANE CELL 7-23-09-2015.xml	
44	Landfill Facility	Vector	BASE PLAN .dwg	
45	Landfill Facility	Vector	cad_90421506_cad_liner_contours_2m_grid_points_u19_w84.shp	Used to interpret the Till thickness beneath the landfill liner system.
46	Landfill Facility	Vector	CM_Landfill_Facility_u19_w84.shp	
47	Landfill Facility	Vector	CM_Landfill_Property_parcels_u19_w84.shp	
48	Landfill Facility	Vector	CM_Landfill_Site_Wells_temp_u19_w84.shp	
49	Landfill Facility	Vector	CM_monitoring_wells_u19_w84.shp	
50	Landfill Facility	Vector	HDPE LINER - CELL 1-final grade.xml	
51	Numerical Model	Vector	CM_Numerical_Model_Domain_u19_w84.shp	Study area defined in Phase 1, used to define the extent of the numerical model domain.

Notes:
1. Highlighted rows indicate primary data sources used to construct and calibration the numerical model. Other data listed here would have been used during Phase 1 to develop the conceptual model; for example, the strike and dip information compiled during the geological mappping program carried out during Phase 1 (refer to Table 4.1 of the Phase 1 report).

Table 2: Hydraulic Parameters and Boundary Conditions - Base Case

Hydrostratigraphic Unit		Effective Porosity: Suggested Range from Phase 1	Effective Porosity: Base Case	Hydraulic Conductivity Parameters [m/s]: Hydraulic Conductivity Parameter	Hydraulic Conductivity Parameters [m/s]: Phase 1, Table 4.1 Suggested Ranges	Hydraulic Conductivity Parameters [m/s]: Base Case Model
Quaternary Units	Tb: Till blanket	0.2 - 0.3	0.25	Kh	1x10^{-8} to 1x10^{-6}	1.0E-7
				Kv	1x10^{-8} to 1x10^{-6}	1.0E-7
				Ratio (Kh/Kv)	1.0	1.0
	Tv: Till veneer	0.2 - 0.3	0.25	Kh	1x10^{-8} to 1x10^{-6}	1.0E-7
				Kv	1x10^{-8} to 1x10^{-6}	1.0E-7
				Ratio (Kh/Kv)	1.0	1.0
	GMn: Glaciomarine	Only Till unit discussed in Phase 1 report	0.15	Kh	Only Till unit discussed in Phase 1 report.	1.0E-6
				Kv		1.0E-7
				Ratio (Kh/Kv)		10.0
	GFf: Glaciofluvial		0.3	Kh	Only Till unit discussed in Phase 1 report.	1.0E-4
				Kv		1.0E-5
				Ratio (Kh/Kv)		10.0
	A: Undifferentiated Alluvial Deposits		0.3	Kh	Only Till unit discussed in Phase 1 report.	1.0E-4
				Kv		1.0E-5
				Ratio (Kh/Kv)		10.0
Bedrock Units	Upper Bedrock Exfoliation Zone	0.01 - 0.03	0.02	Kh	1x10^{-6} to 1x10^{-4}	1.5E-6
				Kv	1x10^{-6} to 1x10^{-4}	1.5E-6
				Ratio (Kh/Kv)	> 1	1.0
	Igneous Plutonic Bedrock HU	0.001 - 0.01	0.01	Kh	1x10^{-10} to 1x10^{-7}	1.0E-8
				Kv	1x10^{-10} to 1x10^{-7}	1.0E-8
				Ratio (Kh/Kv)	1.0	1.0
	Metamorphic Bedrock HU	0.001 - 0.01	0.01	Kh	1x10^{-7} to 1x10^{-5}	1.0E-8
				Kv	1x10^{-7} to 1x10^{-5}	1.0E-6
				Ratio (Kh/Kv)	<< 1	0.01
	Strike-Slip Faults	0.01 - 0.05	0.03	Kh	1x10^{-6} to 1x10^{-4}	1.0E-7
				Kv	1x10^{-6} to 1x10^{-4}	1.0E-5
				Ratio (Kh/Kv)	<< 1	0.01
	Thrust Faults	0.01 - 0.05	0.03	Kh	1x10^{-6} to 1x10^{-4}	1.0E-5
				Kv	1x10^{-6} to 1x10^{-4}	1.0E-7
				Ratio (Kh/Kv)	>> 1	100.0
Recharge [mm/year]	Till Blanket (Tb)				100 to 400 mm/year (8% to 31% of 1,300 mm of precipitation)	17 to 85
	Till Veneer (Tv)					50 to 128
	Glaciomarine (GMn)					17
	Glaciofluvial (GFf)					68
	Alluvial (A)					85
Landfill Source Flux (mm/yr)					0.2 to 34	0.2

Table 3: Water Budget Results - Base Case

RUN	Water Budget Selection	Constant Heads			Recharge			Landfill Leakage	Total IN[1]	NET IN as Fraction of Total IN	Imbalance	Global Percent Discrepancy
		INPUT	OUTPUT	Net IN (+) / Net OUT (-)	Vol. Flux	Areal Flux	% of Precip.				IN (+)/OUT (-)	
		m^3/d	m^3/d	m^3/d	m^3/d	mm/yr	%	m^3/d	m^3/d	%	m^3/d	
Base Case	Domain	1,078	4,022	-2,944	2,944	37	3%	0.14	4,022	NA	0	0.0%
	Lakes	982	470	512	Not Applicable					13%	Not Applicable	
	Streams		2,249	-2,249						-56%		
	Grand Bay	96	1,302	-1,206						-30%		

Table 4: Description of Sensitivity Scenarios

Conceptual Model Element	ID	Short Description	Long Description	Rationale
TILL	SENS-1	Increased Till Conductivity	Increase vertical and horizontal components of the Till hydraulic conductivity (K) by a factor of 10 from the Base Case.	Lack of slug test results in the till unit mean relatively large uncertainty in this parameter. We are treating the till as an undifferentiated unit whereas in reality it will be variable with sand lenses acting as preferential pathways for infiltration. Increased hydraulic conductivity of the till will allow for more recharge to the groundwater system.
TILL	SENS-2	Fractured Till Anisotropy	Vary Till hydraulic conductivity from isotropic (Base Case) by increasing the vertical component by a factor of 10 to simulate a fractured till with enhanced vertical permeability (Kv>Kh).	The nature of till anisotropy is unknown. Vertical fracturing may act to enhance infiltration, resulting in steeper gradients in the bedrock and fault HUs, resulting in fast plume migration and shorter time of travel to downstream wells and/or receiving surface waters. Use the same increase factor as for SENS-1.
UPPER BEDROCK	SENS-3	Increased Conductivity of Upper Bedrock	Increase the upper weathered bedrock hydraulic conductivity by a factor of 10 from the Base Case.	Increasing the hydraulic conductivity of the upper bedrock unit will result in a more effective under drain below the relatively low permeability surficial Tills.
FAULTS	SENS-4	No Active Fault Zones	Set hydraulic properties of the fault zones to the corresponding bedrock HU values.	To assess how results would differ if the faults do not act as preferential flow zones.
BEDROCK	SENS-5	Increased Bedrock Conductivity	Increase the two bedrock HU conductivities by a factor of 10 from the base case, maintaining the anisotropy ratio.	Increasing the hydraulic conductivity of the bedrock units will result in a more homogenous hydraulic conductivity field compared to the Base Case (i.e., bedrock and fault conductivities are more similar).
GW-SW INTERACTION	SENS-6	Reduced SW-GW Hydraulic Connection	Decrease the hydraulic conductivity of the surficial materials under lakes and stream beds by a factor of 10x from the base case values.	If surface drainage features are underlain by a lower hydraulic conductivity zone, seepage between the surface water and groundwater regimes will be impeded, resulting in impacted groundwater from the landfill potentially migrating further downstream.

Table 4: Description of Sensitivity Scenarios

Conceptual Model Element	ID	Short Description	Long Description	Rationale
LANDFILL SOURCE TERM	SENS-7	Landfill Source Flux	Vary the source flux leaking out the bottom of the landfill liner system from **6 litres/hectare/day** (the Base Case, or Best Estimate) to **940 litres/hectare/day** (the upper end of the range reported in Section 3.6.3, of the Phase 1 report).	This range of infiltration corresponds to between 0.2 mm/yr (Best Estimate) and 34 mm/yr (Worst Case). The best estimate, based on liner design and site geological conditions, is orders of magnitude smaller than inferred recharge over natural soils. The Worst Case is similar to the the range of recharge rates applied over till materials in the numerical model.
CLIMATE CHANGE	SENS-8	Enhanced Infiltration	Increase recharge rates by 25% to account for potential climate change effects.	Although climate change effects is an area of on-going research, it is generally agreed that precipitation will increase in the New Brunswick region and this scenario accounts for climate change by increasing the recharge that occurs to the groundwater system.

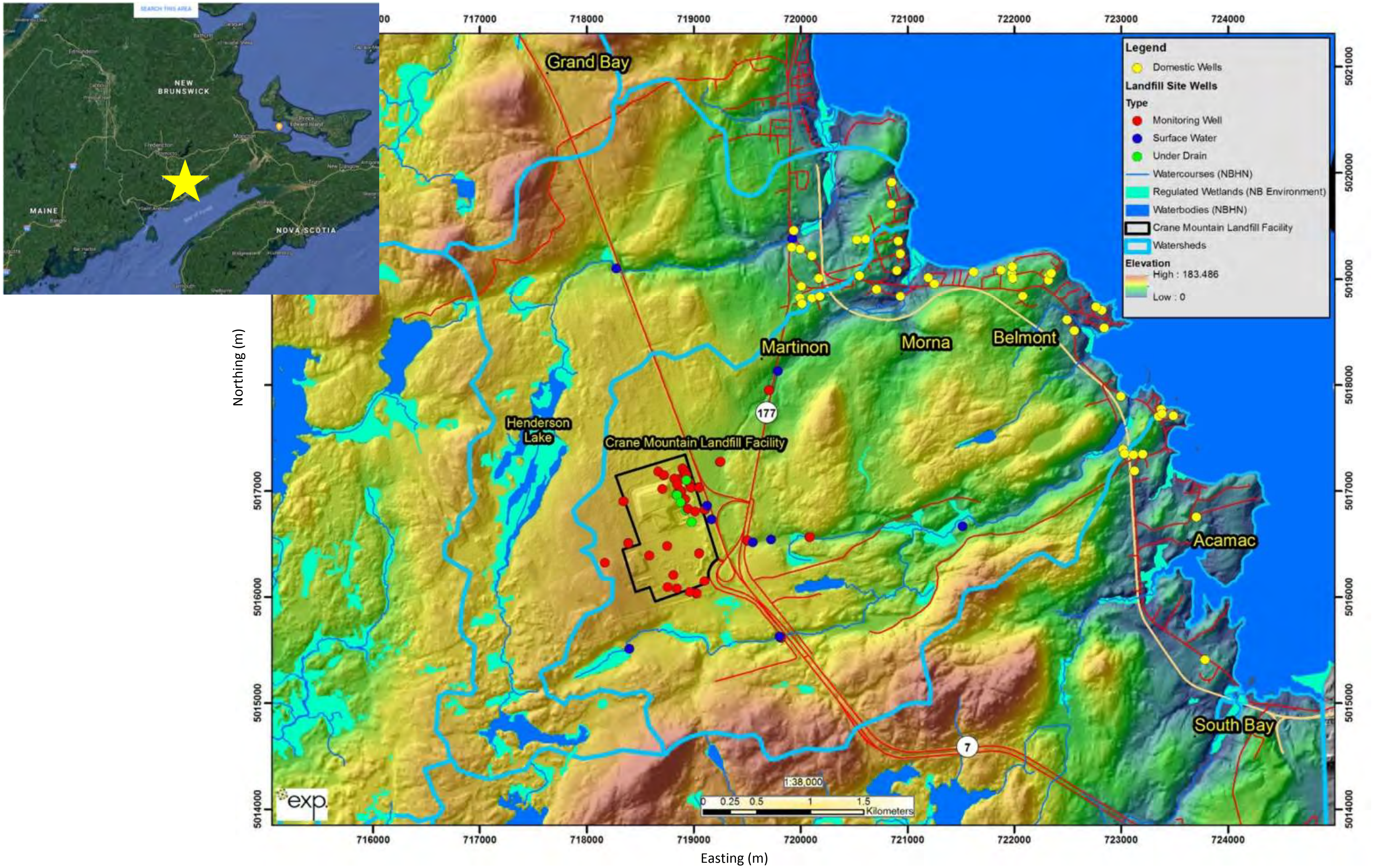
Table 5: Hydraulic Parameters and Boundary Conditions - Sensitivity Scenarios

		Effective Porosity		Hydraulic Conductivity Parameters [m/s]										
	Hydrostratigraphic Unit	Suggested Range from Phase 1	Base Case	Hydraulic Conductivity Parameter	Phase 1 Table 4.1 Suggested Ranges	Base Case	SENS-1 (more permeable Till)	SENS-2 (fractured Till)	SENS-3 (more permeable upper bedrock)	SENS-4 (no active fault zones)	SENS-5 (more permeable bedrock)	SENS-6 (reduced SW-GW connection)	SENS-7 (landfill source flux)	SENS-8 (climate change)
Quaternary Units	Tb: Till blanket	0.2 - 0.3	0.25	Kh	$1x10^{-8}$ to $1x10^{-6}$	1.0E-7	1.0E-6	1.0E-7	1.0E-7	1.0E-7	1.0E-7	All hydraulic conductivity parameters the same as the Base Case except that the conductivity of the surficial material underneath surface water features are reduced by a factor of 10x.	1.0E-7	All hydraulic conductivity parameters the same as the Base Case. Recharge rates are increased by 25%.
				Kv	$1x10^{-8}$ to $1x10^{-6}$	1.0E-7	1.0E-6	1.0E-6	1.0E-7	1.0E-7	1.0E-7		1.0E-7	
				Ratio (Kh/Kv)	1.0	1.0	1.0	0.1	1.0	1.0	1.0		1.0	
	Tv: Till veneer	0.2 - 0.3	0.25	Kh	$1x10^{-8}$ to $1x10^{-6}$	1.0E-7	1.0E-6	1.0E-7	1.0E-7	1.0E-7	1.0E-7		1.0E-7	
				Kv	$1x10^{-8}$ to $1x10^{-6}$	1.0E-7	1.0E-6	1.0E-6	1.0E-7	1.0E-7	1.0E-7		1.0E-7	
				Ratio (Kh/Kv)	1.0	1.0	1.0	0.1	1.0	1.0	1.0		1.0	
	GMn: Glaciomarine	Only Till unit discussed in Phase 1 report	0.15	Kh	Only Till unit discussed in Phase 1 report.	1.0E-6	1.0E-6	1.0E-6	1.0E-6	1.0E-6	1.0E-6		1.0E-6	
				Kv		1.0E-7	1.0E-7	1.0E-7	1.0E-7	1.0E-7	1.0E-7		1.0E-7	
				Ratio (Kh/Kv)		10.0	10.0	10.0	10.0	10.0	10.0		10.0	
	GFf: Glaciofluvial		0.3	Kh	Only Till unit discussed in Phase 1 report.	1.0E-4	1.0E-4	1.0E-4	1.0E-4	1.0E-4	1.0E-4		1.0E-4	
				Kv		1.0E-5	1.0E-5	1.0E-5	1.0E-5	1.0E-5	1.0E-5		1.0E-5	
				Ratio (Kh/Kv)		10.0	10.0	10.0	10.0	10.0	10.0		10.0	
	A: Undifferentiated Alluvial Deposits		0.3	Kh	Only Till unit discussed in Phase 1 report.	1.0E-4	1.0E-4	1.0E-4	1.0E-4	1.0E-4	1.0E-4		1.0E-4	
				Kv		1.0E-5	1.0E-5	1.0E-5	1.0E-5	1.0E-5	1.0E-5		1.0E-5	
				Ratio (Kh/Kv)		10.0	10.0	10.0	10.0	10.0	10.0		10.0	
Bedrock Units	Upper Bedrock Exfoliation Zone	0.01 - 0.03	0.02	Kh	$1x10^{-6}$ to $1x10^{-4}$	1.5E-6	1.5E-6	1.5E-6	1.5E-5	1.5E-6	1.5E-6		1.5E-6	
				Kv	$1x10^{-6}$ to $1x10^{-4}$	1.5E-6	1.5E-6	1.5E-6	1.5E-5	1.5E-6	1.5E-6		1.5E-6	
				Ratio (Kh/Kv)	> 1	1.0	1.0	1.0	1.0	1.0	1.0		1.0	
	Igneous Plutonic Bedrock HU	0.001 - 0.01	0.01	Kh	$1x10^{-10}$ to $1x10^{-7}$	1.0E-8	1.0E-8	1.0E-8	1.0E-8	1.0E-8	1.0E-7		1.0E-8	
				Kv	$1x10^{-10}$ to $1x10^{-7}$	1.0E-8	1.0E-8	1.0E-8	1.0E-8	1.0E-8	1.0E-7		1.0E-8	
				Ratio (Kh/Kv)	1.0	1.0	1.0	1.0	1.0	1.0	1.0		1.0	
	Metamorphic Bedrock HU	0.001 - 0.01	0.01	Kh	$1x10^{-7}$ to $1x10^{-5}$	1.0E-8	1.0E-8	1.0E-8	1.0E-8	1.0E-8	1.0E-7		1.0E-8	
				Kv	$1x10^{-7}$ to $1x10^{-5}$	1.0E-6	1.0E-6	1.0E-6	1.0E-6	1.0E-6	1.0E-5		1.0E-6	
				Ratio (Kh/Kv)	<< 1	0.01	0.01	0.0	0.01	0.0	0.01		0.0	
	Strike-Slip Faults	0.01 - 0.05	0.03	Kh	$1x10^{-6}$ to $1x10^{-4}$	1.0E-7	1.0E-7	1.0E-7	1.0E-7	Assigned the bedrock HU values	1.0E-7		1.0E-7	
				Kv	$1x10^{-6}$ to $1x10^{-4}$	1.0E-5	1.0E-5	1.0E-5	1.0E-5		1.0E-5		1.0E-5	
				Ratio (Kh/Kv)	<< 1	0.01	0.01	0.01	0.01		0.01		0.01	
	Thrust Faults	0.01 - 0.05	0.03	Kh	$1x10^{-6}$ to $1x10^{-4}$	1.0E-5	1.0E-5	1.0E-5	1.0E-5		1.0E-5		1.0E-5	
				Kv	$1x10^{-6}$ to $1x10^{-4}$	1.0E-7	1.0E-7	1.0E-7	1.0E-7		1.0E-7		1.0E-7	
				Ratio (Kh/Kv)	>> 1	100.0	100.0	100.0	100.0		100.0		100.0	
Recharge [mm/yr]	Till Blanket (Tb)				10 to 40 cm/yr (8% to 31% of 1,300 mm of precipitation - page 11 of Phase 1 report)	17 to 85	Adjustments made to the magnitude of the recharge applied over the existing recharge zones defined in the Base Case model to produce a reasonable match to the GEMTEC 2006 interpreted upper bedrock hydraulic head map.						Base Case recharge values applied for these scenarios.	
	Till Veneer (Tv)					50 to 128								
	Glaciomarine (GMn)					17								
	Glaciofluvial (GFf)					68								
	Alluvial (A)					85								
Landfill Source Flux (mm/yr)						0.2	0.2	0.2	0.2	0.2	0.2	0.2	34	0.2

Table 6: Water Budget Results - Sensitivity Scenarios

RUN	Water Budget Selection	Constant Heads INPUT	Constant Heads OUTPUT	Constant Heads Net IN (+) / Net OUT (-)	Recharge Vol. Flux	Recharge Areal Flux	Recharge % Change from Base Case	Recharge % of Precip.	Landfill Leakage	Total IN[1]	NET IN as Fraction of Total IN	Imbalance IN (+)/OUT (-)	Global Percent Discrepancy
		m^3/d	m^3/d	m^3/d	m^3/d	mm/yr	%	%	m^3/d	m^3/d	%	m^3/d	
Base Case	Domain	1,078	4,022	-2,944	2,944	37	0%	3%	0.14	4,022	NA	0	0.0%
	Lakes	982	470	512	Not Applicable						13%	Not Applicable	
	Streams		2,249	-2,249							-56%		
	Grand Bay	96	1,302	-1,206							-30%		
SENS-1 (more permeable Till)	Domain	1,064	4,502	-3,438	3,438	43	17%	3%	0.14	4,502	NA	0	0.0%
	Lakes	962	531	431	Not Applicable						10%	Not Applicable	
	Streams		2,633	-2,633							-58%		
	Grand Bay	102	1,338	-1,236							-27%		
SENS-2 (v2) (fractured Till)	Domain	1,079	4,373	-3,294	3,294	41	12%	3%	0.14	4,373	NA	0	0.0%
	Lakes	974	514	460	Not Applicable						11%	Not Applicable	
	Streams		2,523	-2,523							-58%		
	Grand Bay	105	1,336	-1,231							-28%		
SENS-3 (more permeable Upper Bedrock)	Domain	1,697	15,447	-13,750	13,750	173	367%	13%	0.14	15,447	NA	0	0.0%
	Lakes	1,599	4,214	-2,615	Not Applicable						-17%	Not Applicable	
	Streams		10,002	-10,002							-65%		
	Grand Bay	98	1,231	-1,133							-7%		
SENS-4 (no active fault zones)	Domain	185	1,945	-1,760	1,760	22	-40%	2%	0.14	1,945	NA	0	0.0%
	Lakes	111	268	-157	Not Applicable						-8%	Not Applicable	
	Streams		1,338	-1,338							-69%		
	Grand Bay	74	339	-265							-14%		
SENS-5 (more permeable bedrock)	Domain	1,090	5,314	-4,224	4,224	53	43%	4%	0.14	5,314	NA	0	0.0%
	Lakes	1,004	679	325	Not Applicable						6%	Not Applicable	
	Streams		3,095	-3,095							-58%		
	Grand Bay	86	1,540	-1,454							-27%		
SENS-6 (reduced SW-GW connection)	Domain	756	3,700	-2,944	2,944	37	0%	3%	0.14	3,700	NA	0	0.0%
	Lakes	659	491	168	Not Applicable						5%	Not Applicable	
	Streams		1,938	-1,938							-52%		
	Grand Bay	97	1,271	-1,174							-32%		
SENS-7 (landfill source flux)	Domain	1,073	4,040	-2,967	2,966	37	1%	3%	23.00	4,039	NA	-1	0.0%
	Lakes	977	476	501	Not Applicable						12%	Not Applicable	
	Streams		2,262	-2,262							-56%		
	Grand Bay	96	1,302	-1,206							-30%		
SENS-8 (climate change)	Domain	1,001	4,680	-3,679	3,679	46	25%	4%	0.14	4,680	NA	0	0.0%
	Lakes	892	581	311	Not Applicable						7%	Not Applicable	
	Streams		2,736	-2,736							-58%		
	Grand Bay	109	1,363	-1,254							-27%		

Appendix 2 – REPORT FIGURES



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Site Location Showing Topography, Surface Drainage and Watershed Boundaries

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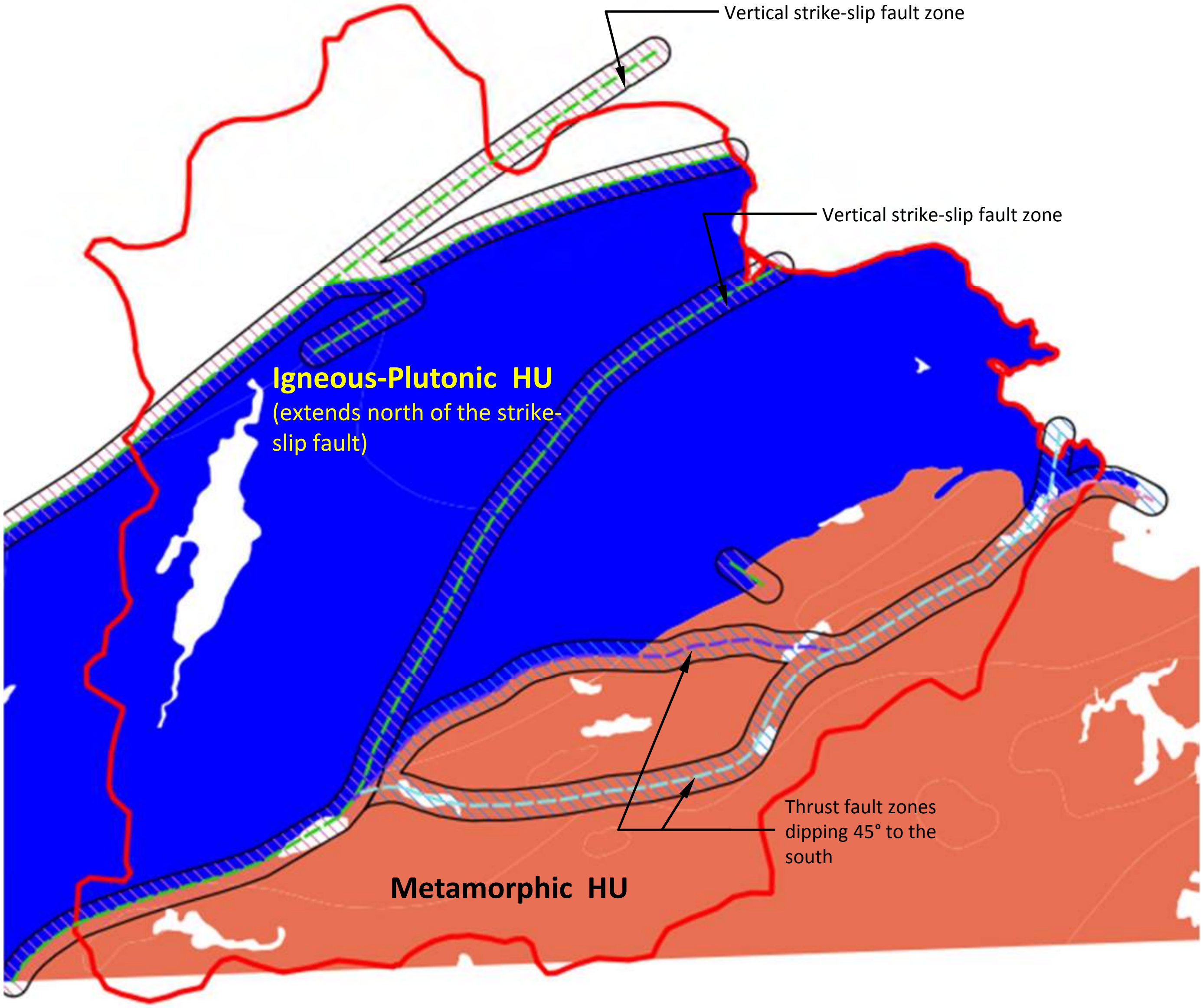
Figure
1

f:\26307\551\reporting\figures\fig 1 - site location.pptm



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Bedrock Subcrop Map and Structural Features

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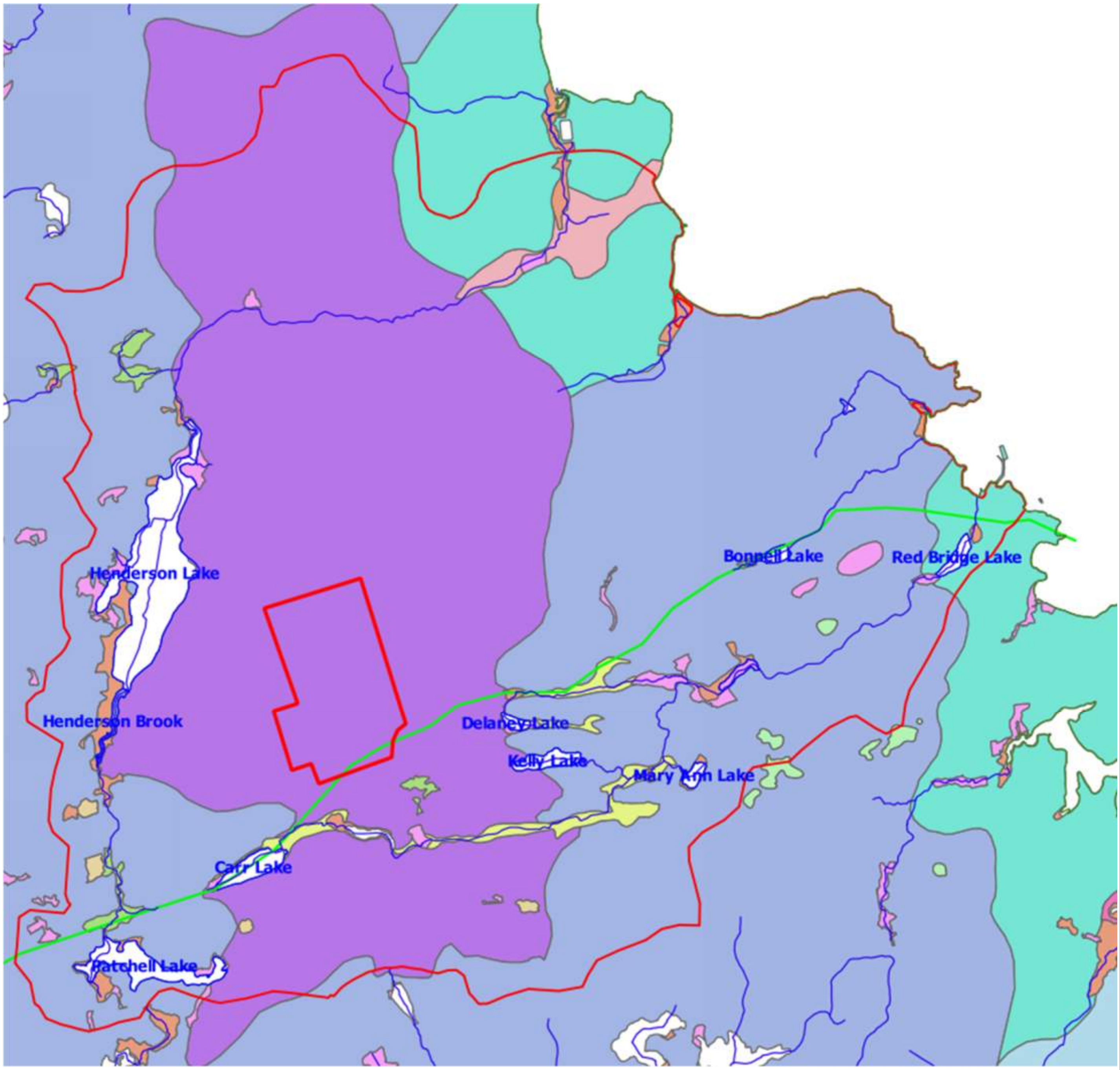
Figure
2

f:\26307\551\reporting\figures\fig 4 - interpreted thickness of surficial sediments.pptm



A	Alluvial sediments: undifferentiated
GFf	Glaciofluvial sediments: subaqueous outwash fan
GMn	Glaciomarine sediments - Littoral and nearshore sediments
GM	Glaciomarine sediments: undifferentiated
GMm	Glaciomarine sediments: submarine moraine
GMn	Glaciomarine sediments: littoral and nearshore
Owb	Organic deposits: bog
Owf	Organic deposits: fen
Owm	Organic deposits: marsh
Owv	Organic deposits: veneer
R	Bedrock
Tb	Glacial sediments: blanket
Tv	Glacial sediments: veneer

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Surficial Geology

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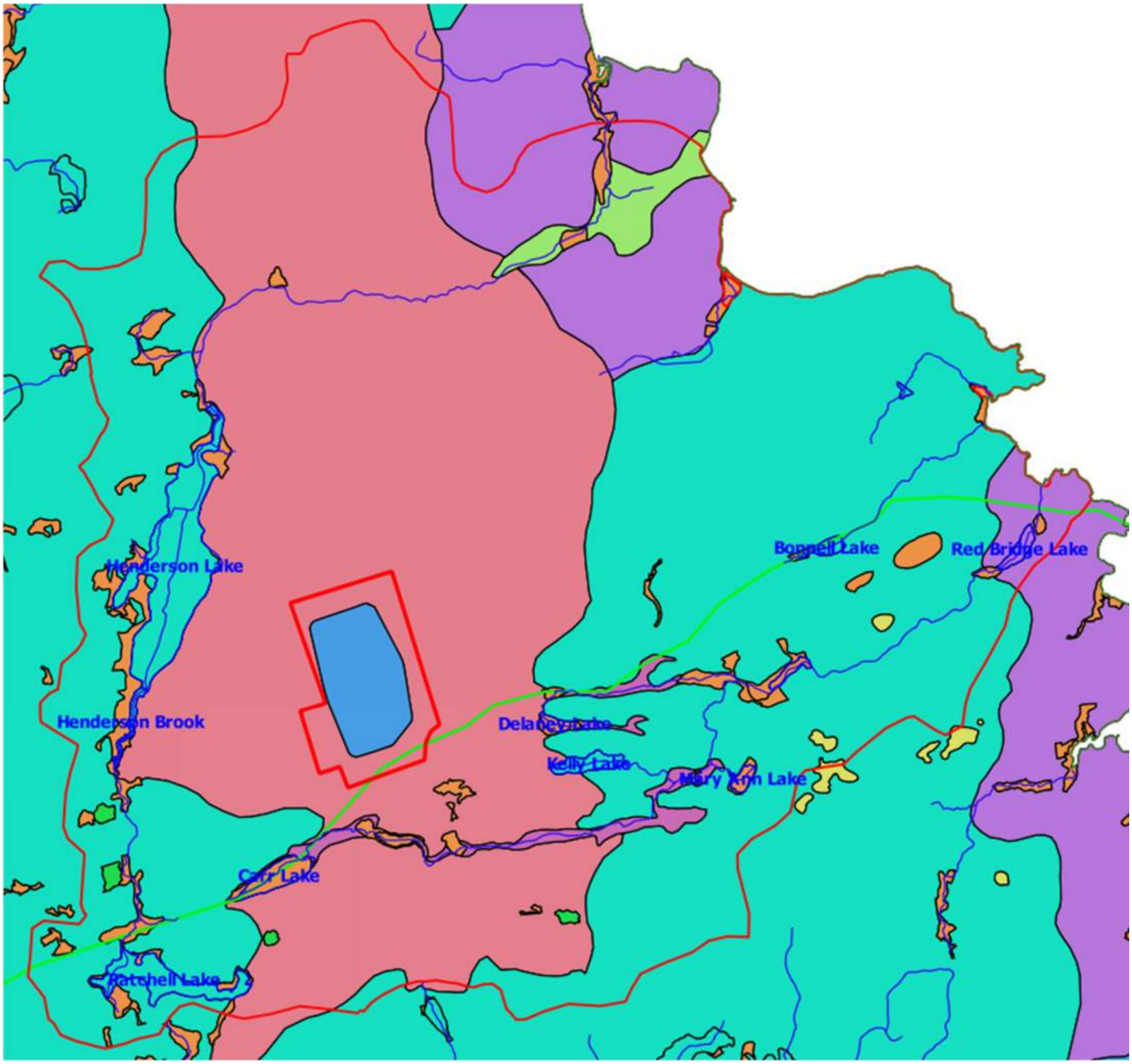
Figure 3



Sediment Thickness (m)

- 0
- 0.5
- 1
- 1.25
- 1.75
- 2
- 2.5
- 4
- 5

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Interpreted Thickness of Surficial Sediments

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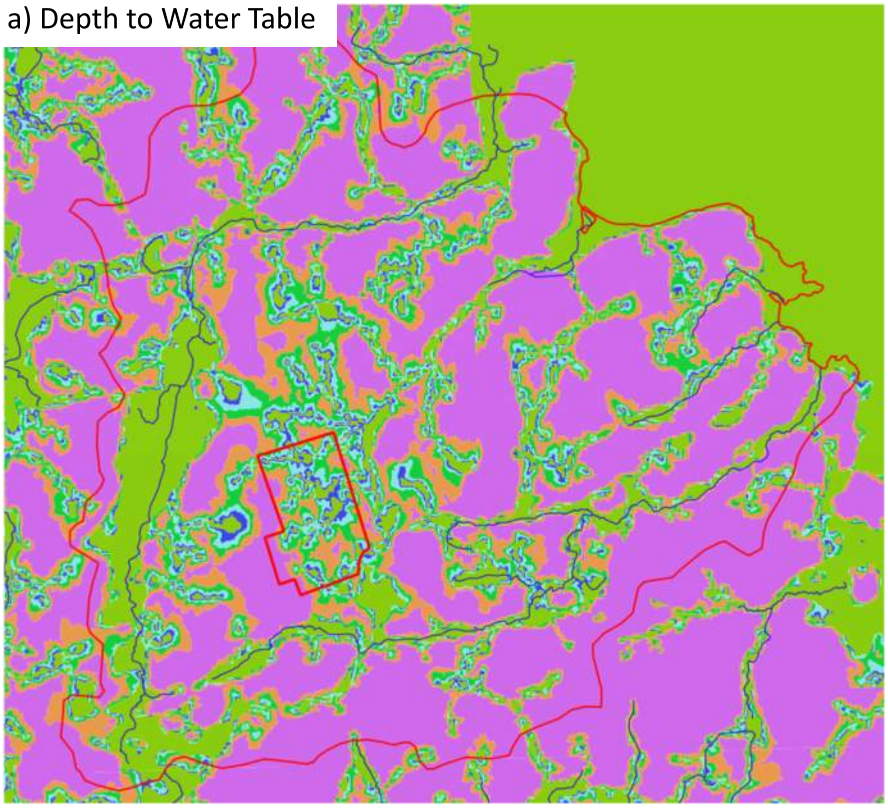
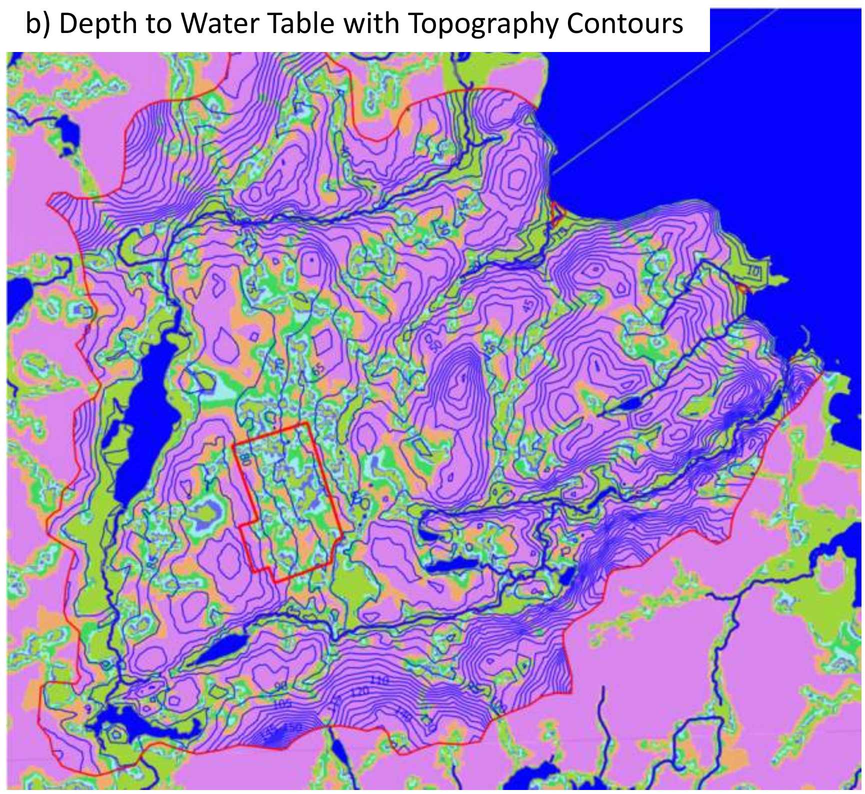
Figure 4

f:\26307\551\reporting\figures\fig 4 - interpreted thickness of surficial sediments.pptm

a) Depth to Water Table



b) Depth to Water Table with Topography Contours



Water Table Depth (m)

1
2
3
4
5
6

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Interpreted Water Table Depth

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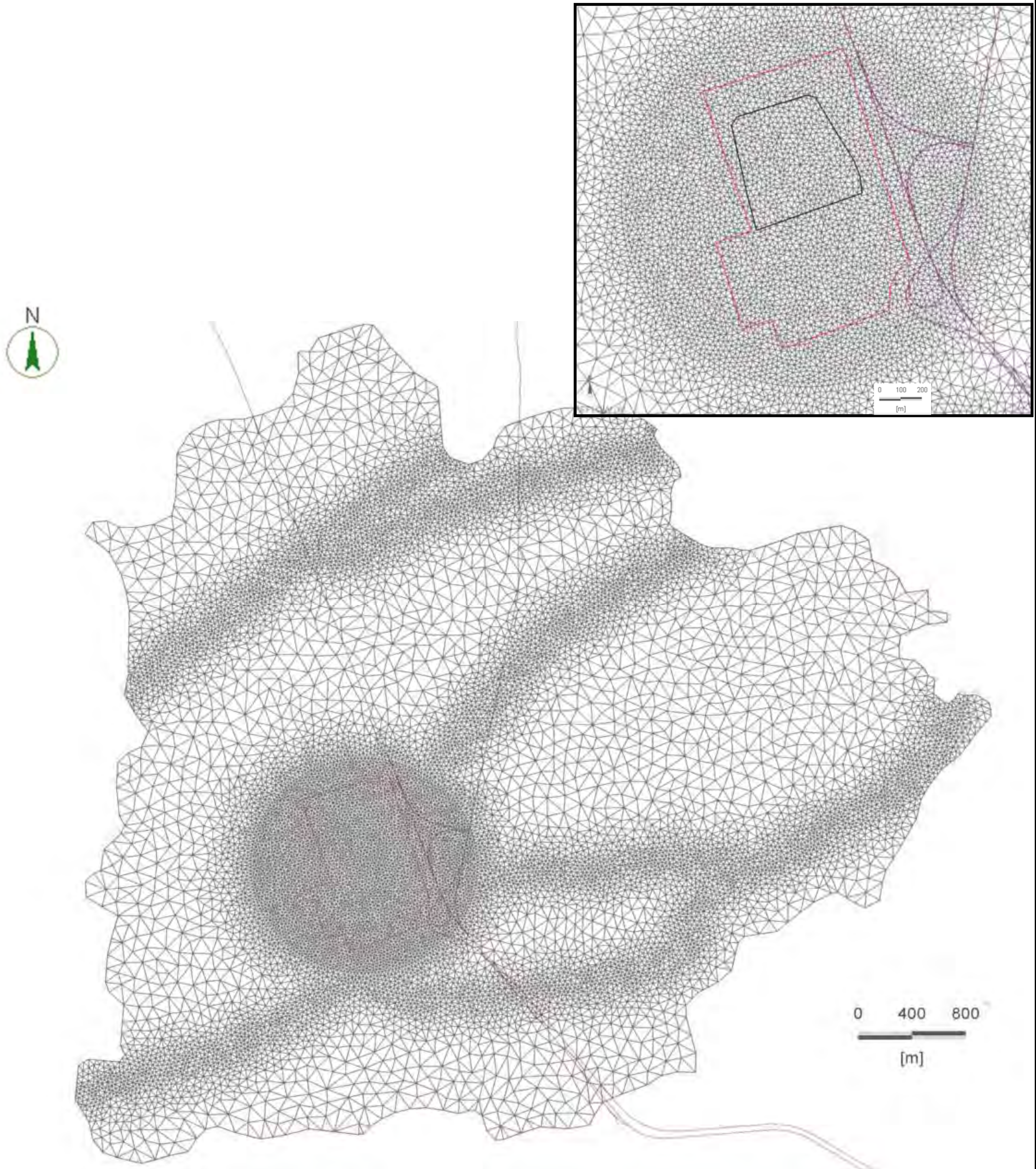
Figure
5

f:\26307\551\reporting\figures\fig 5 - interpreted water table depth.pptm



Notes:

1) Cross-section locations shown are for Figures 9, 10, 13 and 14.

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Model Domain and Numerical Mesh

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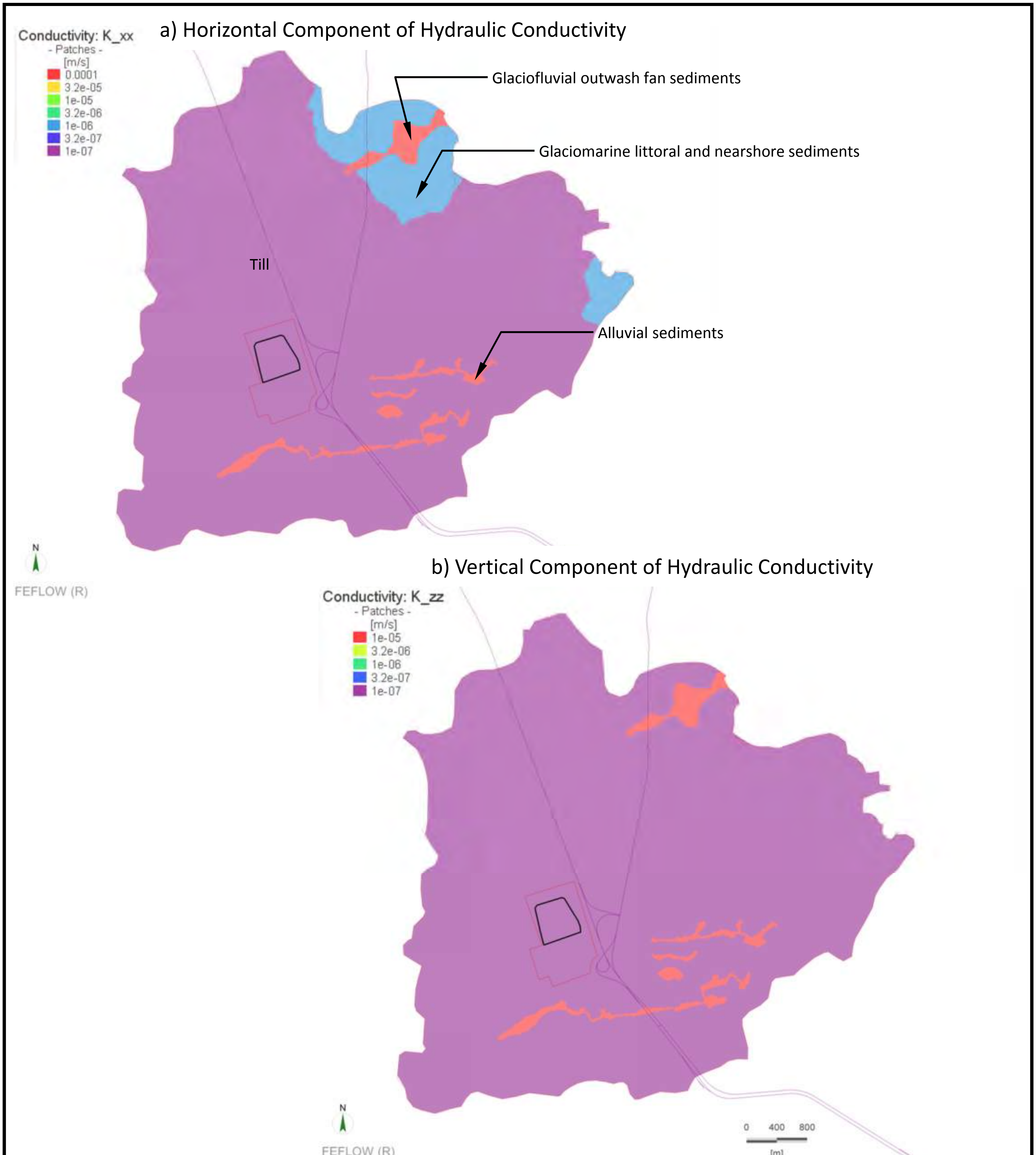
Figure 6



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Hydraulic Conductivity Assigned Over Model Layer 1 – Surficial Sediments

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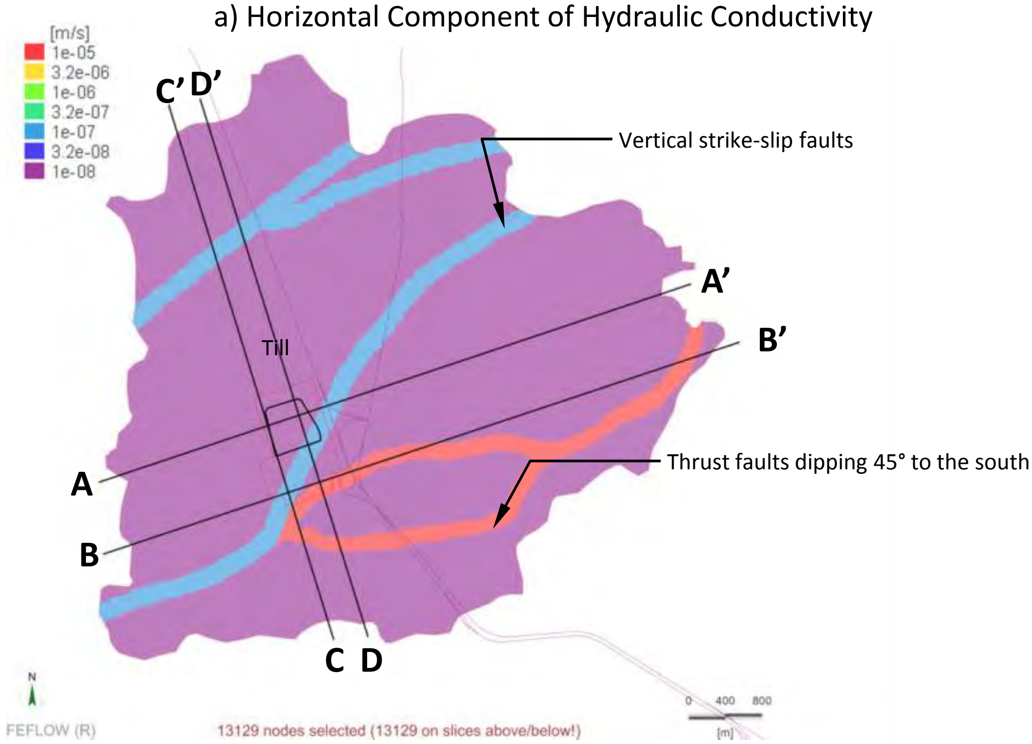
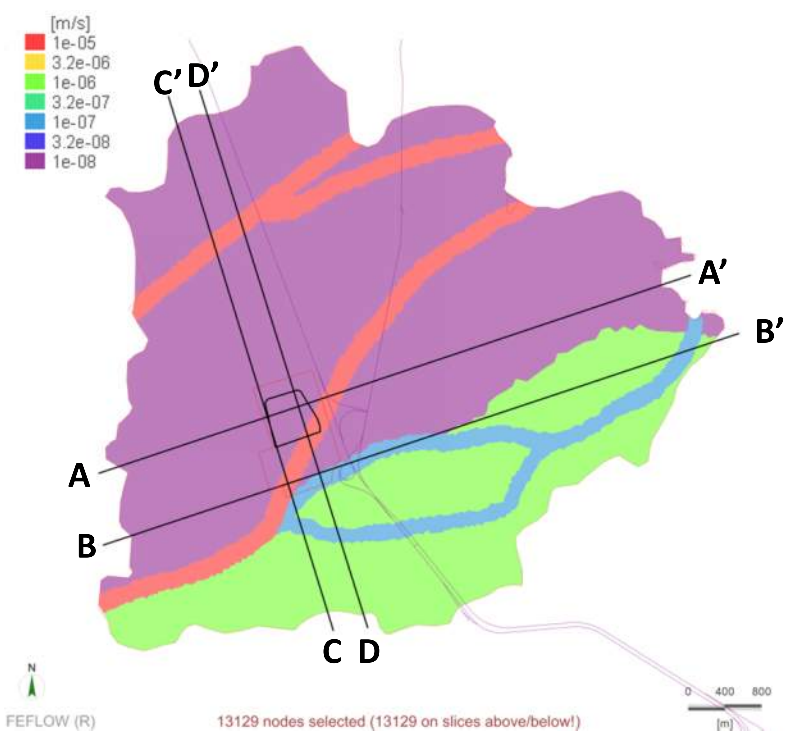
Figure
7

a) Horizontal Component of Hydraulic Conductivity



b) Vertical Component of Hydraulic Conductivity



Notes:

1) Cross-section locations shown are for Figures 9, 10, 13 and 14.

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Hydraulic Conductivity Assigned Over Model Layer 3 – Bedrock

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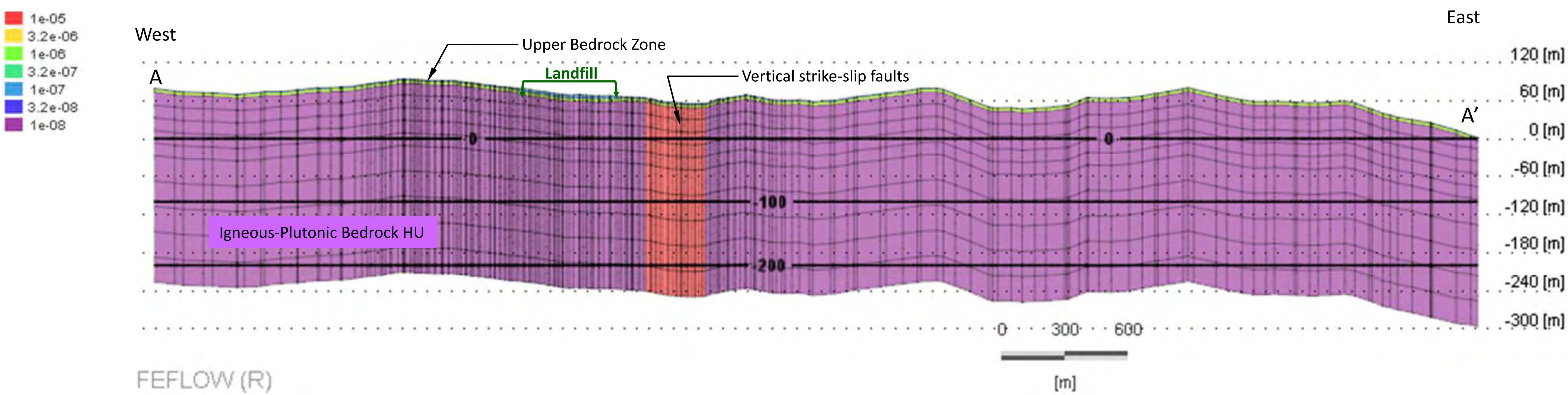
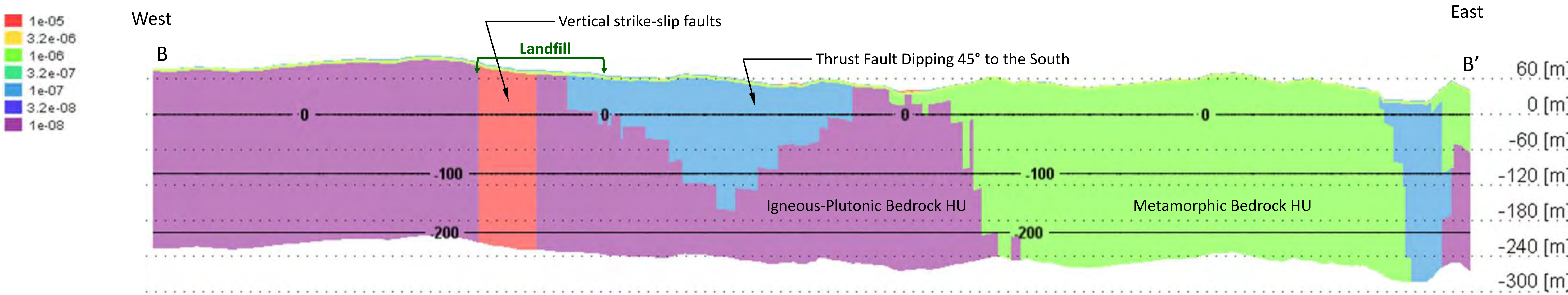
Figure 8

a) Vertical Component of Hydraulic Conductivity Along Cross-Section AA’



b) Vertical Component of Hydraulic Conductivity Along Cross-Section BB’



Notes:

1) Vertical exaggeration is 3x.
2) Refer to Figure 8 for cross-section locations.

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Hydraulic Conductivity Along West-East Cross-Sections AA’ and BB’

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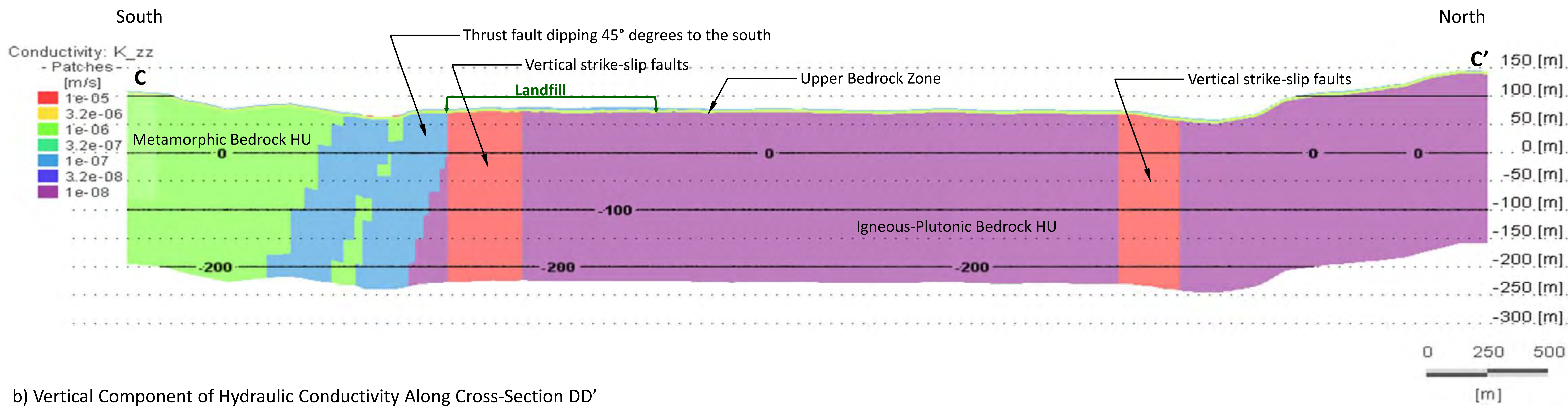
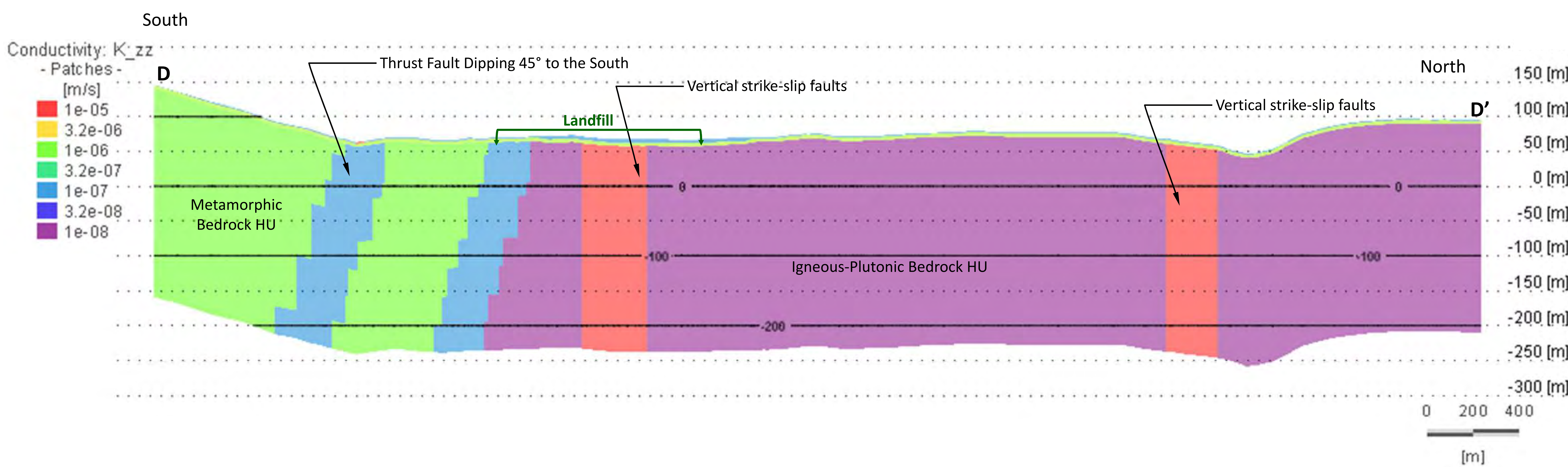
Figure 9

f:\26307\551\reporting\figures\fig 9 - k-field over section aa' & bb'.pptm

a) Vertical Component of Hydraulic Conductivity Along Cross-Section CC’



b) Vertical Component of Hydraulic Conductivity Along Cross-Section DD’



Notes:
1) Vertical exaggeration is 3x.
2) Refer to Figure 8 for cross-section locations.

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Hydraulic Conductivity Along West-East Cross-Sections CC’ and DD’

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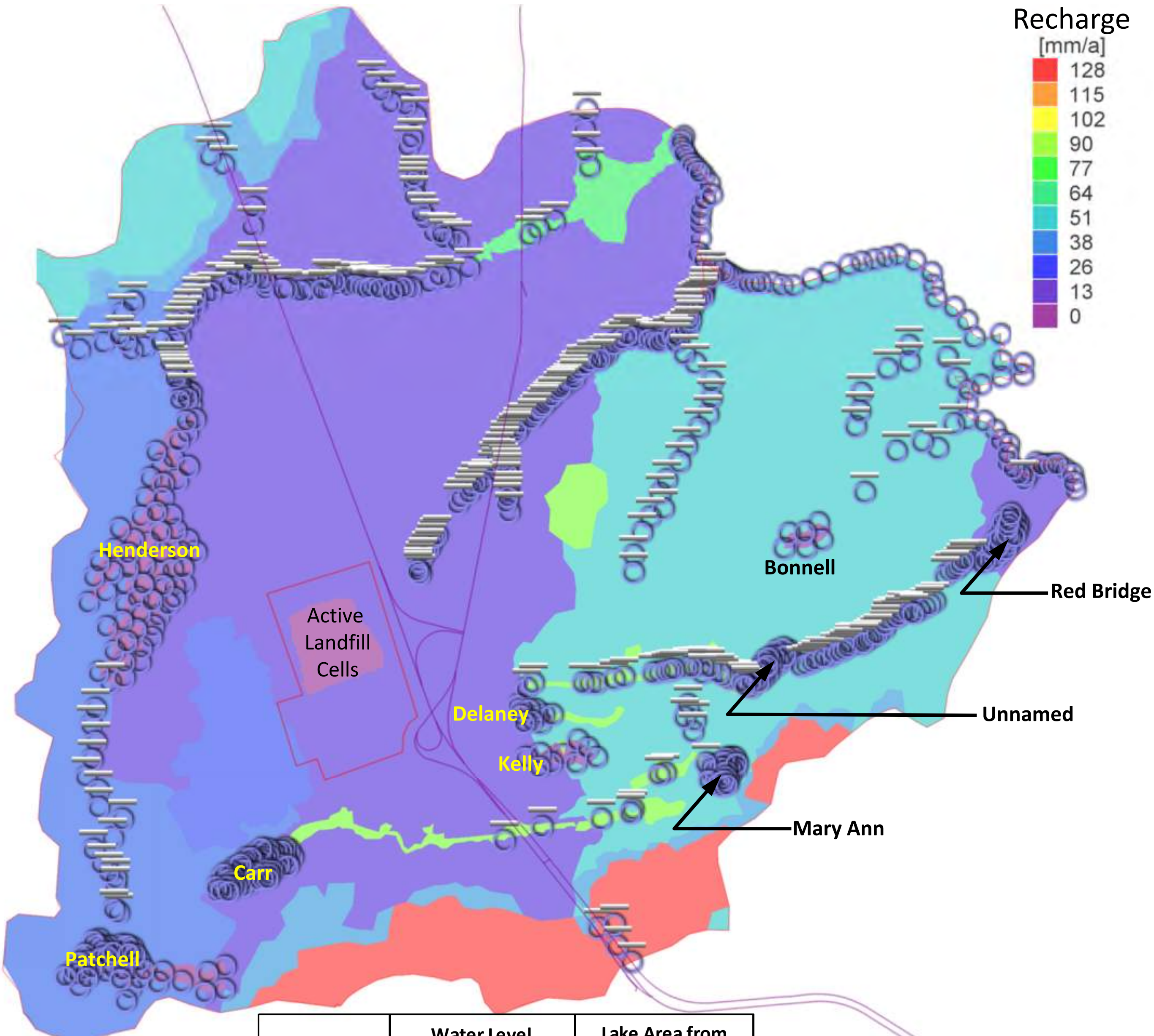
Figure 10

f:\26307\551\reporting\figures\fig 9 - k-field over section aa' & bb'.pptm



Lake	Water Level Assigned in Model [masl]	Lake Area from Waterbody GIS File [m^2]
Patchell	77	126,886
Carr	70.5	58,251
Henderson	69.5	460,962
Kelly	62	40,572
Bonnell	61.5	19,404
Delaney	56.5	13,661
Mary Ann	52	16,792
Unnamed	31.5	16,364
Red Bridge	20	23,928

Specified Head Lake Boundary

Specified Stream Boundary

NOTES:

1. Lake boundaries allow water to either enter or exit the groundwater system depending on nearby simulated heads. Stream boundaries are constrained to only allow water to drain from the groundwater system into the surface water system.
2. Flux applied over the active landfill cells based on reported ranges discussed in Section 4.4.4.

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Model Boundary Conditions

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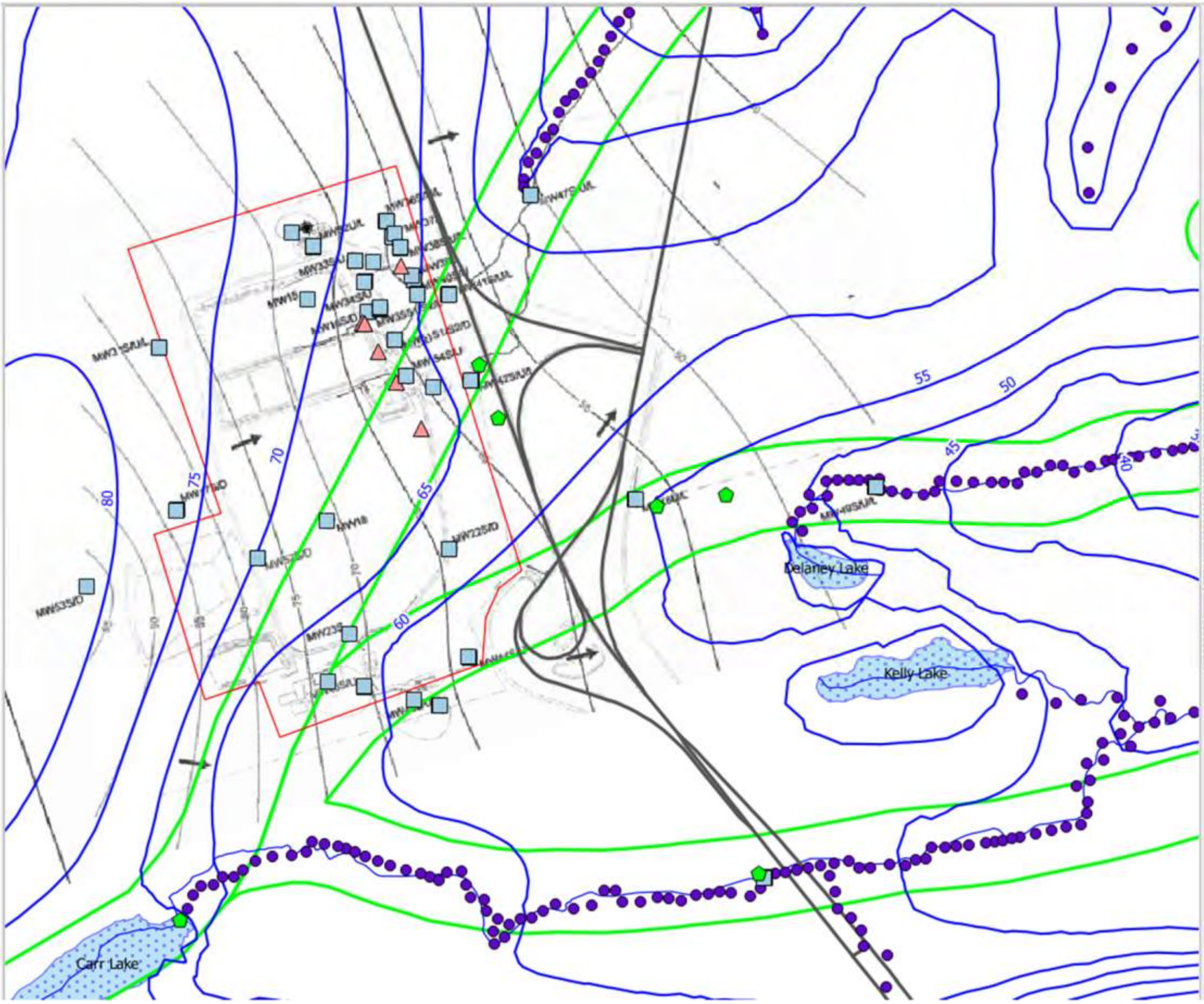
Figure 11



NOTES:

1. Base map shows interpreted upper bedrock hydraulic heads from the November 2006 GEMTEC Update of Bedrock Hydrogeology report.

75 Base Case Simulated Head Contours

Surface Water Drainage Boundary Condition

Monitoring Well Location

Surface Water Monitoring Location

Under Drain

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Base Case Hydraulic Head Distribution and Groundwater Flow Patterns – Plan View

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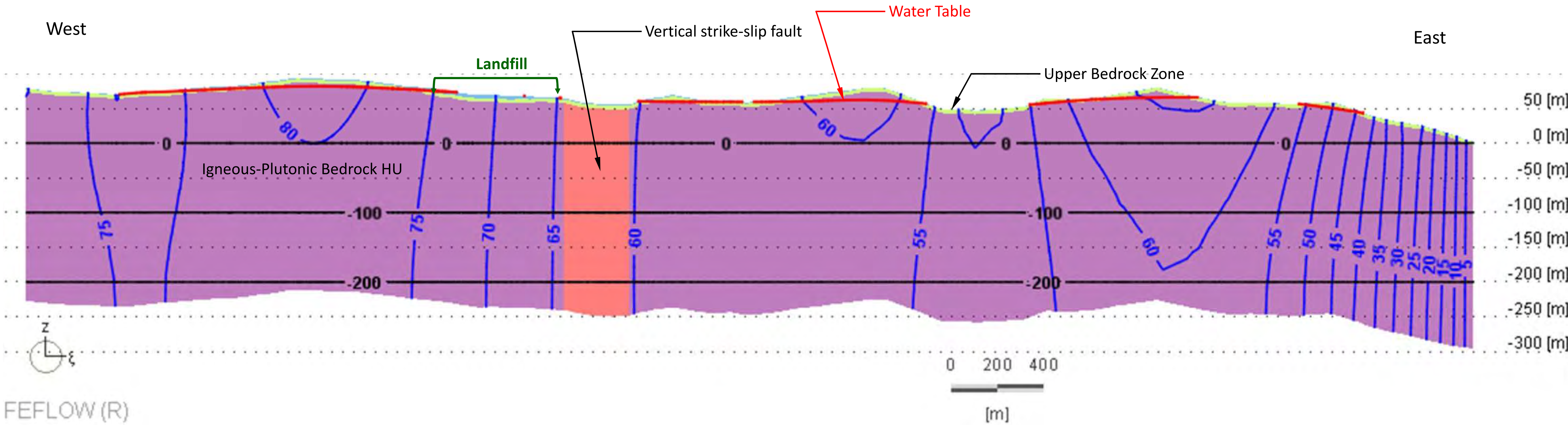
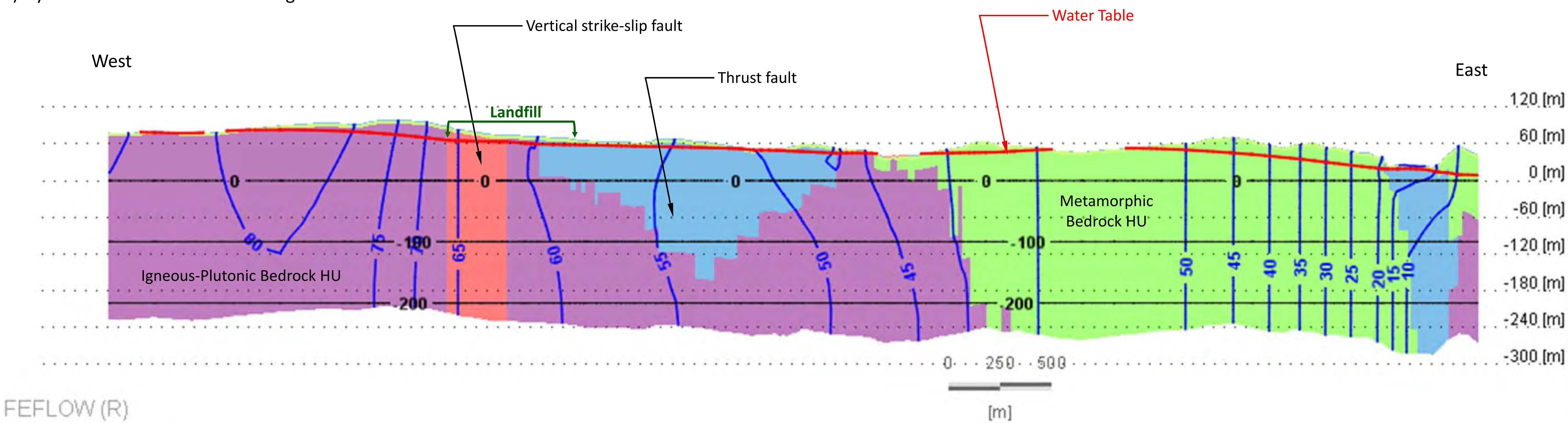
Figure 12

a) Hydraulic Head Distribution Along Cross-Section AA’



b) Hydraulic Head Distribution Along Cross-Section BB’



Notes:

1) Vertical exaggeration is 10x.
2) Refer to Figure 8 for cross-section locations.

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Base Case Hydraulic Heads Along West-East Cross-Sections AA’ and BB’

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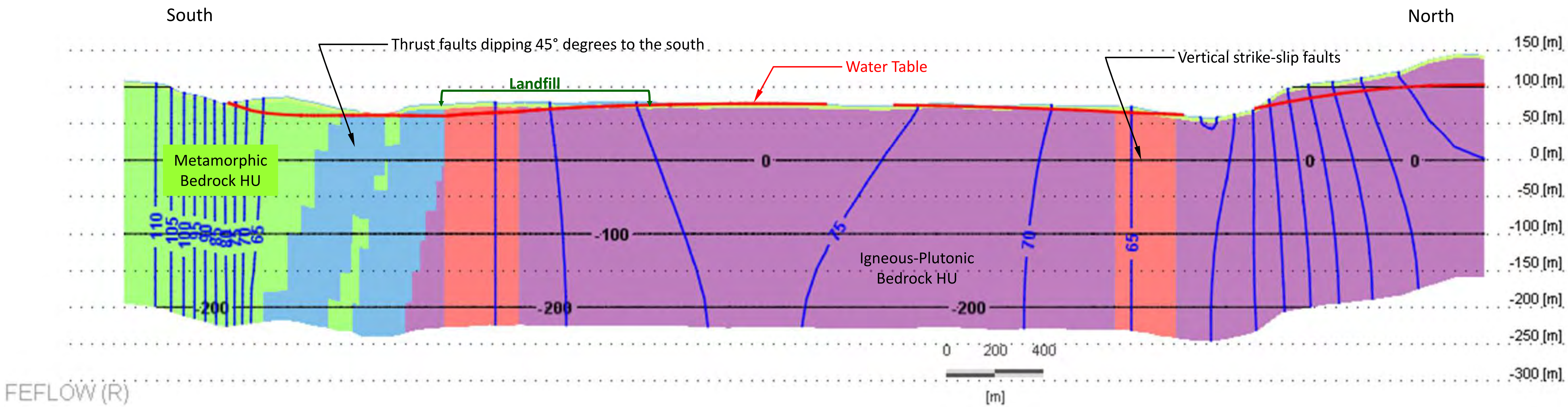
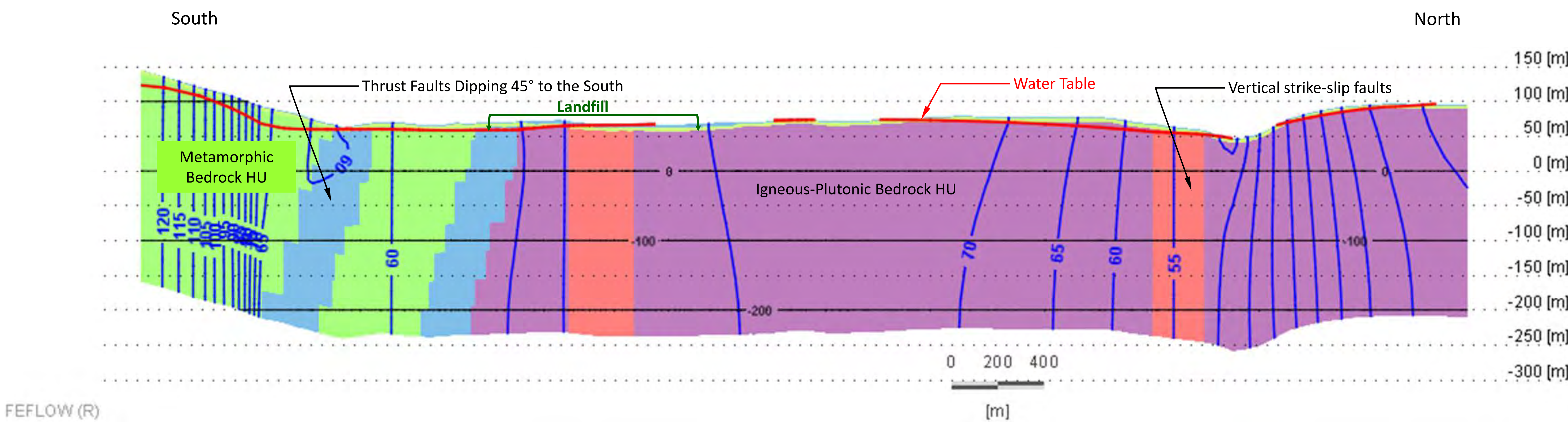
Figure 13

a) Hydraulic Head Distribution Along Cross-Section CC’



b) Hydraulic Head Distribution Along Cross-Section DD’



Notes:

1) Vertical exaggeration is 3x.
2) Refer to Figure 8 for cross-section locations.

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Base Case Hydraulic Heads Along South-North Cross-Sections CC’ and DD’

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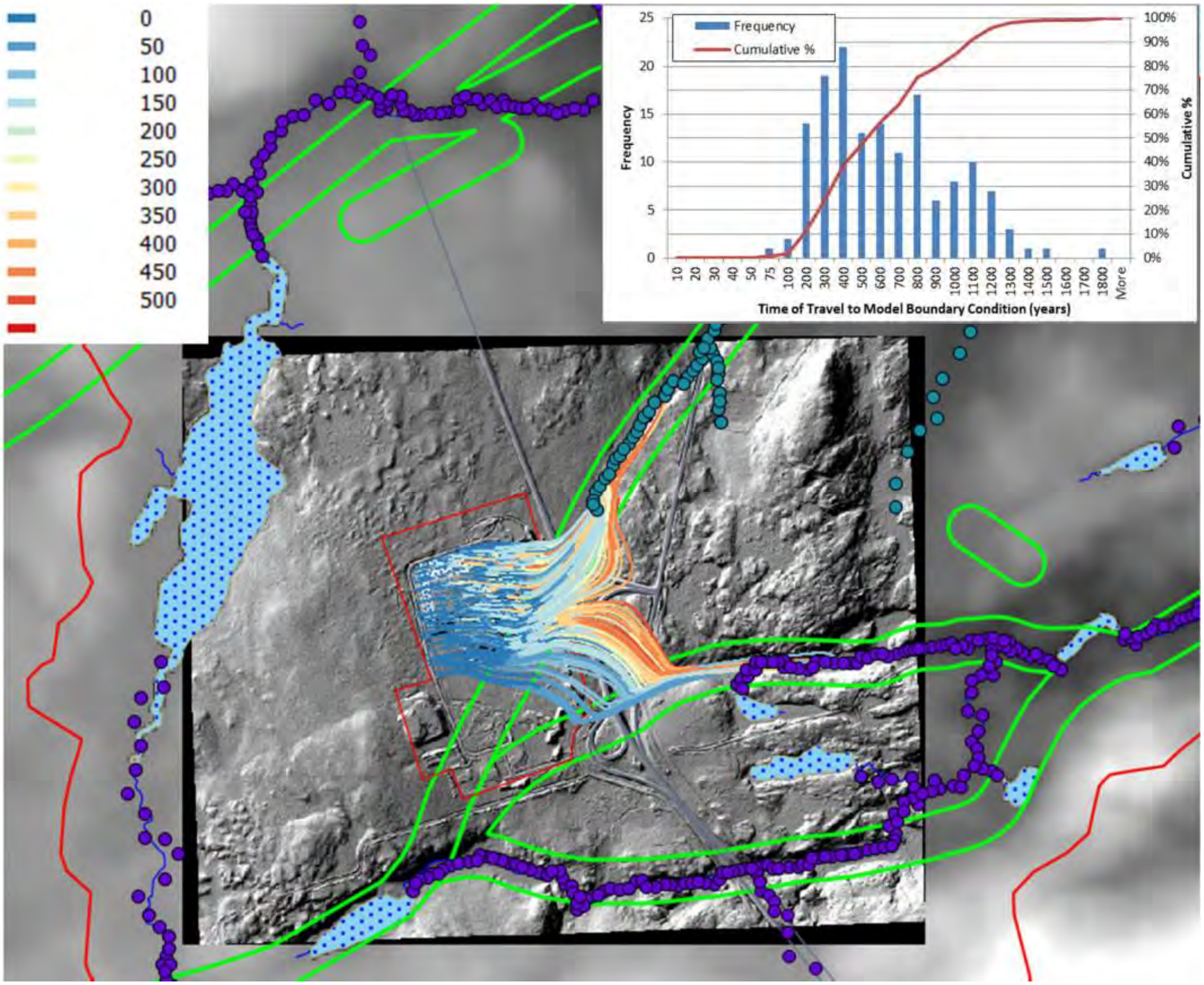
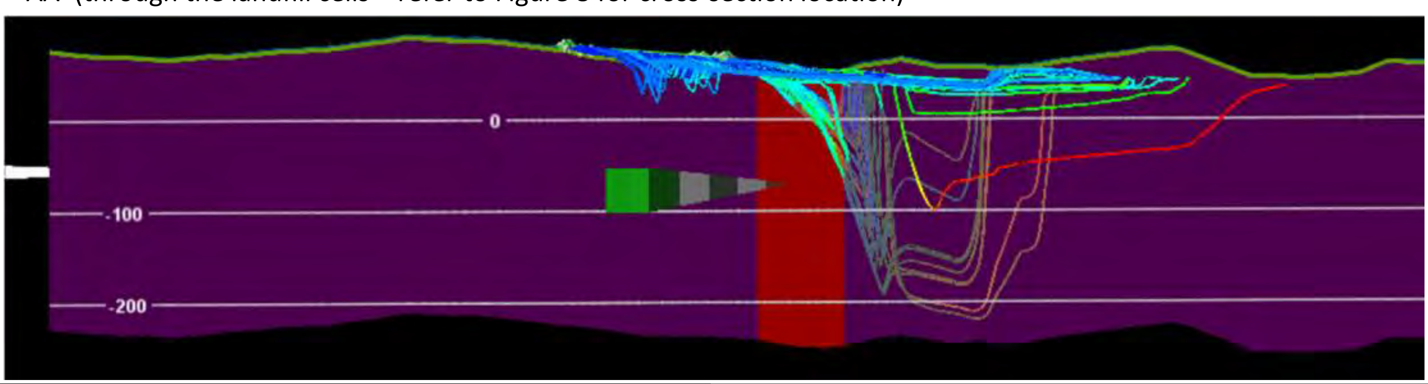
Figure 14

a) Pathlines showing time of travel (years) as particles migrate to surface water discharge locations



b) 3D view (looking north) of pathlines superimposed on the vertical conductivity distribution along cross-section AA' (through the landfill cells – refer to Figure 8 for cross-section location)



- Stream boundary nodes assigned over extended drainage network
- Stream boundary nodes assigned over NB watercourse GIS layer

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Base Case Pathline Results

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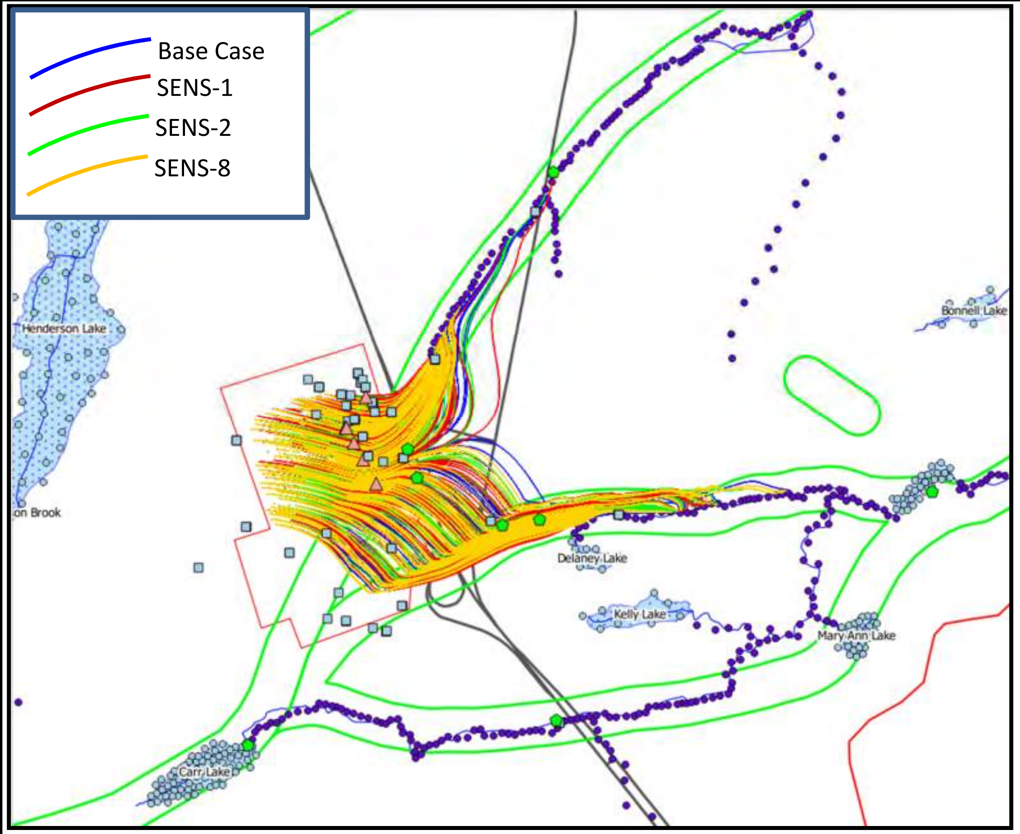
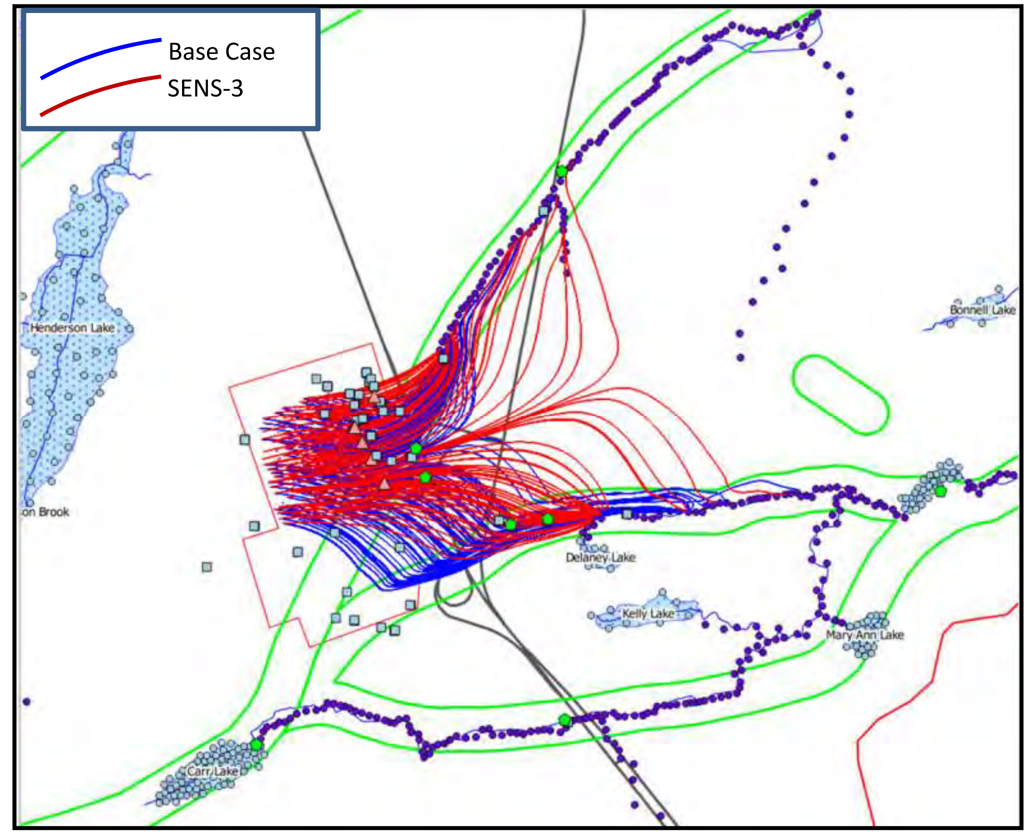
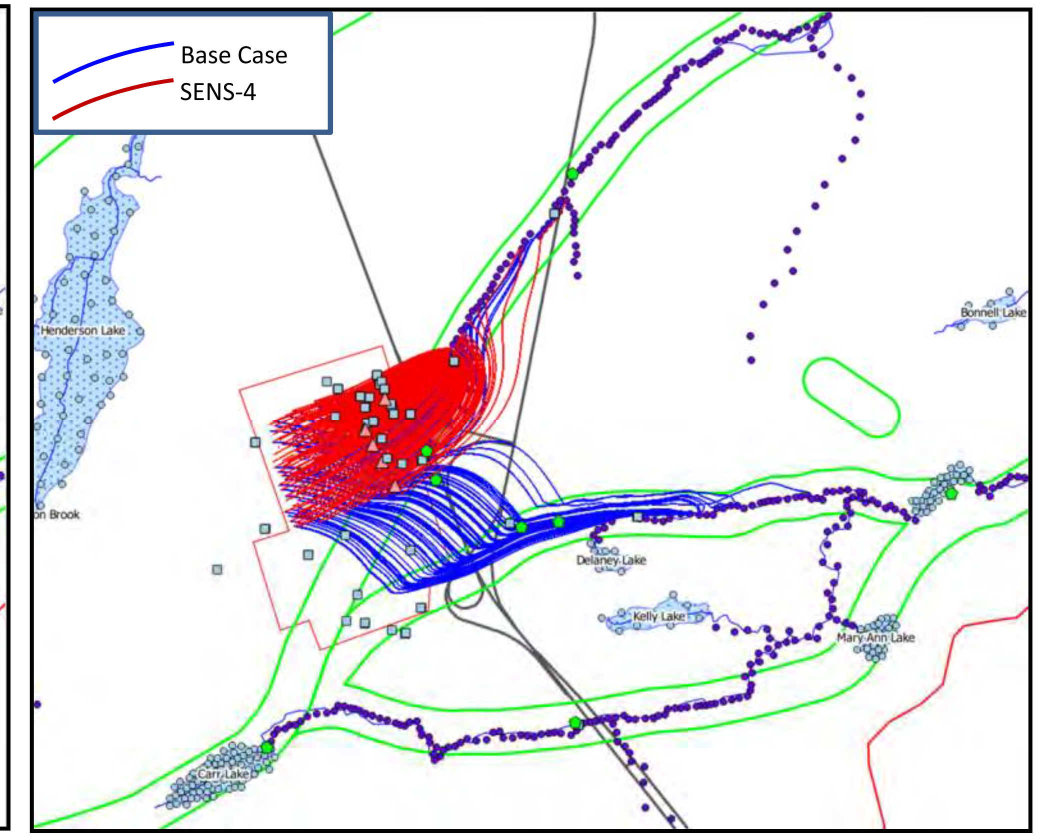
Figure 15



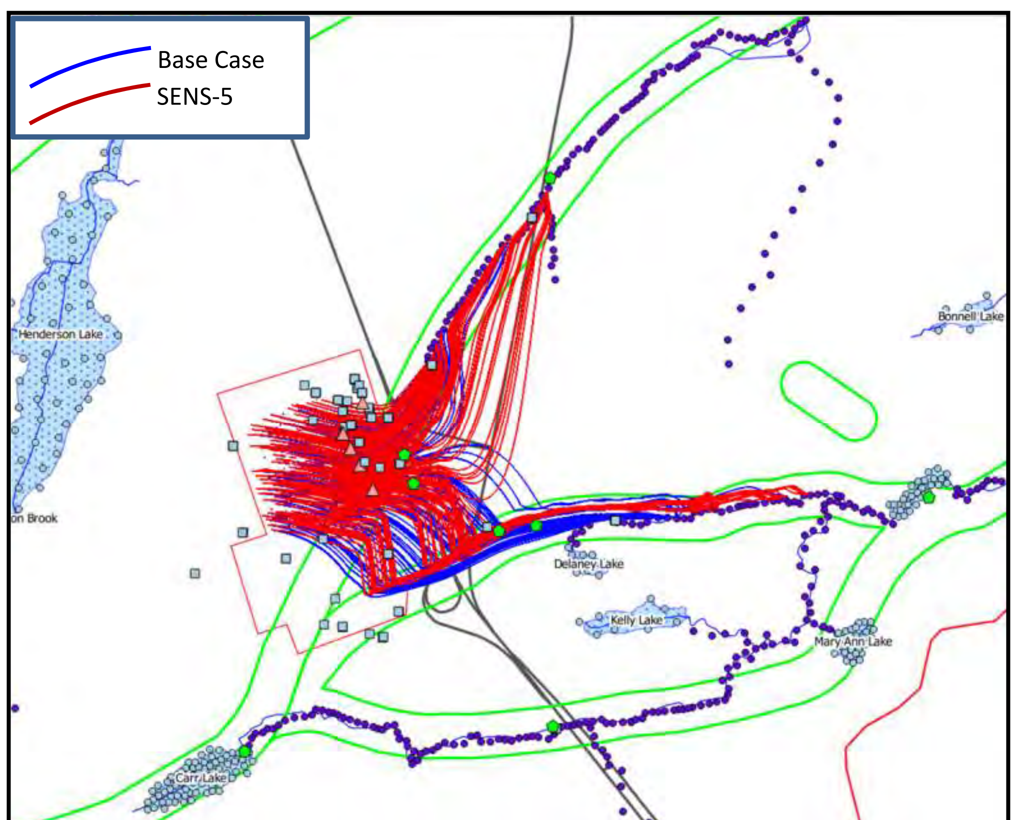
a) Pathline traces for the Base Case, SENS-1, SENS-2 and SENS-8 scenarios



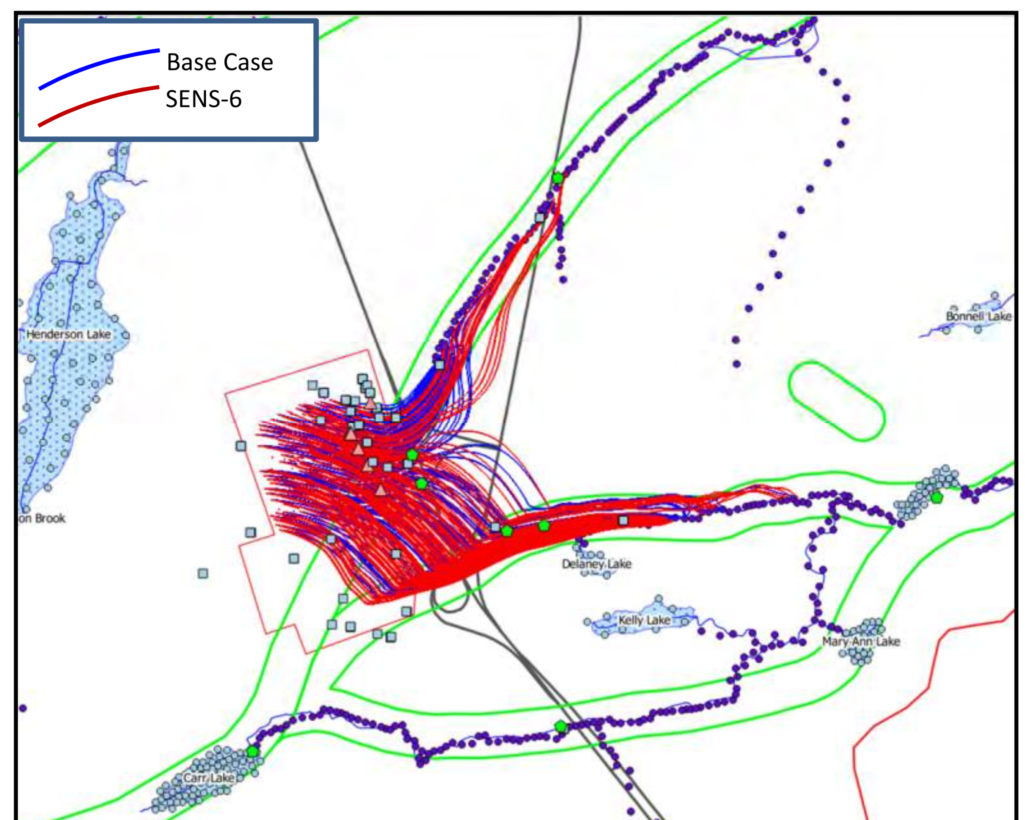
b) Pathline traces for the Base Case and SENS-3 scenarios



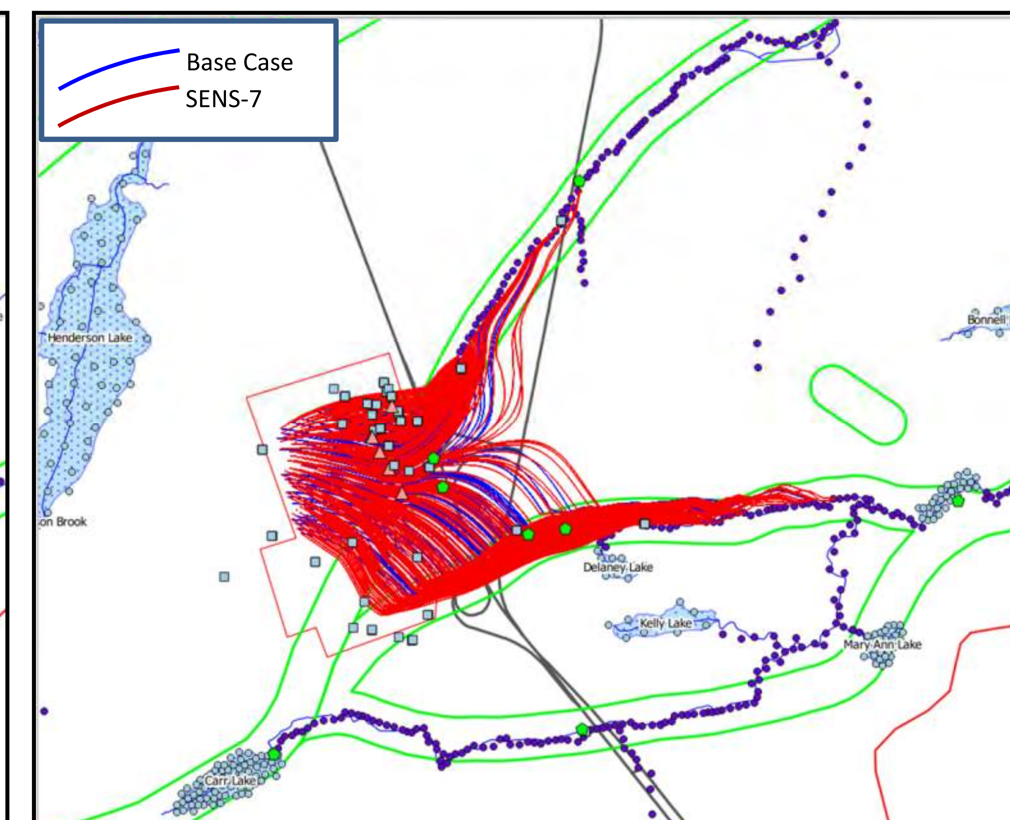
c) Pathline traces for the Base Case and SENS-4 scenarios



d) Pathline traces for the Base Case and SENS-5 scenarios



e) Pathline traces for the Base Case and SENS-6 scenarios



f) Pathline traces for the Base Case and SENS-7 scenarios

- Lake Boundary Nodes
- Stream Boundary Nodes
- Monitoring Well Location
- Surface Water Monitoring Location
- Under Drain

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Pathline Results for Sensitivity Scenarios

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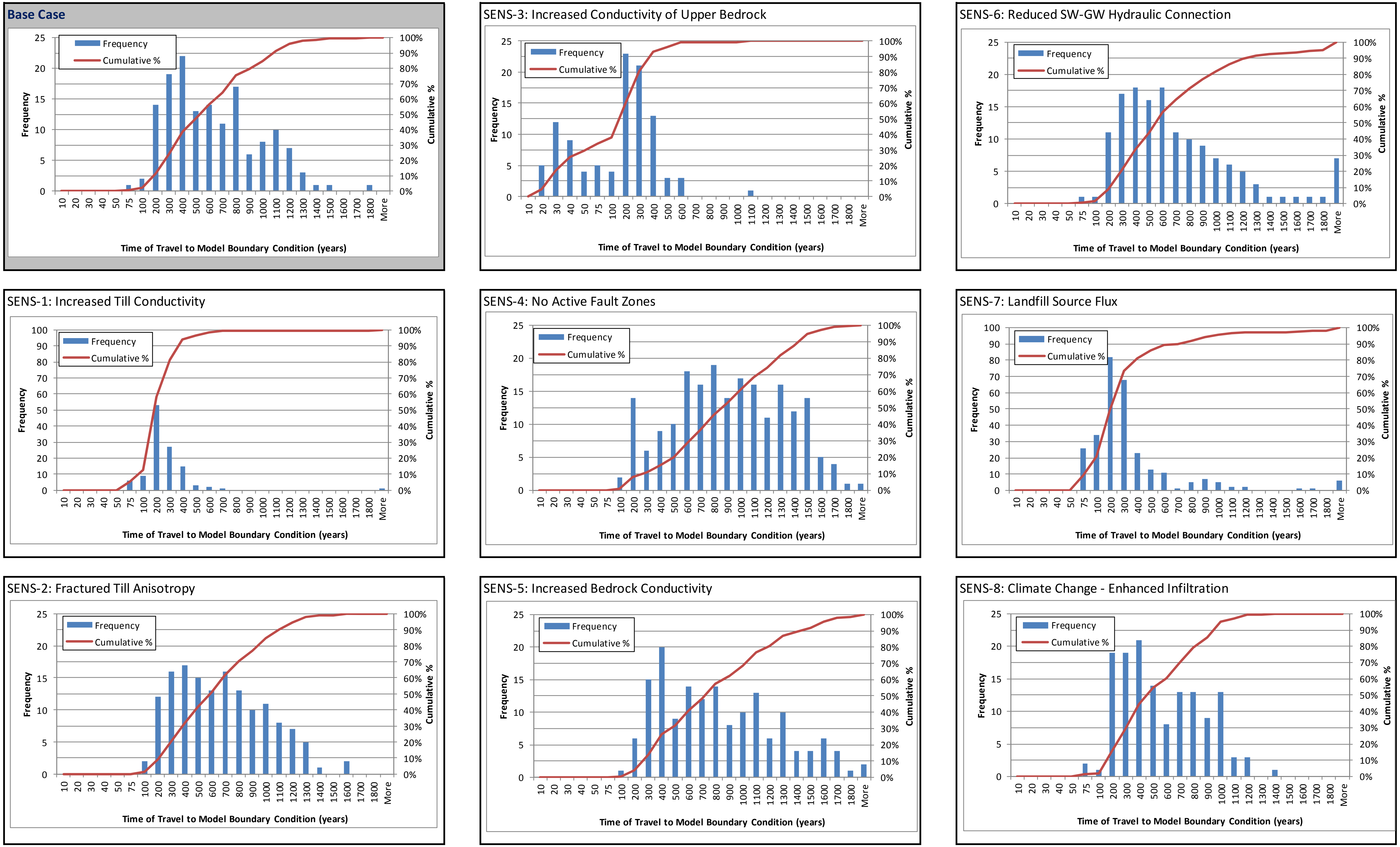
Figure 16



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Time of Travel to Downstream Drainage Network Boundary Conditions

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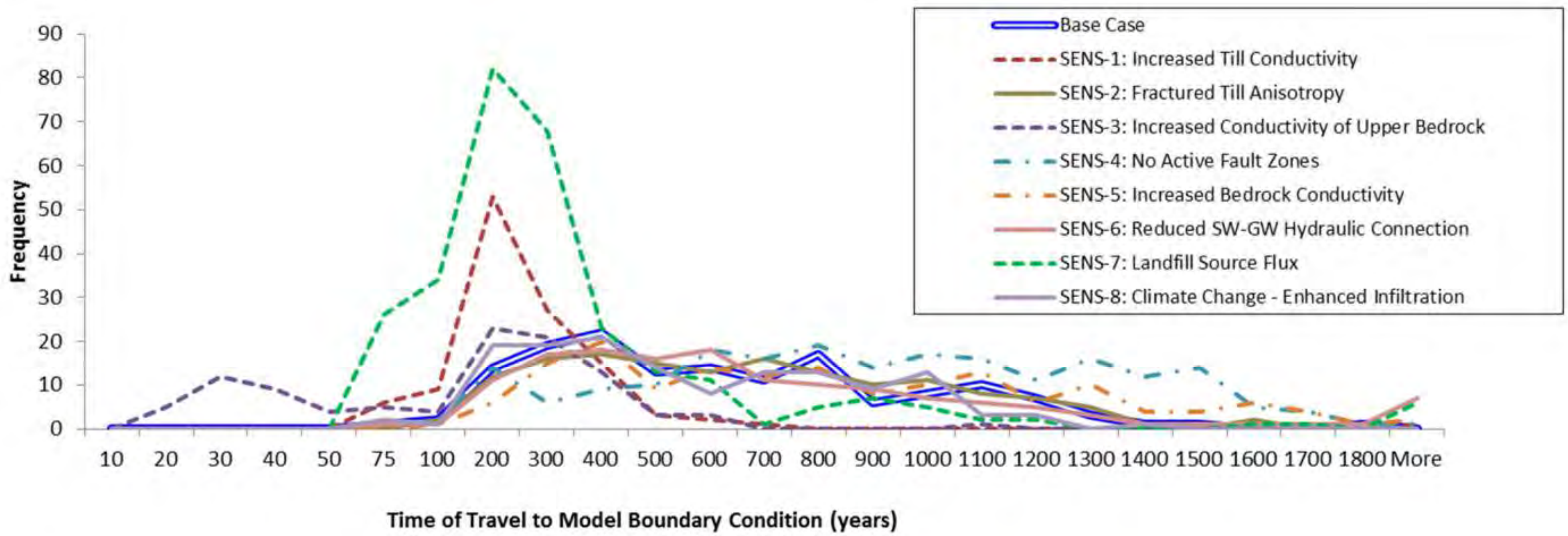
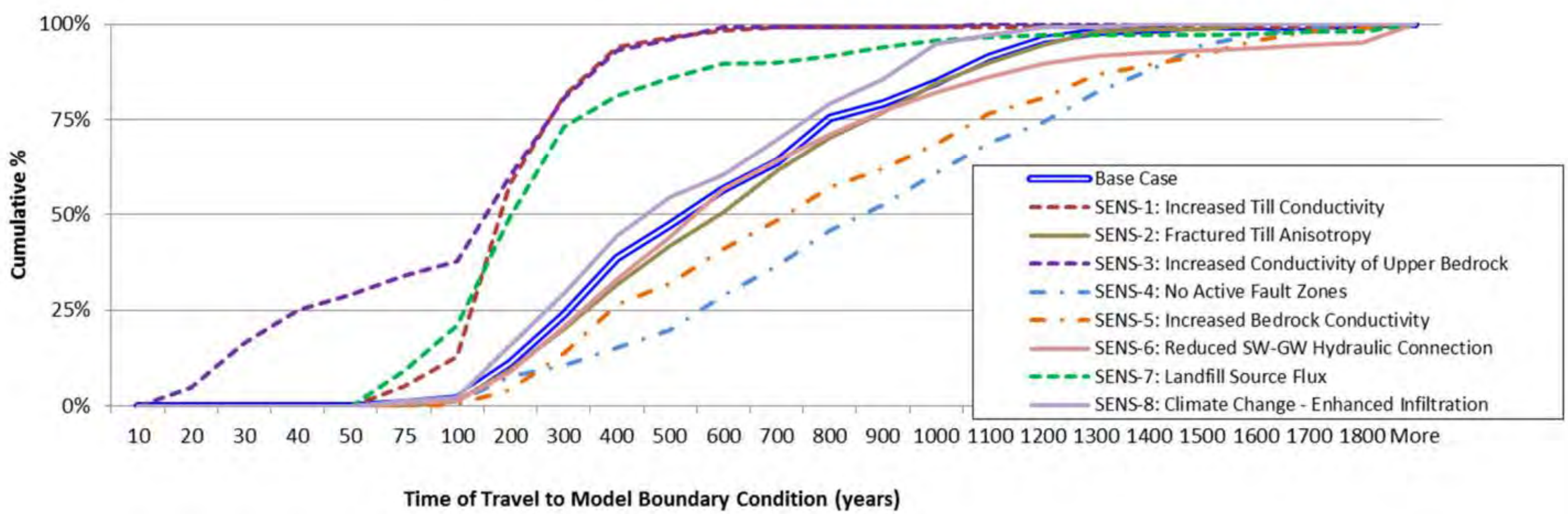
Figure 17

f:\26307\551\reporting\figures\fig 17 - time of travel - all scenarios.pptm





NOTES:

1. Note the time of travel increments along the X-axis of these line graphs are smaller between 0 and 100 than for the rest of the graph in order to refine the graph for the shortest times of travel.

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Comparison of Particle Time of Travel Histograms for All Scenarios

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Figure
18

Appendix 3 –
ABBREVIATIONS AND ACRONYMS

Abbreviation/Unit	Definition
cm	centimetre
DEM	Digital Elevation Model
HRD	Hydrostratigraphic Rock Domain
HU	Hydrostratigraphic Unit
K_h	Horizontal Hydraulic Conductivity
K_v	Vertical Hydraulic Conductivity
L/s	Litres per second
m	metre
mm	millimetres
m/s	metres per second
m^3/day or m^3/d	cubic metre per day
M m^3	Million cubic metres
mm/year	millimetres per year
masl	metres above sea level
mbgs	metres below ground surface

LIST OF FIGURES (TO BE DELETED FROM FINAL PDF)

LIST OF TABLES (TO BE DELETED FROM THE FINAL PDF)

ANNEXE E

Rapport annuel de surveillance environnementale 2022

Rapport présenté à : Department of Environment and Local Government
Projet GEMTEC : 100018.012 (June 21, 2023)

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Environmental Monitoring Program
Fourth Quarter and Annual Report 2022
Crane Mountain Landfill
Saint John, New Brunswick

GEMTEC Project: 4662.09 – R55

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GEMTEC
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Fundy Regional Services Commission
10 Crane Mountain Road
Saint John, New Brunswick
E2M 7T8

Environmental Monitoring Program
Fourth Quarter and Annual Report 2022
Crane Mountain Landfill
Saint John, New Brunswick

March 6, 2023
GEMTEC Project: 4662.09 – R55

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GEMTEC Consulting Engineers and Scientists Limited
191 Doak Road
Fredericton, NB, Canada
E3C 2E6

March 6, 2023

File: 4662.09 – R55

Fundy Regional Services Commission
10 Crane Mountain Road
Saint John, New Brunswick E2M 7T8

Attention: Mr. Marc MacLeod, General Manager

Re: Environmental Monitoring Program, Fourth Quarter and Annual Report 2022
Crane Mountain Landfill, Saint John, New Brunswick

Enclosed are two copies of our monitoring report for October to December 2022 and the 2022 annual environmental monitoring program report for the Crane Mountain Landfill located in Saint John, New Brunswick.

Our conclusions and recommendations are presented in the following report. We would be pleased to discuss any questions that you or the committee may have regarding the content of this report. Please feel free to contact the undersigned if you have any questions or comments.

David Rae, Ph.D., P.Geo.
Senior Risk Assessor
Responsible for entire report, except Section 6.0: Breakthrough Requirements and associated conclusions

Marco Sivitilli, P.Eng.
Civil/Geotechnical Engineer
Responsible for Section 6.0: Breakthrough Requirements and associated conclusions

cc: Sheryl Johnstone-Beaumont, P.Eng., Permitting South, NB Department of Environment and Local Government, Marysville Place (1 electronic copy)

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1.0 INTRODUCTION

GEMTEC Consulting Engineers and Scientists Limited (GEMTEC) was retained by the Fundy Regional Services Commission (former Fundy Regional Service Commission) to complete the 2022 compliance monitoring reporting requirements for the Crane Mountain Landfill (herein referred to as "the Landfill") located in Saint John, New Brunswick. This report is the fourth of the quarterly compliance monitoring reports that are required each year under the Landfill's Certificate of Approval to Operate (COA, I-11079), valid until November 30, 2025 (Appendix A). The monitoring schedule, as outlined in the COA, is also attached in Appendix A. The focus of the monitoring program is to assess the environmental impacts of the landfill on the groundwater and surface water systems in the vicinity of the landfill.

This report presents the analytical results and physical measurements that were obtained by Saint John Laboratory Services Ltd. in 2022. GEMTEC personnel did not observe or oversee the collection of any samples or field measurements. Additionally, GEMTEC was provided analytical results in a spreadsheet; laboratory certificates of the analysis were not provided to GEMTEC for review. GEMTEC provides no verification of the accuracy of the results, adherence to standard field sampling procedures or compliance with field sampling procedures stipulated in the COA with regard to sampling completed by Saint John Laboratory Services Ltd.

Objectives of this report include identifying possible analytical anomalies over the reporting period with particular attention to leachate indicator parameters. Recommendations are provided to address any monitoring issues. This report is limited to the compliance monitoring and reporting requirements as specified in Sections 95 – 113 of the COA and no comments or observations are made concerning the operation of the landfill. GEMTEC's scope of work was limited to completion of the reporting requirements in Section 112 (first three quarterly reports) and Section 113 (fourth quarter and annual report) of the COA.

2.0 MONITORING SCHEDULE AND PARAMETERS

In accordance with the COA, compliance monitoring for the fourth period of 2022 (October to December) included the following:

2.1 Groundwater Sampling (October to December)

Collection of groundwater samples from select groundwater monitoring wells in November 2022 for analysis of general chemistry parameters.

2.2 Underdrain Sampling (October to December)

Collection of underdrain samples in November 2022 for analysis of general chemistry parameters, trace metals and BTEX/Modified TPH.

2.3 Surface Water (October to December)

Collection of one surface water sample (Sed Pond) in November 2022 for analysis of general chemistry parameters, trace metals and BTEX/Modified TPH.

2.4 Leachate (October to December)

Collection of monthly leachate effluent samples in October, November and December, 2022 for analysis of alkalinity, ammonia, barium, boron, biological oxygen demand (BOD_5), cadmium, chemical oxygen demand (COD), chromium, calcium, chloride, copper, cyanide, iron, magnesium, manganese, lead, mercury, nitrate-nitrite, nickel, phenols, sodium, sulphate, total suspended solids (TSS), total dissolved solids (TDS), total organic carbon (TOC), total kjeldahl nitrogen (TKN), phosphorous, potassium, zinc and BTEX/Modified TPH.

All of the monitoring well locations at the facility are shown in Figure 1 with the surface water and underdrain sampling locations displayed in Figure 2.

LEGEND

MONITORING WELL (SURVEYED 2022)

MONITORING WELL (SURVEYED PRIOR TO 2022)

MONITORING WELL TO BE DECOMISSIONED (SURVEYED PRIOR TO 2022)

DECOMMISSIONED OR DESTROYED MONITORING WELL

NOTE: 2020 aerial photo from Google Earth.

2022 SURVEYED MONITORING WELLS

NAME	EASTING	NORTHING	TOP OF PVC ELEV	GROUND ELEV
MW31L	2522249.868	7363523.583	78.964	
MW31S	2522249.932	7363523.582	78.989	
MW31U	2522249.925	7363523.509	78.970	
MW32U1	2522633.364	7363756.288	68.449	67.282
MW32U2	2522634.094	7363757.327	68.146	67.208
MW33S	2522732.091	7363720.662	66.365	65.502
MW33U	2522732.046	7363719.534	66.385	65.548
MW34S	2522755.729	7363668.425	65.733	64.694
MW34U	2522754.532	7363667.435	65.397	64.779
MW35L	2522791.324	7363600.597	64.443	64.041
MW35S1	2522790.649	7363602.101	64.613	64.165
MW35S2	2522789.758	7363603.684	64.788	64.270
MW37S	2522832.440	7363782.136	62.846	61.881
MW38L	2522844.786	7363749.297	63.377	62.440
MW38S	2522845.339	7363747.768	63.509	62.463
MW38U	2522844.761	7363749.322	63.408	62.440
MW39A-1/2/3	2522874.867	7363669.134	61.341	60.847
MW39S	2522870.662	7363679.876	62.711	61.717
MW43S	2522721.996	7362683.403	71.935	71.254
MW43U	2522722.321	7362684.607	71.705	71.159
MW46L	2523395.091	7363118.097	58.678	57.909
MW46U	2523395.853	7363118.659	58.836	57.890
MW51S1	2522832.630	7363522.872		64.359
MW51S2	2522833.273	7363520.579	64.865	64.283
MW52D	2522479.326	7362965.975	77.348	77.348
MW52S	2522482.018	7362967.328	78.239	77.337
MW53D	2522118.717	7362796.402	102.564	101.912
MW54S	2522846.577	7363425.990	65.907	65.018
MW54U	2522848.026	7363424.889	65.779	65.042
MW55S	2522925.559	7363290.242	64.303	63.690
MW56S	2522943.388	7363224.005	68.214	
MW57S	2523210.777	7363862.681	53.064	52.298
MW57D	2523211.932	7363862.940	52.460	52.460

DRAWN BY: AGSD	CHECKED BY: CW
CALCULATIONS BY	CHECKED BY
DATE: FEB, 2023	
PROJECT: ENVIRONMENTAL MONITORING PROGRAM CRANE MOUNTAIN LANDFILL	
DRAWING: MONITORING WELL LOCATIONS	
SCALE: 1:10000 (0 200 400 600m)	
FILE NO.: 46620908	DRAWING: FIGURE 1

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CONSULTING ENGINEERS AND SCIENTISTS

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LEGEND

SURFACE WATER SAMPLING LOCATION

UNDER-DRAIN MONITORING LOCATION

DRAWN BY AGSD	CHECKED BY CW
CALCULATIONS BY	CHECKED BY
DATE FEB, 2023	
PROJECT ENVIRONMENTAL MONITORING PROGRAM CRANE MOUNTAIN LANDFILL	
DRAWING SURFACE WATER AND UNDER-DRAIN MONITORING LOCATIONS	
SCALE 1:20000 (0 400 800 1200m)	
FILE NO. 46620908	DRAWING FIGURE 2

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3.0 COMPLIANCE MONITORING RESULTS (OCTOBER TO DECEMBER, 2022)

All samples were analyzed by Saint John Laboratory Services Ltd., with the exception of the trace metals thallium and uranium, which were analyzed by RPC Science & Engineering (RPC) in Fredericton, New Brunswick.

Field parameters including temperature, conductivity, dissolved oxygen (DO), and pH were measured by Saint John Laboratory Services Ltd. According to Saint John Laboratory Services Ltd. all field meters were calibrated prior to each sampling event.

3.1 Screening Criteria

The screening criteria used to evaluate the sample results are as follows:

Groundwater results from the monitoring wells and shallow infrastructure, such as the underdrains, were evaluated against historical data, the Guidelines for Canadian Drinking Water Quality (GCDWQ, 2020), and the Atlantic Risk-Based Correction Action (RBCA) Tier I Risk Based Screening Levels (RBSLs, 2022) for an industrial-potable site. Drinking water guidelines are used for comparison purposes only and an exceedance of a guideline does not necessarily indicate contamination, as some of the groundwater parameters exceeding the GCDWQ are naturally occurring.

Surface water data are compared to historical data, the Canadian Council of Ministers of the Environment (CCME) Water Quality Guidelines for the Protection of Fresh Water Aquatic Life (FWAL), and the RBCA Tier I Ecological Screening Levels (ESLs) for an industrial-potable site.

Leachate effluent results are compared to municipal standards for BOD_5 and historical results. Leachate effluent from the Crane Mountain Landfill is sent to the City of Saint John municipal treatment facility and must meet the municipal standard.

3.2 Groundwater

The general chemistry results for samples collected from the groundwater monitoring wells are presented in Table C1-1, in Appendix C. Field data for the groundwater samples are presented in Table C1-4 in Appendix C.

Samples were collected from eight groundwater monitoring wells (MW33U, MW34S, MW34U, MW35L, MW35S2, MW38U, MW41S, and MW41U) on November 24, 2022. A duplicate sample was also collected from MW33U in November. All required wells were sampled in accordance with the facility's COA (I-11079).

With respect to the GCDWQ, the following exceedances are noted:

- In November 2022, turbidity was observed at levels exceeding the GCDWQ of 1 nephelometric turbidity unit (NTU) in groundwater samples collected from three monitoring wells; MW34S (2.27 NTU), MW35L (1.59 NTU), and MW35S2 (19.9 NTU). Turbidity is due to naturally occurring particles in groundwater and elevated turbidity is typical for samples collected from monitoring wells where sampling techniques involve the rapid removal of water from wells. The GCDWQ for turbidity is based on treatment limits for filters and is not a health-based guideline.

- The concentration of manganese exceeded the GCDWQ aesthetic objective (AO) of 0.02 mg/L, and the Maximum Acceptable Concentration (MAC) of 0.12 mg/L at two monitoring wells in November 2022: MW34U (0.13 mg/L), and MW41S (0.223 mg/L). The observed manganese concentrations are within the ranges of historical data at these locations.

3.3 Underdrains

The analytical results for general chemistry parameters, trace metals, and BTEX/Modified TPH for the underdrain samples are presented in Tables C2-1, C2-2 and C2-3, respectively, in Appendix C; field parameters are presented in Table C2-4 in Appendix C. Samples were collected from five underdrain sampling locations (UD3, UD4, UD5, UD6 and the Leachate Surge Pond UD) on November 24, 2022. UD6 was incorporated into the sampling program in November 2018.

PHCs were not detected in any of the underdrain samples collected during this reporting period. With respect to general chemistry and trace metals parameters, underdrain results met the GCDWQ, with the following exceptions:

- The concentration of manganese exceeded the GCDWQ AO of 0.02 mg/L and the MAC of 0.12 mg/L at Leachate Surge Pond UD (0.102 mg/L). The observed manganese concentrations were within historical ranges at this location.

3.4 Surface Water Results

The Sed Pond was the only surface water sample collected during this monitoring period. The analytical results for general chemistry parameters (including BOD_5, TKN, TDS, and TSS), trace metals, and BTEX/TPH are presented in Tables C3-1, C3-2, and C3-3, respectively, in Appendix C; field parameters are presented in Table C3-4 in Appendix C.

PHCs were not detected at the Sed Pond during this reporting period. With respect to general chemistry and trace metals parameters, the Sed Pond met the CCME FWAL guidelines, with the following exceptions:

- The aluminum concentration at the Sed Pond in November 2022 (153 µg/L) exceeded the CCME FWAL pH-dependent guideline of 100 µg/L. This concentration is within historical ranges.

15 sedimentation pond discharge events occurred in 2022. TSS is recorded during the discharge events and compared to a maximum TSS value of 25 mg/L as outlined in the COA. Of the 15 discharge events, none exceeded the maximum TSS value. The TSS values from the 2022 sedimentation pond discharge events are presented in Appendix H.

3.5 Leachate Effluent

Samples of the facility's leachate effluent (MH#1) were collected in October, November and December, 2022. The samples were analyzed for specific parameters according to Section 103 of the COA. Analytical results for the leachate effluent are presented in Table C4-1 in Appendix C.

The landfill's leachate effluent is trucked to the City of Saint John's wastewater treatment facility. There are no provincial compliance requirements or standards outlined in the Approval for the effluent. However, the City of Saint John stipulates that the effluent sample must have a weighted average BOD_5 value less than 400 mg/L. The results indicate that the BOD_5 values from October to December, 2022 ranged from 17 mg/L (December) to 35 mg/L (November), with a non-weighted average of 24 mg/L.

4.0 ANNUAL COMPLIANCE MONITORING RESULTS (2022)

4.1 Domestic Well Sampling

Samples from 49 domestic wells in the Martinon area of Grand Bay-Westfield were collected in September 2022. All samples were collected by GEMTEC personnel and submitted to RPC for general chemistry and trace metals analyses.

A copy of the results were sent to individual homeowners and to the New Brunswick Department of Health. Sampling results are not discussed in this report in order to maintain the confidentiality of the participants in the program.

4.2 Groundwater Elevation

The depth to water was measured at all monitoring well locations prior to sample collection. In general, the groundwater levels are consistent with historical findings. Regionally, the groundwater appears to trend southeast. The groundwater elevation data is presented in Appendix D.

4.3 Landfill Monitoring

The environmental sampling requirements are presented in the Approval issued to the landfill by the New Brunswick Department of Environment and Local Government (NBDELG). The current Approval (I-11079) came into effect on December 01, 2020 and is valid until November 30, 2025.

Saint John Laboratory Services Ltd, contracted by the Fundy Regional Services Commission, collected all samples in 2022. A copy of Approval I-11079 is included in Appendix A. Furthermore, as per the Approval, a copy of the facility's Asbestos Disposal Record is attached in Appendix B of this report.

The environmental compliance monitoring for 2022 included the following:

4.3.1 Groundwater Sampling

According to the compliance monitoring schedule, samples were scheduled to be collected from 56 groundwater monitoring wells in the spring and fall (April and September) of 2022 for analysis of general chemistry, trace metals and BTEX/TPH. Eighteen of these locations (MW32U2, MW33U, MW34S, MW34U, MW35L, MW35S2, MW38U, MW41S, MW41U, MW51D, MW51S1, MW51S2, MW52D, MW52S, MW53D, MW54S, MW54U, MW55S, and MW56S) were also scheduled to be sampled during the summer (July 2022). Eight of these locations (MW33U, MW34S, MW34U, MW35L, MW35S2, MW38U, MW41S, and MW41U) were scheduled to be sampled in February and November 2021. Two sampling locations (MW55S and MW56S) were scheduled to be sampled in April and September 2022 for general chemistry analysis only. Two new wells were installed in August 2018 (MW55S and MW56S) and have been included in the compliance monitoring schedule. An additional two new wells (MW57S/D) were added to the sampling rotation. These wells were drilled in September 2022 approximately 30 m to the east of MW47L/S/U to replace these wells. Once wells MW57S/D were drilled and operational, the Department of Environment and Local Government gave approval to decommission wells MW47L/S/U. These wells were successfully decommissioned in November 2022. With the exception of those locations noted in Table 1, all monitoring well stations were sampled as scheduled.

Table 1 Locations Not Sampled in 2022

Sample Location	Date	Comment
MW39S	April & September	Has not been sampled since at least 2011. The well was checked in 2022, and should be sampled moving forward. The well was dry when attempted to sample in 2022.
MW41S	February	Inaccessible
MW41U	February	Inaccessible
MW46U	April & September	Well casing warped around piezometer

MW47 WELL NEST	April & September	Damaged Bridge (Decommissioned November 2022)
MW50U	April & September	Well casing warped around piezometer

4.3.2 Potable Water Sampling

Samples from five potable groundwater well sites (Administration Building, Operations Building, Haz Waste Building, Scale House, and Compost Buildings) were collected on October 20, 2022. Samples collected from all potable groundwater sampling locations were analyzed for general chemistry, thallium, uranium, and bacteria (Total Coliforms and *E.coli*). It is important to note the following:

- The Administration Building had a UV water treatment system installed in December 2021;
- The Gate House water supply is for washroom use only (potable water is supplied); and
- The Maintenance Building, Compost Building, and Zenon Building's water supply is for washroom and operational purposes only (potable water is supplied).

4.3.3 Surface Water Sampling

Samples from six surface water sampling sites (downstream surface water samples) were collected in the spring and fall (between April and September 2022) as per the COA. Samples were also collected from two reference sites (SWR1 and SWR2) during these months. The sedimentation pond discharge location (Sed Pond) was sampled in February, April, July, September, and November 2022. Samples collected from all surface water sampling locations were analyzed for general chemistry, trace metals, BTEX/TPH, Biochemical Oxygen Demand (BOD_5), Chemical Oxygen Demand (COD), Total Kjeldahl Nitrogen (TKN), Total Suspended Solids (TSS), and Total Dissolved Solids (TDS).

4.3.4 Underdrains Sampling

Samples from underdrains UD3, UD4, UD5, UD6, and the Leachate Surge Pond underdrain (leachate pond UD) were scheduled to be collected in March, April, July, September, and November 2022 for analysis of general chemistry, trace metals, BTEX/TPH, BOD_5, COD, TKN, and TSS. All underdrain sample stations were sampled as scheduled.

4.3.5 Leachate Sampling

Leachate samples were collected monthly and analyzed for the following parameters: Alkalinity, Ammonia, Barium, Boron, BOD_5, Cadmium, COD, Chromium, Calcium, Chloride, Copper, Cyanide, Iron, Magnesium, Manganese, Lead, Mercury, Nitrite-Nitrate, Nickel, Phenols, Sodium, Sulphate, TSS/TDS, TKN, and Zinc.

Saint John Laboratory Services Ltd. reports that all field-testing equipment was calibrated prior to each sampling event, that all the monitoring wells were purged prior to samples being obtained and that all samples were filtered through 0.45 µm filters for the analysis of chloride, sulphate, nitrates, and trace metals. Field parameters were measured at all sampling locations. All parameters, with the exception of uranium and thallium, were analyzed by Saint John Laboratory Services Ltd. in Saint John, New Brunswick. Uranium and thallium analyses were conducted by RPC.

PHCs were not detected in any of the groundwater samples collected in 2022. Groundwater monitoring locations are shown in Figure 1 and surface water and underdrain locations are shown in Figure 2.

4.4 Results

4.4.1 Groundwater Results

Results for general chemistry parameters, trace metals, and BTEX/TPH for samples collected from the groundwater monitoring wells are presented in Tables C1-1 through C1-5 in Appendix C. Field data for the groundwater samples are presented in Table C1-6 in Appendix C. Groundwater results from the monitoring wells were evaluated using historical data and GCDWQ. Drinking water guidelines are used for comparison purposes only and an exceedance of a guideline does not necessarily indicate contamination, since some of the groundwater parameters commonly exceed these guidelines due to natural conditions. The results were also compared to the Atlantic RBCA Environmental Quality Standards (EQS) for groundwater for an industrial potable site, with coarse grained soil. These guidelines vary based on the distance to surface water, the results are broken down into greater than 10 m or less than 10 m from a surface water body.

Several parameters in groundwater samples exceeded historical concentrations; however, they did not exceed GCDWQ guidelines if available for the parameter. The following maximum concentrations were noted: nitrate + nitrite at MW55S; potassium at MW45L, MW49U, and MW50S; sulfate at MW52D; sodium at MW52D; arsenic at MW56S. There were multiple locations where concentrations of alkalinity, chloride, calcium, magnesium and bicarbonate exceeded their historical concentrations.

Chloride concentrations did not exceed guidelines at any location. Chloride can be an indicator of leachate. The chloride trend in monitoring wells MW50S/L/U have all shown increased levels of chloride. This well is located downgradient from the landfill. Based on water level information provided from Saint John laboratory Services, it appears the groundwater flows southeast. This well cluster is also located directly beside Route 7. The chloride levels in wells upgradient from MW50S/L/U have also shown slight increasing trends in chloride. The chloride trend graphs are plotted in Appendix F.

With respect to general chemistry and trace metals parameters, groundwater samples met the guidelines in 2022, with the following exceptions:

General Chemistry

- Elevated turbidity exceeding the GCDWQ Aesthetic Objective (AO) of 1.0 NTU was observed at 26 monitoring ells during one or more of the sampling events in the following months: March, April, July, September, and November. This is consistent with historical data. Turbidity is due to naturally occurring particles in groundwater and elevated turbidity is typical for samples collected from the monitoring wells where sampling techniques involve the rapid removal of water from wells. The GCDWQ for turbidity is based on treatment limits for filters and is not a health-based guideline.

- Elevated iron concentrations exceeding the GCDWQ Aesthetic Objective (AO), Atlantic RBCA EQS, and Human Health guideline of 0.3 mg/L was observed at MW36S (1.003 mg/L) in April. The observed concentration is within historical ranges.

- Concentrations of manganese exceeded the GCDWQ AO of 0.02 mg/L at 21 of the 56 monitoring wells sampled in 2022. The concentrations of manganese at 10 monitoring wells also exceeded the MAC (health-based guideline) of 0.12 mg/L. Manganese is frequently detected in groundwater samples recovered from the site at concentrations in excess of the GCDWQ AO and MAC. The observed manganese concentrations are within the ranges of historical data at these locations. Trend graphs for manganese concentrations at select locations are presented in Appendix E. It should be noted that the original monitoring wells MW54S and MW54U were decommissioned in June 2011 and new monitoring wells were installed in the same location in October 2011; therefore, the observed concentrations of manganese at these two locations may not be comparable to historical data.

- pH was below the GCDWQ acceptable range of 7.0 to 10.5 in April 2022 at MW31S (6.6), MW41S (5.4), and MW53D (6.2); July at MW41S (5.8), MW53D (5.7); September 2022 at MW36S (6.7), MW43S (6.7), MW43U (6.9), MW44S (6.4), MW52D (6.9), and MW53D (6.8); November at MW41S (6.2). These measurements are consistent with historical data. No samples recovered from the monitoring well locations were higher than the upper limit (10.5). The GCDWQ for pH is not a health-based guideline; it is related to effectiveness of potable groundwater treatment, controlling corrosion, and reducing leaching from plumbing and distribution systems (HC, 2019).

- Colour exceeded the GCDWQ aesthetic objective at a number of monitoring wells during each sampling event. The GCDWQ is an aesthetic objective based on disinfection of potable groundwater and is not a health-based guideline. Colour is due to naturally occurring organic substances, metals or industrial wastes (Health Canada, 2019).

Trace Metals

- Monitoring wells were separated based on their vicinity to surface water because the Atlantic RBCA ecological guidelines are lower if the groundwater is < 10m from a surface water body. Aluminum was detected at concentrations exceeding the Atlantic RBCA ecological guideline (< 10 m from surface water) of 5 µg/L at MW36L (April and September), MW36S (April and September), MW36U (April and September; parent and duplicate), and MW38L (April and September). The Atlantic RBCA ecological guideline (>10 m from surface water) of 50 µg/L was exceeded at MW43S (September), and MW57D (September). The concentrations also exceeded the GCDWQ and Atlantic RBCA guideline of 100 µg/L at MW36S (April and September), MW41S (April and September), MW43S (April), MW43U (April and September), and MW57S (September). The above GCDWQ for aluminum is an operational guideline and is not health-based. It is related to treatment plants using aluminum-based coagulants and does not apply to naturally occurring aluminum in groundwater (HC, 2019). GCDWQ also published a health-based maximum acceptable concentration (MAC) of 2900 µg/L. This human health-based guideline was not exceeded at any sampling location. All concentrations were within historical ranges.
- Concentrations of arsenic exceeded the Atlantic RBCA Ecological guideline (< 10 m from surface water) of 5 µg/L at MW36L in April (8 µg/L), and September (9 µg/L). The GCDWQ MAC of 10 µg/L, and the Atlantic RBCA Ecological guideline (> 10 m from surface water) of 50 µg/L was exceeded at MW44U in April (53 µg/L, parent and duplicate) and September (51 µg/L, parent and duplicate), and MW45L April (73 µg/L), and September (80 µg/L).Trend graphs for arsenic concentrations at these locations are presented in Appendix G.

- Concentrations of copper exceeded the Atlantic RBCA ecological guideline (< 10m from surface water) of 2 µg/L at MW36S (7 µg/L April, and 5.1 µg/L September). This concentration falls within historical ranges.

- Concentrations of zinc exceeded the Atlantic RBCA Ecological guideline (< 10 m from surface water) of 7 µg/L at MW36S in April (14 µg/L). This concentration falls within historical ranges.

4.4.2 Potable Water Wells

Groundwater results from the potable groundwater wells were evaluated using historical data and the GCDWQ. Drinking water guidelines are used for comparison purposes only and an exceedance of a guideline does not necessarily indicate contamination, since some of the groundwater parameters commonly exceed these guidelines due to natural circumstances. Analytical results are presented in Table C-5 in Appendix C.

With respect to the GCDWQ, there were no exceedances in the samples collected in 2022, with the following exceptions:

- Arsenic in the groundwater sample collected from the Scale House (0.041 mg/L; GCDWQ: 0.01 mg/L); this is within the historical range of <0.001 mg/L to 0.057 mg/L at this sampling location. Mr. Ron Nelson of FRSC indicated that the landfill is aware of the arsenic exceedances in the potable water at the Gate House and that the water has not been consumed since arsenic exceedances were first identified. According to Mr. Nelson, bottled water is provided for consumption at the Gate House and at the other buildings at the landfill as well.

4.4.3 Underdrains

The analytical results for general chemistry parameters, trace metals, and BTEX/TPH for the underdrain samples are presented in Tables C2-1, C2-2 and C2-3 in Appendix C; field parameters are presented in Table C2-4 in Appendix C. Groundwater results from the underdrains were evaluated using historical data and the GCDWQ.

Sulfate exceeded historical concentrations at UD5; however, no GCDWQ was available for sulfate.

PHCs were not detected in any of the underdrain samples collected in 2022. With respect to general chemistry and trace metals parameters, underdrain results met the GCDWQ, with the following exceptions:

General Chemistry and Trace Metals:

- The concentration of manganese exceeded the GCDWQ AO of 0.02 mg/L at UD4 (0.024 mg/L, March), UD5 (0.029 mg/L, March), UD6 (0.022 mg/L, November), and Leach Surge Pond UD (0.097 mg/L, March; 0.034, July). The concentrations of manganese at UD3 (March), UD6 (March), and Leach Surge Pond UD (November) also exceeded the GCDWQ MAC of 0.12 mg/L. The observed concentrations are within the ranges of historical data at these locations. An all-time high concentration was detected at UD6 in March, however, this location was sampled for the first time in November 2018; therefore, historical trends have not yet been established. Concentrations of manganese above the GCDWQ have been observed in samples collected from the underdrains in the past. Trend graphs for the concentration of manganese at UD3, UD4 and Leach Surge Pond UD are presented in Appendix E.
- Elevated turbidity exceeding the GCDWQ Aesthetic Objective (AO) of 1.0 NTU was observed at UD6 (1.15 NTU, March), and Leach Surge Pond UD (1.12 NTU, March).

4.4.4 Surficial and Surface Water

The analytical results for general chemistry parameters (including BOD_5, TKN, TDS, and TSS), trace metals, and BTEX/TPH are presented in Tables C3-1, C3-2 and C3-3 in Appendix C; field parameters are presented in Table C3-4 in Appendix C and calculated CCME FWAL guidelines are presented in Table C3-5 in Appendix C. Samples were also collected from the Sedimentation Pond (Sed Pond) discharge at the mid-point of all discharges and analyzed for TSS. The mid-point Sedimentation Pond (Sed Pond) discharge TSS data is attached in Appendix H. The daily meteorological data for 2022 are presented in Appendix I.

One surface water sample exceeded its historical concentration in strontium (101 µg/L); however, it does not have a CCME FWAL guideline. PHCs were not detected in any of the surface water samples collected in 2022. With respect to general chemistry and trace metals parameters, surface water samples met the CCME FWAL guidelines, with the following exceptions:

General Chemistry and Trace Metals:

- The aluminum concentrations at SW1 (115 µg/L, September; parent and duplicate), SWR1 (182 µg/L, September), and Sed Pond (153 µg/L, November) exceeded the CCME FWAL pH dependant guideline of 100 µg/L. These concentrations are within historical ranges.
- The copper concentration at SW1 in April (0.003 mg/L; duplicate only), SW5 in April (0.004 mg/L), and Sed Pond in April (0.010 mg/L) exceeded the CCME FWAL hardness dependant, sample specific guideline. These concentrations are within historical ranges.
- The zinc concentration at SW1 (12 µg/L, September; parent and duplicate), SW5 (9 µg/L, September), SW6 (9 µg/L, September), and Sed Pond (13 µg/L, September) exceeded the CCME FWAL pH, hardness and dissolved organic carbon dependant sample specific guideline. These concentrations are within historical ranges.

4.5 Leachate Effluent

Samples of the facility's leachate effluent (MH#1) were collected monthly in 2022. The samples were analyzed for specific parameters according to the facility's COA. The 2022 results for the leachate effluent are attached in Appendix C4-1.

The facility's leachate effluent is trucked to the City of Saint John municipal sewage treatment facility. There are no provincial compliance requirements or standards outlined in the Approval for the effluent. However, the City of Saint John stipulates that effluent samples must have a weighted average BOD_5 value less than 400 mg/L. However, there is an agreement with the City of Saint John stating that if the weighted average BOD_5 value is greater than the stipulated 400 mg/L a surcharge is applied. The results indicate that the monthly average BOD_5 values from 2022 ranged from 24.3 mg/L to 113.3 mg/L with an annual average of 58.58 mg/L. The 2022 results for the weighted BOD_5 are attached in Table C4-1 in Appendix C.

5.0 TRENDING GRAPHS

The trending graphs presented in Appendix J were compiled using all the available data for the Crane Mountain Landfill (1997 to present). Tabulated general chemistry and trace metal data for select monitoring points is presented in the trending graphs. During plotting it was necessary to assign values to data points, which were below their respective analytical detection limits. In this case, values below the detection limits were assigned values equal to half their respective detection limits. For example, data points with concentrations less than the detection limit for ammonia (< 0.5 mg/L) were assigned a value of 0.25 mg/L.

This section highlights significant trends or analytical anomalies noted in the tabulated and plotted data (1997 to present). Trending graphs for each monitoring well and cell underdrains are attached in Appendix J for the following parameters: alkalinity, ammonia, barium, boron, calcium, chloride, conductivity, iron, magnesium, pH, sodium, sulfate, and total organic carbon.

5.1 Monitoring Wells

With respect to on-site wells, the following trends were observed:

- An increasing trend in chloride concentrations has been observed at the following monitoring well locations: MW35S2, MW38L, MW42S, MW43S, MW44S, MW45L, and MW45U. It should be noted that the observed chloride concentrations at these monitoring locations are below the GCDWQ AO of 250 mg/L. At MW34S, the chloride concentration continues to decrease from the observed high of 166.1 mg/L in 2011. A decreasing trend is observed for chloride concentration at sampling location MW34U, after a historical high value of 47.6 mg/L (February 2019). Increasing trends of chloride at MW33S and MW41S have been reported in the past; however, chloride concentrations at these locations have decreased and remained stable. Chloride concentrations at MW51D were previously showing an increase trend and a chloride spike (17 mg/L) was also observed in September 2016. Chloride concentrations have since returned to historical levels and have been stable at this monitoring well. Increasing trends of chloride concentrations have been observed at MW37S until 2013 and have since been showing a decreasing trend. All-time high concentrations of chloride was observed at MW35S2 (9.9 mg/L; April 2022), MW42S (11.5 mg/L; April 2022), MW44U (18.4 mg/L; September 2022), and MW45U (57.3 mg/L; April 2022), however, none of the reported concentrations exceeded the GCDWQ.
- An increasing trend in calcium concentrations was observed at MW43S, MW44S, MW51S1, MW52S, and MW52D. A slight increasing trend in calcium concentrations was also observed at MW33S since 2012. An increasing trend in calcium concentrations at MW31L was observed from 2010 to 2013 but has since remained relatively stable. A decreasing calcium trend was previously noted at MW45L and MW54S; however, spikes in concentration were observed in 2019 the concentrations decreased in 2020 but then

have since steadily increased. A decreasing trend in calcium concentrations was also observed at: MW31S, MW31U, MW32U1, MW32U2, MW33S, MW34U, MW34S (since 2000), MW36S, MW38U, MW38L, MW36S, MW41S (since 2011), MW46L (since 2005), and MW54S (since 2014). Calcium concentrations at MW42S has been decreasing since 2008 with spikes beginning in September 2020 leading to a new all time high in April 2022 (36.5 mg/L). The concentration at MW35S1 has been increasing since September 2013, but in September 2022 the concentration began to trend downward. MW52D has been trending upward and hit an all time high in July 2022 (167 mg/L), but then dropped in September 2022 this concentration remains above historical measurements (105.1 mg/L). An all-time high concentration of calcium was noted for sampling locations: MW35S1 (41.6 mg/L; April 2022), MW42S (36.5 mg/L; April 2022), MW44S (29.1 mg/L; April 2022), and MW50L (96.1 mg/L; April 2022), and the concentrations of calcium returned to the respective historical ranges in subsequent sampling events, with the exception of MW44S, and MW50L.

- Increasing trends of magnesium were observed in MW43S, MW51S1, MW52S, and MW52D. The concentrations at MW42S and MW52S show an increasing trend and reached a new all time high in April, but then decreased to historical ranges in the subsequent sampling round. MW32U2 reached a new all time high in April 2021 and has been decreasing since. A decreasing trend in magnesium concentration was observed at: MW33S, MW34U (since 2019), MW36S, MW37S, MW41S (since 2011), and MW54U (since 2019). An all-time high concentration of magnesium was noted for sampling locations: MW42S (6.1 mg/L; April 2022), MW49L (4 mg/L; April 2022), MW52S (7.6 mg/L; April 2022), and MW52D (51 mg/L; July), and returning to respective historical ranges in subsequent sampling events.
- Increasing trends in alkalinity were observed at MW36L, MW42S, MW43S, MW46L, MW51S1, and MW52D. MW34U has increased since a large drop in concentration in 2021 and has increased and appears to have stabilized. A decreasing trend in alkalinity was observed at: MW31S (since 2017), MW32U1, MW32U2 (since 2014), MW36S, MW38U (since 2012), MW41S (since 2010), MW44U, MW54S, and MW54U. A decreasing alkalinity trend was noted at MW42S from 2015 to 2021; however, the highest concentrations of alkalinity at MW42S was reported in April 2022 (114 mg/L). Additionally, all-time highs in alkalinity were reported at MW43S (133 mg/L; September 2022), MW51S1 (190 mg/L; April 2022) and MW52D (388 mg/L; September 2022). MW43S is located downgradient of the landfill cells and was intended to monitor potential impacts from landfill activity. However, shallow groundwater at this location may be impacted by runoff from the finished compost that is stored immediately up gradient of MW43S.
- Increasing trends in conductivity were observed at MW31S, MW31U, MW42S, MW43S, MW44S, MW48S, MW48L, MW51S1, and MW52D. Decreasing trends in conductivity were observed at: MW32U2 (since 2014), MW34S (since 2011), MW36L (since 2015),

MW36S, MW37S, MW38S, MW38U (since 2012), MW41S (since 2011), MW44U, and MW54U (since 2012). The values of conductivity reached an all-time high at the sampling locations: (MW31U (524 µS/cm; September 2022), MW35S2 (294 µS/cm; September 2022), MW40U (256 µS/cm; September 2022), MW42S (258 µS/cm; September 2022), MW48L (587 µS/cm; September 2022), and MW51S1 (417 µS/cm; July 2022) and decreased to values within historical range in following sampling events, with the exception of MW31U, MW40U, MW42S, MW48L, and MW51S1 as it was the most recent sampling event.

- Increasing trends in sulfate concentrations were observed at: MW35S1, MW44S, MW51S1, MW52S and MW52D (since 2016). Decreasing trends in sulfate concentrations were observed at: MW31U, MW36L, MW36S (since 2011), MW38L, MW41S, MW42U, MW48U, and MW54S (since 2013). A decreasing trend in sulfate concentrations was observed at MW44U from 2008 until 2016; since 2016, an increasing trend has been observed. Historical high values of sulfate concentrations were obtained at: MW52D (325 mg/L; July 2022).
- Spikes in TOC were observed at several sampling locations in 2022, although no all-time high values were recorded this year.
- A spike in boron concentrations was observed in September 2016 at: MW35S2, MW36L, MW38L, MW38U, MW40S, MW40U, MW41L, MW41S, MW42S, MW43U, MW48L, MW51D, MW51S1, MW51S2, MW52D, MW52S, and MW53D but has since returned to previous levels and stabilized with the exception of MW52D, where an all-time high concentration in boron (2217 µS/cm) was observed in September 2022. An increase in boron concentration was observed at MW31L in 2016; however, the concentration has been decreasing since. A decreasing trend in boron concentrations has been observed at MW36U (since 2016), and MW38S (since 2004).
- An increase in barium concentration was observed at MW38U in September 2022. A spike in barium concentrations leading to an all-time high value of 43 mg/L at MW32U2 was recorded in May 2020 and the value returned within historical range in the subsequent sampling events.
- Increasing trends in sodium were observed at: MW34U, MW35S2, MW43S, and MW52D. A decreasing trend in sodium was observed at: MW31L (since 2013), MW33S, MW41S, MW44U, and MW48U. Highest concentration of sodium was recorded at MW48L (48.7 mg/L; April 2019), MW41L (31.1 mg/L; April 2019), MW32U2 (227.5 mg/L; April 2020), MW42L (24 mg/L; April 2020), and MW43S (36.6 mg/L; September 2021), and later, decreased within the historical range. MW52D reached an all-time high concentration (40.9 mg/L; July 2022) and did not fall back into its historical range.

- Decreasing iron concentrations are noted in MW31S, and MW43U and an iron spike was observed at MW53D in 2019. There were no all-time high concentrations of iron recorded in 2022.

Increasing trends of several parameters (alkalinity, boron, calcium, conductivity, magnesium, and sulphate) have been observed at MW52D, located downgradient of the construction and demolition debris disposal site. Increasing trends began in approximately 2016 and concentrations of these parameters have increased consistently over the last seven years. These parameters are potentially indicative of construction waste (e.g., drywall) leachate and further investigation is recommended (refer to Section 8.0).

With respect to off-site wells, the following increasing trends were observed:

- Increasing trends in chloride concentrations continues at monitoring wells MW50U and MW50L, which are located immediately downgradient of a highway interchange. MW50U showed a slight decrease in September 2022. Concentrations of calcium, magnesium and conductivity, also continue to increase at these locations. It is important to note that MW50U has not been sampled since 2017. The wells are located just off of Route 7 indicating that the impacts may be associated with the application of highway de-icing agents. In 2015-2017, GEMTEC was retained to conduct an additional assessment of the groundwater at selected wells on site. The results of the additional assessment were presented to Fundy Regional Services Commission under separate cover. Slight decreasing trends in alkalinity have been observed at these locations.

5.2 Underdrains

None of the parameters that would indicate leachate impacts show any significant trends at UD3, and UD4. However, the following trends were observed:

- An increase in boron (113 µg/L; November 2022) concentration at UD5, the concentration of boron has not exceeded the detection limit of 100 µg/L since 2018. This concentration is within historical ranges.
- An increasing trend for concentration of magnesium, calcium and conductivity was observed at UD3, UD4, UD5 and Leachate Pond Discharge UD.
- An increasing trend in sulfate has been observed at UD5 and Leachate Pond UD since 2016.

6.0 BREAKTHROUGH REQUIREMENTS

Theoretical breakthrough curves for Cells 1, 3, 5, and 8 are shown in Figures 3, 4, 5, and 6 respectively, for various depths of leachate within the sumps and cells. The theoretical leachate front has been calculated for these cells based on leachate level readings taken since each cell began operation.

For Cell 1, in operation since the landfill opened in 1997, the theoretical leachate front is now 78 cm below the top of the 900 mm liner within the sump and 56 cm below the top of the 600 mm liner within the cell. The average depth of leachate in the sump was 104 cm (41 inches) in 2022 and 110 cm (43 inches) over the last five years. Based on leachate level measurements and theoretical breakthrough calculations, Cell 1 has met the 25 year breakthrough requirement.

For Cell 3, which has been in operation since June 2002, the theoretical leachate front is now 52 cm below the top of the 1300 mm sump liner and 43 cm below the top of the 600 mm cell liner. The average depth of leachate in the sump was 139 cm (55 inches) in 2022 and 131 cm (51 inches) over the last five years. Extrapolating the five-year average leachate depth in Cell 3 results in theoretical breakthrough times longer than the required 25 years for both the sump and regular liner (see Figure 4).

For Cell 5, which has been in operation since July 2009, the theoretical leachate front is now 33 cm below the top of the 1300 mm sump liner and 18 cm below the top of the 600 mm cell liner. The average depth of leachate in the sump was 123 cm (49 inches) in 2022 and 122 cm (49 inches) over the last five years. Extrapolating this average depth of leachate in Cell 5 results in theoretical breakthrough times longer than the required 25 years for both the sump and regular liner (see Figure 5).

For Cell 8, which has been in operation since October 2018, the theoretical leachate front is now 12 cm below the top of the 1300 mm sump liner and 11 cm below the top of the 600 mm cell liner. The average depth of leachate in the sump was 208 cm (82 inches) in 2022 and 200 cm (79 inches) over the last four years. Extrapolating this average depth of leachate in Cell 8 results in theoretical breakthrough time longer than the required 25 years for the sump. The theoretical breakthrough time for the 600 mm (above the sump) is 23 years when using the average 4 year annual leachate level (see Figure 6). Adjustments in terms of operating leachate levels in the Cell 8 sump will need to be made by FRSC to meet the 25 year breakthrough requirement. Moving forward, the average leachate depth will need to be maintained at less than 188 cm (74 inches). Average annual leachate depths less than 188 cm were achieved in 2019 and 2020, which would be acceptable in the future.

It should be noted that these numbers are theoretical and ignore the benefits of the geomembrane (HDPE) liner. In fact, when considering the geomembrane liner, the leachate front may not have yet reached the clay liner.

The Leachate Surge Pond was first used in October 2005; however, pond levels have only been routinely collected since March 2007. For the purposes of calculating the theoretical breakthrough time for the leachate surge pond, it has been assumed that the usage of the pond in 2006 was similar to 2007 and the data from 2007 was also used for 2006. Using this data, the theoretical leachate front is now 10 cm below the top of the 600 mm clay liner layer in the composite HDPE and clay liner. The average depth of leachate in the pond was 276 cm in 2022 and 234 cm over the last 5 years. Extrapolating this average depth of leachate results in a theoretical breakthrough time longer than the required 25 years for the composite liner system (i.e., HDPE liner and 600 mm clay liner) (see Figure 6). The composite liner system was considered for this calculation due to the ability to repair defects in the HDPE liner within the lagoon, if required.

Figure 3: Breakthrough Analysis for Cell 1

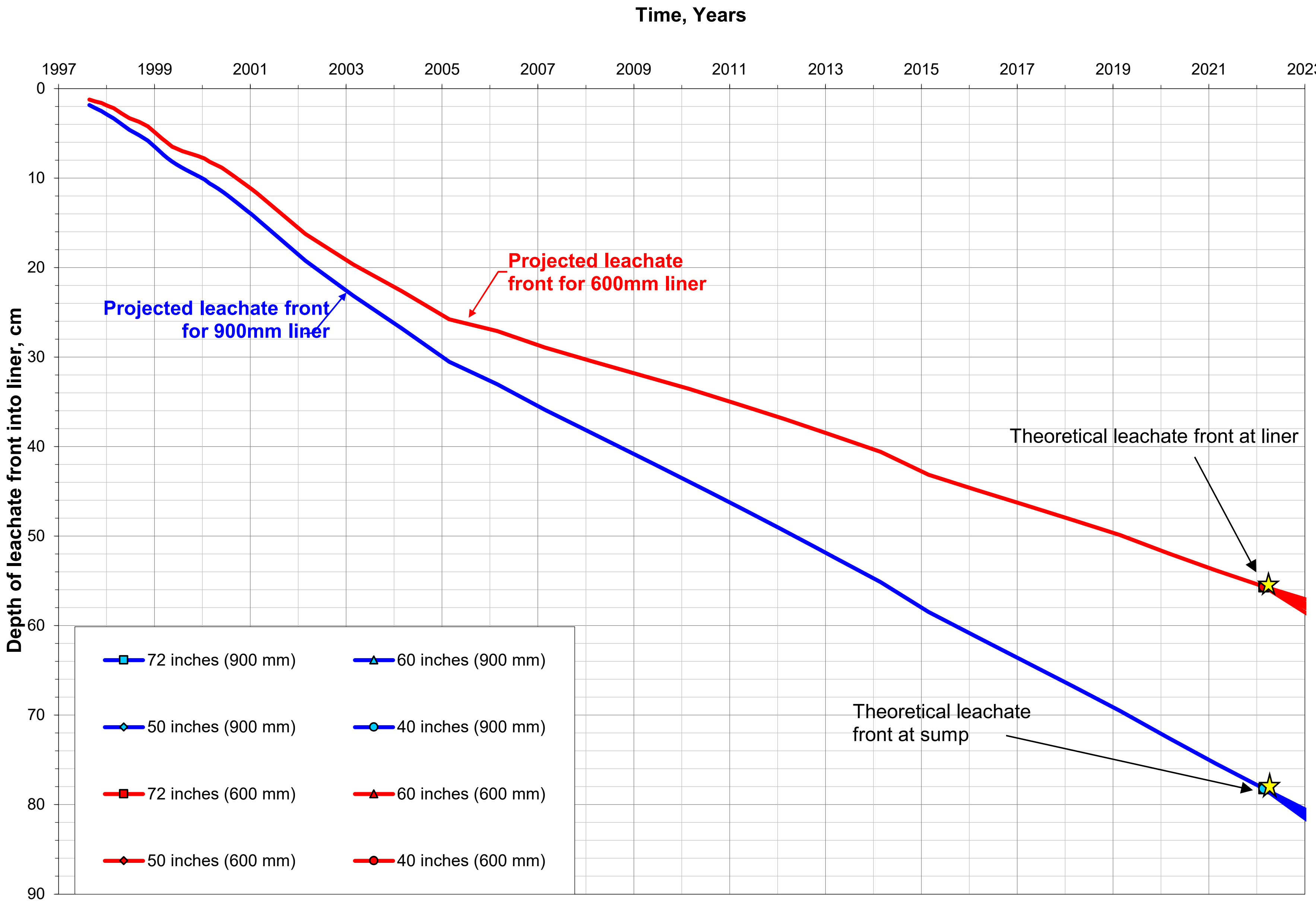


Figure 3 (cells 1 &2) cell levels 2022.xlsx - Figure 3 (Cell1)
23/02/28 - 1:38 PM

Figure 4: Breakthrough Analysis for Cell 3

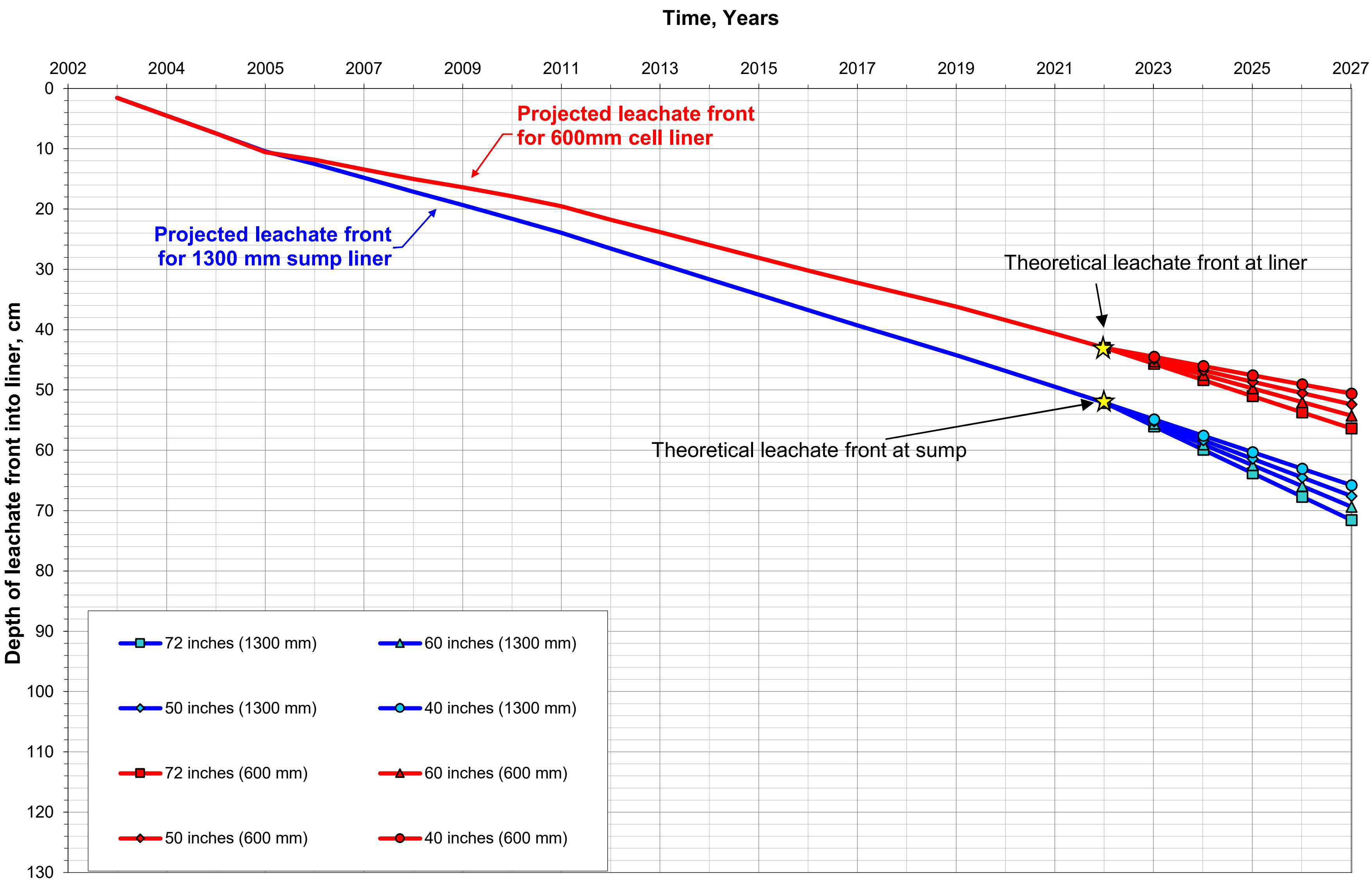
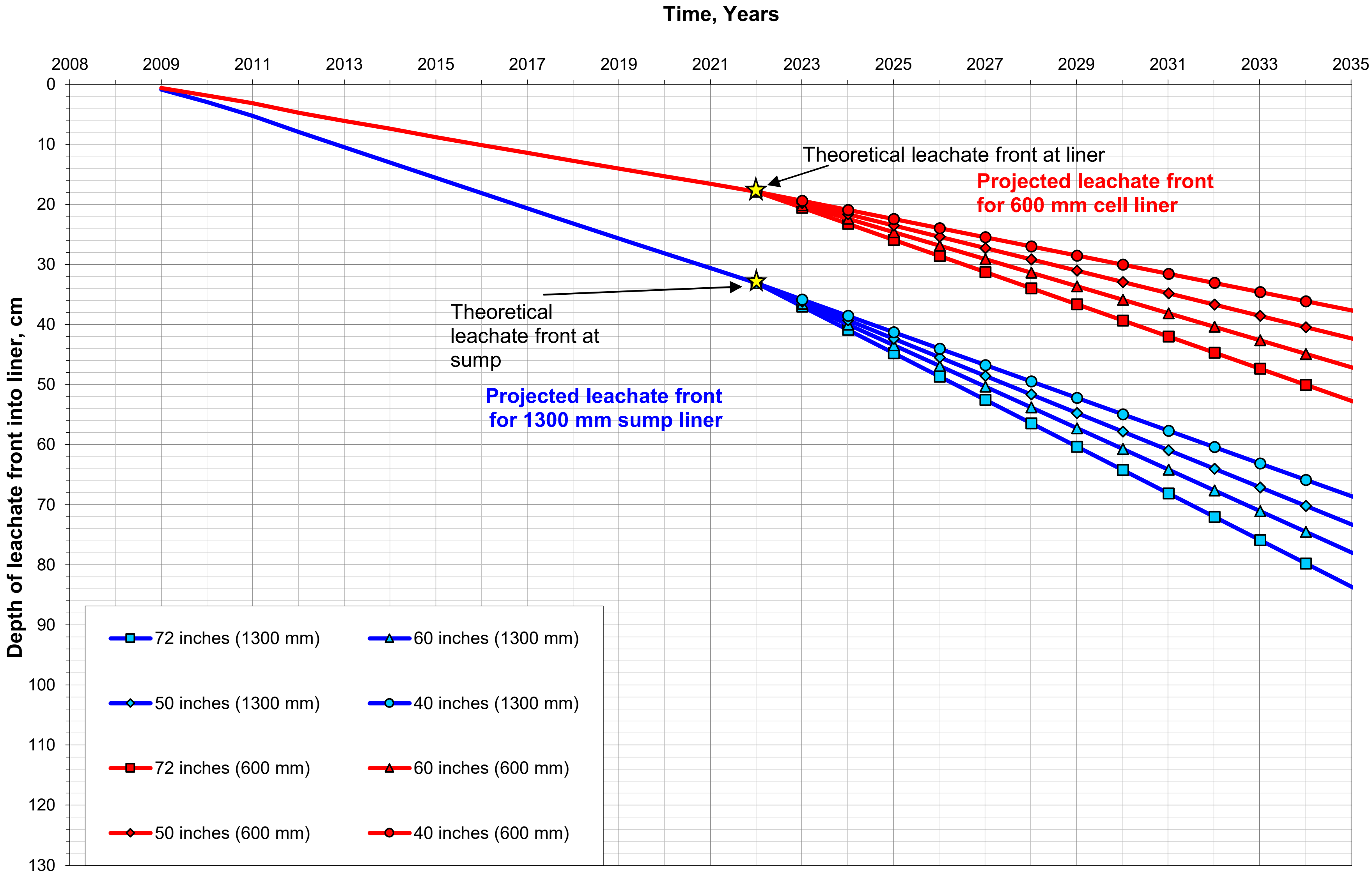


Figure 4 (cells 3 &4) cell levels 2022.xlsx - Figure 4 (Cell3)
23/02/28 - 1:05 PM

Figure 5: Breakthrough Analysis for Cell 5



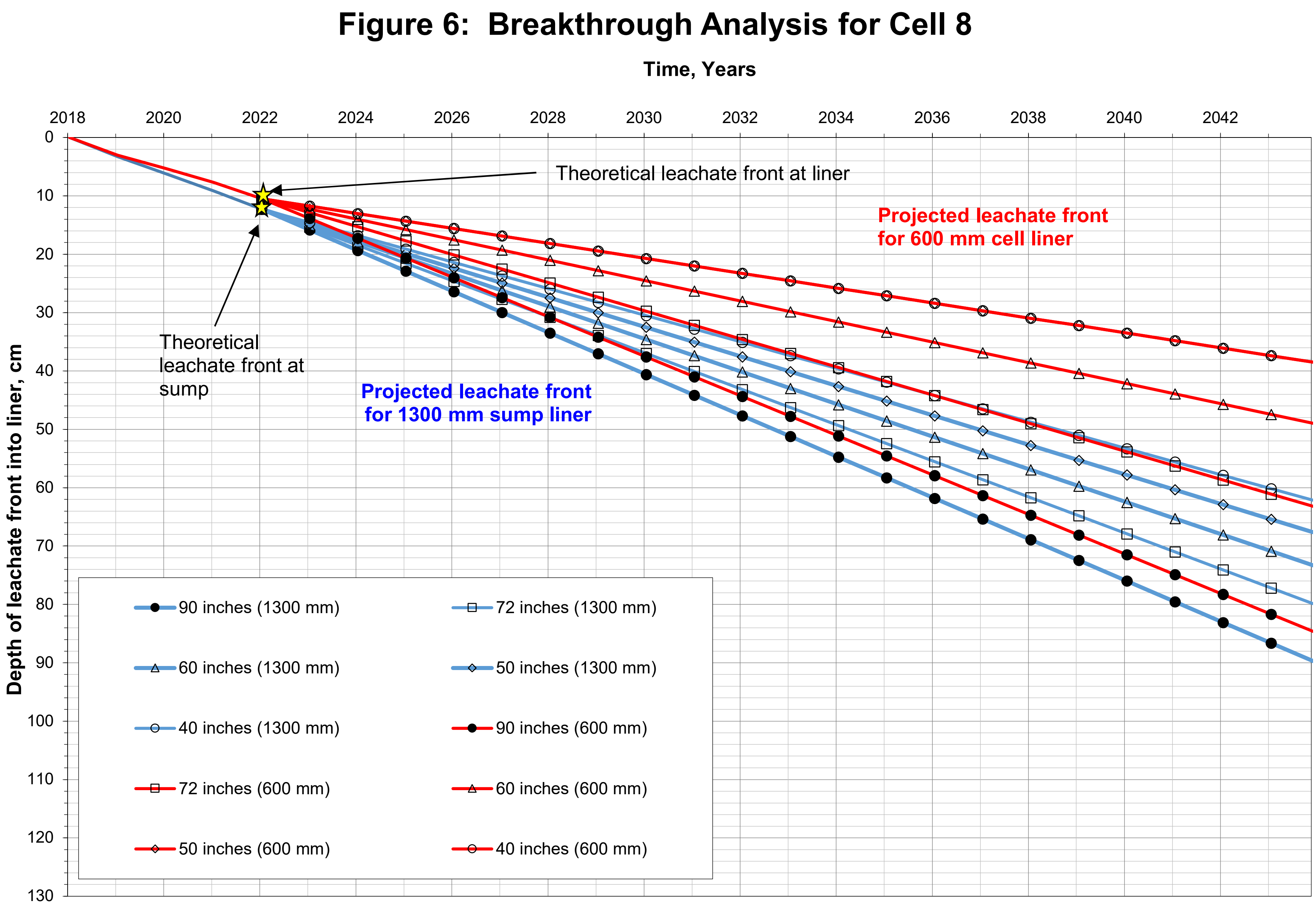
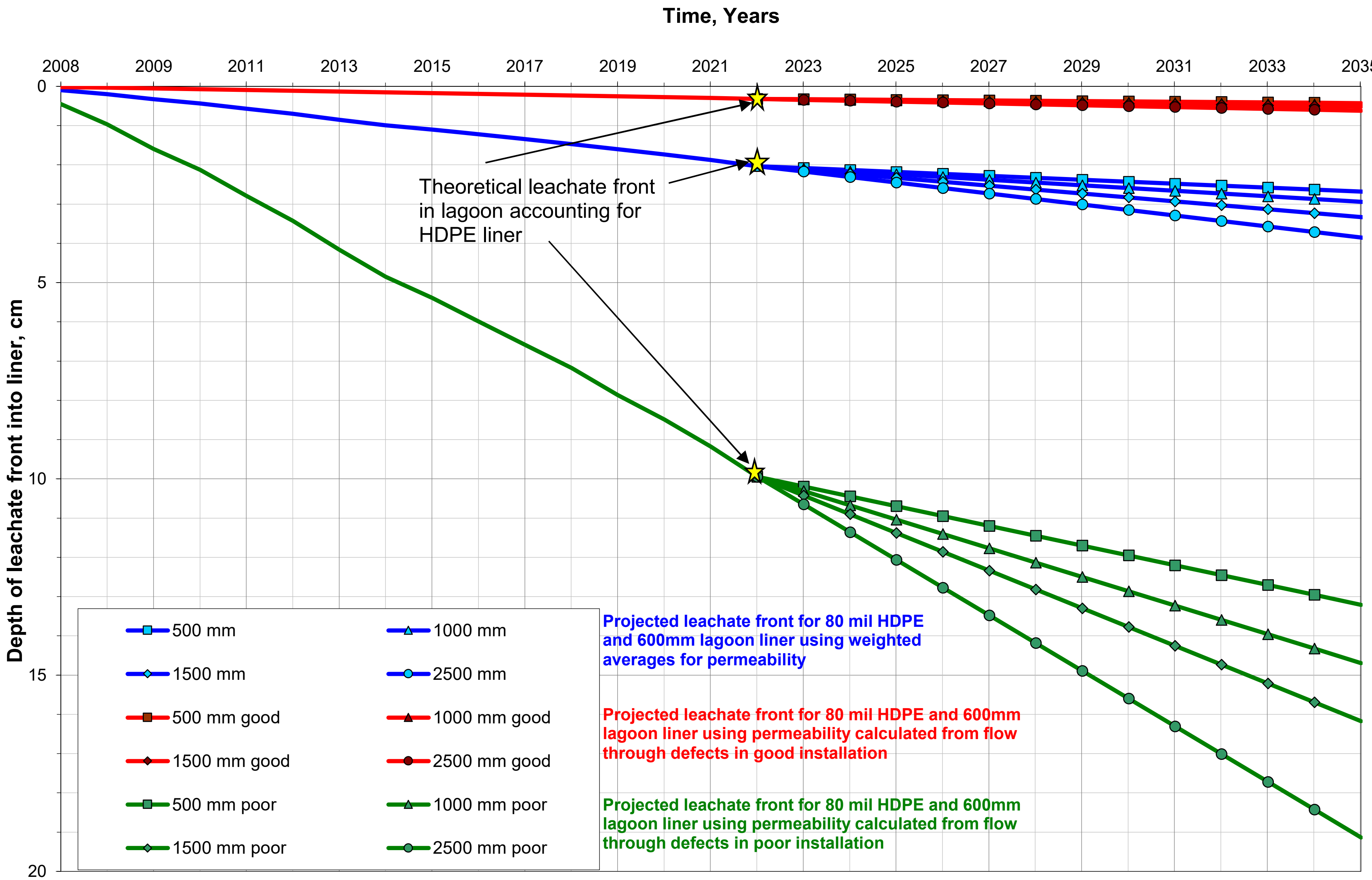


Figure 6: Breakthrough Analysis for Cell 8
Time, Years
2018
2020
2022
2024
2026
2028
2030
2032
2034
2036
2038
2040
2042
Depth of leachate front into liner, cm
0
10
20
30
40
50
60
70
80
90
100
110
120
130
Theoretical leachate front at liner
Theoretical leachate front at sump
Projected leachate front for 600 mm cell liner
Projected leachate front for 1300 mm sump liner
90 inches (1300 mm)
72 inches (1300 mm)
60 inches (1300 mm)
50 inches (1300 mm)
40 inches (1300 mm)
90 inches (600 mm)
72 inches (600 mm)
60 inches (600 mm)
50 inches (600 mm)
40 inches (600 mm)

Figure 7: Breakthrough Analysis for Leachate Surge Lagoon



7.0 CONCLUSIONS

Groundwater, underdrain, and surficial/surface water samples were both collected and analyzed by Saint John Laboratory Services Ltd. in 2022.

Based on the sampling results from 2022, the following conclusions are presented:

In general, there is no evidence of an immediate impact to the environment, ground or surface waters from the landfill. Increasing trends of several parameters (alkalinity, boron, calcium, conductivity, magnesium, and sulphate) were observed at MW52D, located downgradient of the construction and demolition debris disposal site. Concentrations do not exceed Atlantic RBCA Environmental Quality Standards however these parameters are potentially indicative of construction waste (e.g., drywall) leachate and further investigation is recommended (refer to Section 8.0). Similar trends were not observed in MW52S where concentrations of these parameters over the same period (2016-2022) have been stable.

7.1 Groundwater

- Elevated aluminum concentrations are within the range of historical data.
- Elevated arsenic concentrations are within the range of the historical data. Increasing arsenic trends are observed at MW36L, MW38S and MW44U.
- Elevated copper concentration is within the range of historical data.
- Elevated zinc concentration is within the range of historical data.
- Elevated turbidity results are within the range of historical data, with the exception of MW57S and MW57D. These wells were drilled in September 2022 do not have historical data.
- Elevated iron concentrations are within the range of historical data.
- pH values are within the range of historical data.
- Elevated conductivity is within historical ranges, with the exception of MW31U, MW35S2, MW40U, MW42S, MW48L, and MW51S1.
- Lead concentrations were below the laboratory detection limit in all groundwater samples collected from the monitoring wells in 2022, with the exception of MW36S in April.
- Elevated manganese concentrations are within the range of historical data.
- Elevated calcium concentrations are within the range of historical data, with the exception of MW35S1, MW42S, MW44S, MW50L, and MW52D.
- Elevated magnesium concentrations are within the range of historical data, with the exception of MW42S, MW49L, MW52S, and MW52D.

- Elevated chloride concentrations are within the range of historical data, with the exception of MW35S2, MW42S, MW44U, and MW45U.
- Elevated sulfate concentrations are within the range of historical data, with the exception of MW52D.
- Elevated iron concentrations are within the range of historical data.
- Elevated boron concentrations are within the range of historical data, with the exception of MW52D.
- Elevated alkalinity is within the range of historical data, with the exception of MW42S, MW43S, MW51S1, and MW52D.
- Increasing trends for multiple parameters were observed at MW52D.
- Petroleum hydrocarbons (BTEX/TPH) were not detected in any groundwater samples recovered from the monitoring wells in 2022.
- The increasing trend in chloride concentrations continues at off-site monitoring well location MW50U and MW50L; MW50U has not been sampled since 2017. Additional assessment was conducted in 2015-2017 which determined that these impacts are due to road-salting activities on Route 7. The results of the additional assessment were provided to Fundy Regional Services Commission under separate cover.
- The water sample collected from the Gate House had a concentration of arsenic above the GCDWQ. The water in this area is not consumed. Bottled water is provided for consumption.

7.2 Underdrains

- Elevated turbidity and manganese results are within the ranges of historical data.
- Petroleum hydrocarbons (BTEX/TPH) were not detected in any of the underdrain samples collected in 2022.

7.3 Surface/Surficial Water

- All elevated concentrations of copper in surface water samples collected in 2022 were within historical data ranges.
- All elevated concentrations of aluminum in surface water samples were within historical ranges.
- All elevated concentrations of zinc in surface water samples were within historical ranges.
- Petroleum hydrocarbons (BTEX/TPH) were not detected in any of the surface water samples collected in 2022.

7.4 Breakthrough Analysis

- The minimum 25 year breakthrough requirements have been met for Containment Cell 1. Containment Cells 3 and 5 are projected to meet the 25 year breakthrough requirement, based on recorded data and theoretical calculations using average leachate levels for the last 5 years. The Cell 8 theoretical breakthrough calculation is based on limited data (4 years) so there is ample time to make adjustments to operational practices in terms of leachate levels in the leachate pump station sump to avoid not meeting the 25 year breakthrough requirements.

8.0 RECOMMENDATIONS

Based on the results of the 2022 monitoring program, we offer the following recommendations:

- All damaged monitoring wells should be repaired prior to the next groundwater monitoring event. If the wells cannot be repaired, they should be replaced.

- MW57S/D should be added to the COA, replacing MW47S/L/U.

- MW52D should be inspected for any indication of surface runoff entering the well. If the surface seal is compromised, the well should be decommissioned and replaced.

- Consideration should be given to adding MW18, MW22S/D, and MW23S, located downgradient of MW52D, to the monitoring program.

9.0 CLOSURE

This report has been prepared for the sole benefit of our client, Fundy Regional Services Commission. This report may not be relied upon by any other person or entity without the express written consent of GEMTEC Consulting Engineers and Scientists Limited and Fundy Regional Service Commission.

Any use that a third party makes of this report, or any reliance or decisions made based on it, is the responsibility of such third parties. GEMTEC Consulting Engineers and Scientists Limited accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

The report presents the analytical results and physical measurements for samples that were collected and analyzed by Saint John Laboratory Services Ltd. in 2022. Saint John Laboratory Services Ltd. Is contracted directly by the FRSC for water sampling and laboratory analysis.

Should additional information become available, GEMTEC Consulting Engineers and Scientists Limited requests that this information be brought to our attention so that we may re-assess the conclusions presented herein. This report was prepared by Kassidy Totton, EIT (monitoring results) and Marco Silvitilli, P.Eng. (breakthrough analysis). The monitoring results were reviewed by David Rae, PhD, PGeo, and the breakthrough analysis was reviewed by Marco Sivitilli, P.Eng., on behalf of GEMTEC Consulting Engineers and Scientists Limited.

We trust this report provides sufficient information for your present purposes. If you have any questions concerning this report, please do not hesitate to contact our office.

10.0 REFERENCES

Atlantic Partnership in Risk Implementation (PIRI). 2022. Atlantic RBCA (Risk-Based Corrective Action) for Impacted Sites in Atlantic Canada, Version 4.0, User Guidance, July 2022.

Canadian Council of Ministers of the Environment (CCME). Canadian Water Quality Guidelines for the Protection of Aquatic Life Summary Table. Accessed online at https://ccme.ca/en/summary-table in November 2022.

Health Canada. September 2020. Guidelines for Canadian Drinking Water Quality, Summary Table. Accessed online at https://www.canada.ca/en/health-canada/services/environmental-workplace-health/reports-publications/water-quality/guidelines-canadian-drinking-water-quality-summary-table.html in November 2022.

NBDELG, 2008. New Brunswick Groundwater Chemistry Atlas (1994-2007). T2008-1 Environmental Reporting Series. Sciences and Reporting Branch – Sciences and Planning Division – Department of Environment. December 2008.

APPENDIX A

Certificate of Approval (COA) and Monitoring Schedule

APPROVAL TO OPERATE

I-11079

Pursuant to paragraph 8(1) of the *Water Quality Regulation - Clean Environment Act*, and paragraph 5 (3) (a) of the *Air Quality Regulation - Clean Air Act*, this Approval to Operate is hereby issued to:

Fundy Regional Service Commission

for the operation of the

Crane Mountain Landfill

Description of Source:	**A regional sanitary landfill with leachate collection and disposal.**
Source Classification:	**Fees for Industrial Approvals Regulation - Clean Water Act — Class 4** **Air Quality Regulation — Class 4**
Parcel Identifier:	**55087001, 55087027, 55086987, 55087019, 55043301, 55043293, 55160352**
Mailing Address:	**P.O. Box 3032** **Grand Bay-Westfield, NB E5K 4V3**
Conditions of Approval:	**See attached Schedules "A" and "B" of this Approval**
Supersedes Approval:	**I-9959**

Valid From: **December 01, 2020**

Valid To: **November 30, 2025**

Recommended by: Sheryl Johnstone

Issued by: Mark Gly
for the Minister of Environment and Climate Change

November 30, 2020
Date

SCHEDULE "A"

A. DESCRIPTION AND LOCATION OF SOURCE

The Fundy Regional Service Commission operates a regional solid waste management and disposal facility that is commonly referred to as the Crane Mountain Landfill. The Landfill is located in Saint John near Grand Bay-Westfield and serves the residents of Saint John county and the western portions of Kings and Queens county. The Commission operates a construction and demolition debris disposal site, a household hazardous waste depot, an organics transfer facility, material recovery facility, a landfill gas collection system, and a flare/electric generation system at the Landfill. A designated area on site is also utilized for the temporary storage of metal, tires, wood, white goods and other such salvageable/recyclable materials.

The operation of the regional solid waste management and disposal facility by the Fundy Regional Service Commission, located in the City of Saint John, County of Saint John, and the Province of New Brunswick and identified by Parcel Identifier (PID) numbers 55087001, 55087027, 55087019, 55043301, 55086987, 55160352 & 55043293 is hereby approved **subject to the following:**

B. DEFINITIONS

1. **"Approval Holder"** means Fundy Regional Service Commission.

2. "**Department**" means the New Brunswick Department of Environment and Local Government.

3. **"Minister"** means the Minister of Environment and Climate Change and includes any person designated to act on the Minister's behalf.

4. **"Director"** means the Director of the Authorizations Branch of the Department of Environment and Local Government and includes any person designated to act on the Director's behalf.

5. **"Facility"** means the property, leachate collection and treatment systems, buildings, equipment and any other activities involved with the operation of the regional solid waste management and disposal facility by the Fundy Regional Service Commission at PID numbers 55087001, 55087027, 55086987, 55087019, 55043301, 55160352 & 55043293.

6. **"containment cell"** means the area at the Facility approved in writing by the Department for the disposal of solid waste.

7. **“watercourse”** means the full width and length, including the beds, banks, sides and shoreline, or any part of a river, creek, stream, spring, brook, lake, pond, reservoir, canal, ditch or other natural or artificial channel open to the atmosphere, the primary function of which is the conveyance or containment of water whether the flow be continuous or not.

8. **“friable asbestos”** means waste material containing asbestos fibre or asbestos dust in a concentration greater than 1% by weight that is **not** tightly bound within a solid matrix such that it is easily crumbled by the hands.

9. **"petroleum product"** means a mixture of hydrocarbons, or their by-products, of any kind and in any form, including airplane fuel, asphalt, bunker "C" oil, crude oil, diesel fuel, engine oil, fuel oil, gasoline, kerosene, lubricants, mineral spirits, naphtha, petroleum based solvents regardless of specific gravity, transformer oil and waste petroleum products and excluding propane and paint.

10. **“biomedical waste”** means,
    a) any part of the human body, including tissues and bodily fluids, but excluding fluids, extracted teeth, hair, nail clippings and the like, that are not infectious,
    b) any part of the carcass of an animal infected with a communicable disease or suspected by a licensed veterinary practitioner to be infected with a communicable disease,
    c) non-anatomical waste infected with communicable disease,
    d) a mixture of a waste referred to in clause (a), (b) or (c) and any other waste or material; or
    e) a waste derived from a waste referred to in clause (a), (b) or (c), unless the waste that is derived from the waste referred to in clause (a), (b) or (c) is produced in accordance with a certificate of approval that states that, in the opinion of the Director, the waste that is produced in accordance with the certificate of approval does not have characteristics similar to the characteristics of waste referred to in clause (a), (b) or (c).

11. "**hazardous waste"** means any waste material intended for disposal or recycling, that is identified as a hazardous waste or hazardous recyclable material by the federal *Export and Import of Hazardous Waste and Hazardous Recyclable Material Regulations*, and/or is included in Class 1 and/or Class 7 of the federal *Transportation of Dangerous Goods Regulations*. This definition excludes any waste(s) for which the Director of the Approvals Branch has issued a written exemption.

12. **“sludge”** means a solid, semi-solid or liquid residue having less than 15% solids generated during the treatment of municipal and/or industrial wastewater, or generated as a result of other processes.

13. **“liquid waste”** means bulk liquids in a volume greater than 20 litres.

14. **“liquid oily waste”** means any waste containing free flowing petroleum products.

15. **"petroleum contaminated soil"** means soil that contains petroleum products at quantities determined, to the satisfaction of the Department, to be above the level indicated in the most recent version of the RBCA Tier I Risk-Based Screening Level (RBSL) Guidelines for Soil: Commercial, Non-potable, Coarse-grained for Modified TPH (Gas + Diesel#2 + #6 Oil).

16. **"C&D debris"** means

    a) concrete, brick and untreated wood,
    b) siding, ceiling tile, gyproc, insulation,
    c) asbestos that is not friable asbestos,
    d) solid roofing materials such as asphalt shingles,
    e) glass from doors and windows,
    f) metal, wood, fibreglass and durable plastic structural materials from the demolition of a building,
    g) wiring and incandescent light fixtures that do not contain fluorescent tubing/lighting,
    h) toilets, bathtubs, wash basins, and plumbing fixtures,
    i) floor coverings attached to a building during demolition,
    j) broken and aged asphalt, or
    k) any mixture of (a) thru (j)

    that has been obtained during the construction, renovation or demolition of a building or structure. Debris or other materials obtained from commercial, industrial and manufacturing sources is not acceptable. Debris: i) from a building that has or may have manufactured, contained, transferred or distributed contaminated or hazardous (such as a pesticide storage warehouse) products; or ii) that contains PCB's (polychlorinated biphenyls), or iii) that contains lead paint of a known concentration greater than 1000ppm (parts per million) or that has been deemed leachable toxic (exceeds 5 mg/L) or contains lead paint that is flaking/chipping/peeling is not considered C&D debris for the purpose of this Approval.

17. **"C&D Site"** means the portion of the Facility approved by the Department for the disposal of C&D debris.

18. **"disposal cell"** means the area at the C&D Site approved by the Department for the disposal of C&D debris.

19. **"sorting area"** means a location at the C&D Site, if approved in writing by the Director, where loads of C&D debris may be dumped and sorted. Unapproved materials may temporarily be stored here.

20. **"household hazardous waste"** means, for the purposes of this approval, hazardous waste that is generated in New Brunswick households.

21. **"hazardous waste collection and transportation network"** means a company that is approved by or acceptable to the Department to collect and transport hazardous waste.

22. **"landfill gas control and collection system"** is the system used to capture landfill gas from the containment cells. The system consists of the collection wells, piping, generator, flare and skid mount blower.

23. **"SWIM"** means Environment Canada's Single Window Information Manager, which is a one-window secure online electronic data reporting system accessible at: https://www.canada.ca/en/environment-climate-change/services/reporting-through-single-window.html

C. EMERGENCY REPORTING

24. The Approval Holder, operator or any person in charge of the Facility **shall immediately** notify the Department where:

    a) there has been, or is likely to be, a release of a contaminant or contaminants, such as leachate, wastewater, petroleum products, hazardous materials, or gaseous material, from the Facility which is of such magnitude or duration that there is a concern for the health or safety of the public, or there could be an impact to the environment.

Notification Procedure

During normal office hours, telephone the Department Regional Office **until personal contact is made** (i.e. no voice mail messages will be accepted) and provide as much information that is known about the environmental emergency. The telephone number for the Regional Office is provided below:

Saint John Regional Office (Phone) at (506) 658-2558

After hours, or if contact cannot be made to the Regional Office, telephone Environment and Climate Change Canada's National Environmental Emergencies Centre (NEEC) **until personal contact is made** and provide as much information that is known about the environmental emergency. The telephone number for NEEC is provided below:

NECC (Phone) at 1-800-565-1633

At this time the problem that occurred, its resulting impact and what was done to minimize the impact should be clearly expressed.

Within 24 hours of the original notification, a copy of an “Incident Report” shall be electronically mailed to the Region 4 (Saint John) Office and Central Office. The “Incident Report” shall clearly detail as much information about the incident that is available. As a minimum the report should include: details of the problem, its resulting impact and what was done to minimize the impact.

Within five (5) working days from the original notification, a “Detailed Emergency Report” shall be emailed to the Region 4 (Saint John) Office and also to Central Office in Fredericton. The “Detailed Emergency Report” shall describe in detail the problem that occurred, why the problem occurred, what the environmental impact was, what was done to minimize the impact, and what measures have been taken to prevent a re-occurrence of the problem.

Electronic Mail Addresses:
Saint John Regional Office at elg.egl-region4@gnb.ca
Central Office in Fredericton to the assigned Approvals Engineer

D. GENERAL INFORMATION

25. The issuance of this Approval does not relieve the Approval Holder from the responsibility of complying with other applicable federal, provincial or municipal legislation and/or bylaws.

26. A copy of this Approval to Operate should be maintained on-site or in the office of the Approval Holder.

27. The Approval Holder shall immediately notify the Department in writing of any change in the legal name or address of the Facility.

28. Any operating problems or other matters that could cause the Facility to be in non-compliance with this Approval should be reported to the Department immediately.

E. TERMS AND CONDITIONS

GENERAL CONDITIONS

29. In the event of Facility closure, the Approval Holder shall, in addition to any requirements under the *Environmental Impact Assessment Regulation 87-83* filed under the *Clean Environment Act*, prepare plans and an engineering closure proposal with ongoing monitoring, landfill gas and leachate management and complete site rehabilitation if appropriate. The plan shall also include other information as requested in writing by the Minister. The plans shall be submitted to the Director for review and approval **at least six (6) months** before the planned closure date. The plans must be prepared or approved by a person who is a member of the Association of Professional Engineers and Geoscientists of the Province of New Brunswick.

30. In the event of closure of the C&D Site at the Facility, the Approval Holder shall ensure that a Closure Plan is prepared and submitted to the Director for review and approval **at least three (3) months** before the planned closure date. The plans must be prepared or approved by a person who is a member of the Association of Professional Engineers and Geoscientists of the Province of New Brunswick and include, but not necessarily be limited to, updated site plans and an engineering proposal for the site rehabilitation, monitoring, leachate treatment if appropriate and closure.

31. The Approval Holder shall ensure that any item received at the Facility containing ozone-depleting substances, including but not limited to those utilized for refrigeration and/or air conditioning, are decommissioned according to the *Ozone Depleting Substances Regulation 97-132* filed under the *Clean Air Act*.

32. The Approval Holder shall ensure that waste, including C&D debris and friable asbestos, that originates from outside of New Brunswick is not accepted at the Facility unless specifically approved by the Minister following an evaluation under the *Environmental Impact Assessment Regulation*.

33. The Approval Holder shall ensure that an Environmental Management Plan (EMP) is in place at the Facility. The EMP should include detailed emergency, contingency response and clean-up procedures for potential spillage, release or mishandling of leachate, a petroleum product, or other dangerous materials at the Facility. The EMP should also include details on how the Facility will respond to emergency situations that may arise such as forest fires, restricted access to the Facility (traffic accidents or other blockade for example), failure of the leachate treatment and sedimentation ponds or leachate collection systems or other events that would interrupt normal operation of the Facility.

    Facility personnel should be appropriately trained to perform emergency and contingency response procedures as described in the EMP.

34. The Approval Holder shall continue to work on developing and implementing the statistical approach, which includes trigger parameters, in order to quickly identify potential impacts from the landfill.

OPERATING CONDITIONS

35. The Approval Holder shall ensure that the Facility is not used for the disposal of the materials listed below unless otherwise approved in writing by the Director.

    - petroleum contaminated soil,
    - liquid wastes (with the exception of septage from the Facility sewage system),
    - sludge (with the exception of sludge from the Facility leachate treatment system),
    - liquid oily wastes,
    - hazardous wastes,
    - biomedical waste or
    - any mixture of the above

36. The Approval Holder shall ensure that any solid waste disposed of at the Facility is done so in the containment cells at the Facility unless otherwise approved in writing by the Director. It is recommended that the waste be regularly and uniformly compacted.

37. The Approval Holder shall ensure that the minimum 25-year breakthrough requirement for the containment cells at the Facility is maintained.

38. The Approval Holder shall ensure that all exposed waste in the containment cells of the Facility is covered with a minimum of 150 mm of clean soil (or an alternate daily cover that has been pre-approved by the Department), as a minimum, at the end of each operating day.

39. The Approval Holder shall provide supervision when any material is being disposed of at the Facility, including the C&D Site. No disposal at the Facility, including the C&D Site, is permitted otherwise.

40. The Approval Holder shall ensure that the incoming waste at the Facility is routinely scrutinized to ensure that unacceptable waste is not received at the Facility.

41. The Approval Holder shall ensure that a buffer strip of native softwood trees is maintained around the Facility in accordance with the Environmental Impact Assessment Study.

42. The Approval Holder shall ensure that a Pest Management Program is in place at the Facility that is in compliance with "Pest Control at NB Landfill Sites and Transfer Stations", attached as Schedule "B".

CONSTRUCTION

43. The Approval Holder shall ensure that the necessary engineering documentation is submitted to the Director, and approved in writing by the Department, prior to the construction, modification or expansion of:
    1) additional solid waste disposal cells;
    2) landfill gas management systems;
    3) sludge handling facilities;
    4) leachate collection and treatment systems;
    5) facilities for processing recyclables;
    6) storage of waste including household hazardous waste;
    7) special waste disposal cells/locations or
    8) any other pertinent construction activity at the Facility.

44. The Approval Holder shall ensure that final cover applied to the containment cells at the Facility shall be a minimum of 300 mm granular layer, 600 mm low permeability clayey till @ 1 x 10^{-7} cm/sec hydraulic conductivity, 150 mm granular protection layer, 150 mm growing medium and vegetative cover and shall be sloped a minimum of 2% to promote precipitation runoff from the disposal cell. All holes, cave-ins and faults shall be filled in or repaired, as required, until the final cover has been properly stabilized. All side slopes shall be designed to ensure proper slope stability and full containment of leachate. As a minimum, a side slope of less than 4 horizontal to 1 vertical should be utilized.

    If approved in writing by the Director, an alternative final cover plan may be used.

45. The Approval Holder shall ensure that a Quality Assurance and Quality Control (QA/QC) report is submitted to the Department upon completion of the installation of final cover on a containment cell or cells at the Facility. The report must be prepared or approved by a person who is a member of the Association of Professional Engineers and Geoscientists of the Province of New Brunswick or is licensed to practise as a professional engineer pursuant to the *Engineering Profession Act* and include as a minimum:
    - commentary that confirms that all construction activities and testing associated with the installation of final cover were supervised by a qualified independent third party and that the final cover meets the Department's requirements as detailed in the previous condition;
    - all test parameters, the number of tests and locations;
    - copies of any inspection and testing reports;
    - a summary of any problems or deficiencies encountered and how they were corrected; and
    - other information as requested by the Department.

    The QA/QC report should be forwarded to the Department no later than 3 months upon completion of the final cover.

46. The Approval Holder shall ensure that all future containment cells at the Facility are designed such that the installed leachate piping can be inspected in the future by video or an alternate method approved in writing by the Director, to ensure that the leachate piping is in proper working condition.

47. The Approval Holder shall ensure that, prior to decommissioning any monitoring wells at the Facility, a decommissioning plan and schedule is submitted to the Director and approved in writing by the Department.

LEACHATE AND SURFACE WATER

48. The Approval Holder shall ensure that no leachate (including treated leachate) or water that has come in contact with solid waste, is released from the Facility to the environment or to the Facility's surface water drainage system including the sedimentation ponds.

49. The Approval Holder shall ensure that all leachate and all water at the Facility that has come in contact with solid waste is directed to the Facility's leachate collection system.

50. The Approval Holder shall ensure that the leachate levels in the disposal cells at the Facility are monitored and recorded Monday thru Friday. If precipitation is scheduled on Saturday and/or Sunday, or if the leachate levels in the disposal cells are high, then monitoring on Saturday and Sunday is also required.

51. The Approval Holder shall ensure that any leachate taken from the Facility to the Lancaster Wastewater Treatment Facility is treated to a level that is acceptable to the City of Saint John.

52. The Approval Holder shall ensure that surface water at the Facility that has not been in contact with leachate or solid waste is directed to the sedimentation pond(s). Clean surface water that has a total suspended solids (TSS) value of 25mg/l or less may be diverted from the sedimentation pond(s) if approved in writing by the Department. Water from empty disposal cells that has not been in contact with leachate or solid waste should bypass the leachate collection system and be directed to the surface water drainage system at the Facility.

53. The Approval Holder shall ensure that the drainage ditches at the Facility are maintained to ensure they remain free flowing at all times.

54. The Approval Holder shall ensure that there is a continuous, permeable layer of gravel surrounding the waste at the Facility from the top of the upper side slopes through the top of the berm area to the leachate collection system. Particular care must be exercised at the top of berm area so that the final cover will properly intersect the top of berm.

55. The Approval Holder shall ensure that the leachate collection piping at the Facility is properly maintained to ensure they remain free flowing.

56. **Prior to October 15, 2021**, and at least once every two years thereafter, the Approval Holder shall ensure that the leachate collection piping at the Facility is inspected by video or other method pre-approved in writing by the Director, to ensure the leachate collection system is in proper working condition.

WASTE DISPOSAL

57. The Approval Holder shall ensure that hot loads arriving at the Facility containing ashes or other materials that could potentially cause a fire in the containment cells are temporarily stored in a separate secure location until the risk of fire has been eliminated. The material shall then be disposed of in the containment cells (or a designated area that has been approved in writing by the Director) at the Facility.

58. The Approval Holder shall ensure that any friable asbestos accepted at the Facility for disposal has been wetted, placed in securely tied, double bagged 6 mil polyethylene bags or securely tied single 6 mil polyethylene bag that has been placed in a drum or cardboard box with all seams securely taped and each bag, cardboard box and/or drum is clearly labelled “WASTE ASBESTOS UN2590” or “DECHETS D’AMIANTE UN2590” and there are no punctures in the containers (if they are punctured, the contents must be wetted and repackaged prior to land filling) and they are placed at a dedicated location within the containment cells and are immediately covered with a minimum of 300 mm of clean cover material, or 1000 mm of municipal solid waste. Asbestos should be accepted at the Facility by appointment only, and not disposed during windy conditions.

59. The Approval Holder shall ensure that there is a sufficient quantity of wetting agent on-site when asbestos is being handled and disposed at the Facility.

60. The Approval Holder shall ensure that any unloading of friable asbestos at the Facility is done by the driver (or assistant) and that they or any personnel at the Facility who handle the asbestos are wearing the proper respirators and clothing during the unloading and disposal of the asbestos waste. Appropriate facility staff must supervise the unloading and covering of the asbestos waste.

61. The Approval Holder shall ensure that an “Asbestos Disposal Record” is maintained. The Record shall include, but not necessarily be limited to, the disposal date, volume of asbestos waste, origin of the shipment, contractor delivering the asbestos waste and a detailed plan of the disposal location at the Facility.

HOUSEHOLD HAZARDOUS WASTE

62. The Approval Holder shall ensure that the household hazardous waste depot at the Facility is operated in accordance with the most recent edition of the household hazardous waste Operations Manual that has been approved in writing by the Department.

63. The Approval Holder shall ensure that only household hazardous waste that is generated in New Brunswick is received and stored in the household hazardous waste depot at the Facility. All household hazardous waste received by the Facility is to be stored in the household hazardous waste depot.

64. The Approval Holder shall ensure that all household hazardous waste being stored in the household hazardous waste depot at the Facility is collected by a hazardous waste collection and transportation network. No household hazardous waste is to be stored at the Facility for more than one year.

65. The Approval Holder shall ensure that household hazardous waste at the Facility shall only be received, sorted, stored, and transferred from the Facility.

66. The Approval Holder shall ensure that all household hazardous waste stored in the household hazardous waste depot is:

    a) secured in sealed and chemically resistant containers;
    b) away from high traffic areas and protected from vehicle impacts;
    c) away from electrical panels;
    d) in a containment area that has secondary containment adequate to contain 110 % of the total volume contained within the containment area;
    e) in a containment area that is designed to prevent contact between incompatible chemicals; and
    f) in a containment area designed to prevent the release or discharge of chemicals to the environment as a result of a spill or other upset condition.

67. **Within 15 days of the end of each month**, the Approval Holder shall submit a monthly report to the Director that includes:
    a) a summary report of all household hazardous waste stored in the household hazardous waste depot for the previous month using a form acceptable to the Department, and
    b) a summary report of all spills that have occurred in association with the operation of the household hazardous waste program. This summary shall identify the material spilled, the approximate volume spilled, the date of the spill, the containment methods employed, and the steps taken to prevent a future recurrence of the spill. This does not relieve the Approval Holder of compliance with the Emergency Reporting section of this Approval.

CONSTRUCTION AND DEMOLITION DEBRIS

68. The Approval Holder shall ensure that only C&D debris is disposed of in the C&D Site's disposal cell. Any material at the C&D Site that is not located in a designated sorting area is considered disposed.

69. The Approval Holder shall ensure that all loads of C&D debris that are brought to the C&D Site have been properly scrutinized before they are disposed. If previously approved in writing by the Director, a designated sorting area may be used to scrutinize loads of C&D debris brought to the C&D Site.

70. The Approval Holder shall ensure that any unapproved materials brought to the C&D Site, including those in a designated sorting area, are either immediately placed in a temporary storage area and removed daily from the C&D Site and properly disposed. If the unapproved material is hazardous or may cause immediate impacts to the environment then it shall be immediately removed from the C&D Site and properly disposed of.

71. The Approval Holder shall provide on-site supervision when C&D debris is being disposed of at the C&D Site. No disposal at the C&D Site is permitted otherwise.

72. The Approval Holder shall ensure that clean/uncontaminated cover material at least 150 mm deep is applied to all exposed C&D debris at the C&D Site at least once per week.

73. The Approval Holder shall ensure that any final cover applied at the C&D Site is sloped in such a manner to ensure positive drainage and prevent standing or pooling of water on the surface.

74. The Approval Holder shall ensure that the area between the property line of the Facility and the C&D Site disposal cell is maintained with a treed or bermed buffer zone.

75. The Approval Holder shall ensure that the C&D Site is designed and operated such that surface water is prevented from entering the C&D debris disposal cell. No C&D debris shall be disposed of in free standing water.

76. The Approval Holder shall ensure that a minimum of 1.5 metres of overburden is maintained between the C&D debris and the bedrock and seasonal high groundwater.

77. The Approval Holder shall ensure that the C&D debris disposed of at the C&D Site is regularly compacted to minimize voids. Compaction with a dozer or equivalent is recommended.

78. The Approval Holder shall ensure that the side slopes of the disposal area of the C&D Site are properly stabilized (using riprap or a vegetative layer as part of the cover system for example) and maintained to limit erosion.

79. The Approval Holder shall ensure that a 50 metre treed or bermed buffer zone is maintained on the southern, northern and western boundaries of the C&D Site. It is understood at this time that the entire approved area for the C&D Site may be clearcut as part of a scientific evaluation of woodlot procedures. Ensure that the clearcut area is not grubbed if the scientific evaluation proceeds.

SITE MANAGEMENT

80. The Approval Holder shall ensure that areas of the containment cells at the Facility that will be inactive for at least three months are covered with a 300 mm intermediate cover layer, graded to promote drainage and minimize erosion and infiltration. Any leachate or any water that has, or could, come in contact with waste in the containment cells must be directed to the leachate collection system.

81. The Approval Holder shall ensure that white goods, scrap metals, electronics, propane tanks/canisters, wood, tires and any other materials being salvaged at the Facility are stored in a secured area separate from the main waste disposal area.

82. The Approval Holder shall ensure that debris and litter at the Facility is controlled. Adequate barriers and/or fencing shall be utilized to confine debris and litter to the immediate disposal area. Any debris or litter found along the access roads or otherwise not contained in the disposal cells shall be routinely collected and disposed in an appropriate location.

83. The Approval Holder shall ensure that unauthorized access to and scavenging at the Facility is controlled.

84. The Approval Holder shall ensure that the visibility buffer that has been established on the south and west borders of the Facility is maintained at a height of at least 6 meters.

LANDFILL GAS MANAGEMENT

85. The Approval Holder shall ensure that any landfill gas that is not utilized by the electric generator should be sent to the landfill gas flare as necessary to reduce greenhouse gases.

86. The Approval Holder shall ensure that a continuous temperature monitor is fully functional and in operation at all times when the landfill gas flare is in use. The temperature shall be recorded once every hour.

    An electronic record of the temperature results shall be maintained for a minimum of two years and shall be made available to an inspector upon request.

87. The Approval Holder shall ensure that the landfill gas control and collection system is properly operated and maintained.

88. The Approval Holder shall ensure that when the flare of the landfill gas control and collection system is operated with a minimum gas residence time of 0.75 seconds at a minimum temperature of 875 degrees Celsius to maximize the destruction efficiency.

89. The Approval Holder shall notify the Department if the continuous temperature monitor is taken out of service for maintenance or repair while the landfill gas flare is in operation. During the maintenance or repair the temperature shall be manually monitored and recorded on a schedule approved in writing by the Department.

EMISSIONS AND DISCHARGES

90. The Approval Holder shall ensure that no leachate is discharged from the Facility to the environment.

91. The Approval Holder shall ensure that any discharge from the Facility, including the sedimentation pond, to a watercourse has a total suspended solids (TSS) value of 25 mg/l or less.

92. The Approval Holder shall ensure that there is no open burning conducted at the Facility, including the C&D Site.

93. The Approval Holder shall ensure that both odour and noise emissions released from the Facility are controlled to prevent impacts to off-site receptors. In the event that odour or noise emission impacts do occur, the Department may require the Approval Holder to develop, submit and implement a Control Plan that mitigates the impacts such that they no longer cause a nuisance to off-site receptors. The Control Plan shall be submitted to the Director for review and approval prior to implementation.

94. The Approval Holder shall ensure that fugitive dust emissions generated from truck traffic or other activities at the Facility are controlled by the use of water. Written permission from the Department must first be obtained if calcium chloride or other chemical compounds are to be used for dust control. The use of a petroleum product for dust control is **prohibited.**

TESTING AND MONITORING

95. The Approval Holder shall ensure that the groundwater monitoring wells at the Facility are sampled at seasonal intervals that provide an accurate representation of groundwater quality at the Facility. The existing network of groundwater monitoring wells at the Facility is as follows:

Well Nest	Shallow Till	Deep Till	Shallow Bedrock	Mid Bedrock	Deep Bedrock
MW31			MW31-S	MW31-U	
MW31-L					
MW32			MW32-U	MW32-L	
MW33	MW33-S		MW33-U		
MW34	MW34-S		MW34-U		
MW35	MW35-S1	MW35-S2	MW35-L		
MW36	MW36-S		MW36-U	MW36-L	
MW37	MW37-S				
MW38	MW38-S		MW38-U	MW38-L	
MW39	MW39-S				
MW40	MW40-S		MW40-U		
MW41	MW41-S		MW41-U	MW41-L	
MW42	MW42-S		MW42-U	MW42-L	
MW43	MW43-S		MW43-U		
MW44	MW44-S		MW44-U		
MW45			MW45-U	MW45-L	
MW46			MW46-U	MW46-L	
MW47	MW47-S		MW47-U	MW47-L	
MW48	MW48-S		MW48-U	MW48-L	

MW49	MW49-S		MW49-U	MW49-L
MW50	MW50-S		MW50-U	MW50-L
MW51	MW51-S1	MW51-S2		MW51-D
MW52	MW52-S			MW52-D
MW53				MW53-D
MW54	MW54-S		MW54-U	

96. The Approval Holder shall ensure that any new groundwater monitoring wells, underdrains, leak detection systems or other sampling points at the Facility are sampled and analyzed as directed by the Department in writing.

97. The Approval Holder shall ensure that all ground and surface water samples required to be obtained for the Facility are obtained by a qualified technician and, unless otherwise approved in writing by the Director, analyzed by a laboratory that is, as a minimum, a member in good standing of the Canadian Association for Laboratory Accreditation (CALA) Proficiency Testing Program for Environmental Laboratories.

For the purpose of this Approval, "GENERAL CHEMISTRY" shall include the following analyses:

Ammonia	Alkalinity (as $CaCO_3$)	Calcium
Chemical Oxygen Demand	Chloride	Colour
Copper	Hardness (as $CaCO_3$)	Iron
Nitrate-Nitrite (as N)	Magnesium	Manganese
o-Phosphate (as P)	Phenols	Potassium
r-Silica (as SiO_2)	Sodium	Sulphur (Sulphate & Sulphide)
Total Suspended Solids	Total Organic Carbon	Turbidity
Total Kjeldahl Nitrogen (TKN)	Zinc	

with the associated calculated parameters: Bicarbonate, Carbonate, Hydroxide, Cation Sum, Anion Sum, % difference, Theoretical conductance, Saturation pH (5^{0}C) and Langelier Index (5^{0}C).

and "TRACE METALS" shall include the following analyses:

Aluminum	Antimony	Arsenic	Barium
Beryllium	Bismuth	Boron	Cadmium
Calcium	Chromium	Cobalt	Copper
Iron	Lead	Magnesium	Manganese
Mercury (CVAAS)		Molybdenum	Nickel Potassium
Selenium	Silver	Sodium	Strontium
Thallium	Tin	Uranium	Vanadium
Zinc			

and "BTEX/TPH" shall be analyzed in accordance with the Atlantic RBCA Tier 1 Guidelines for Laboratories and shall include the following parameters:

Benzene	C6-C10 Hydrocarbons
Toluene	>C10-C21 Hydrocarbons
Ethylbenzene	>C21-<C32 Hydrocarbons
Xylene	Modified TPH (Tier 1)

% Rec. iso-butylbenzene-Volatile
% Rec. iso-butylbenzene-Extractable
% Rec. n-dotriacontane-Extractable

98. The Approval Holder shall ensure that the following field parameters are obtained during each sampling event at the Facility:

Conductivity	Dissolved Oxygen	pH
Temperature	ground water elevations (referenced to geodetic datum)	

99. The Approval Holder shall ensure that prior to obtaining a ground water sample from a monitoring well at the Facility, a minimum of one well volume and a maximum of three well volumes be purged from that monitoring well.

100. The Approval Holder shall ensure that all field testing equipment is calibrated before and after each sampling event conducted at the Facility.

101. The Approval Holder shall ensure that groundwater samples to be submitted for analysis of TRACE METALS are field filtered using 0.45 µm in-line waterra filter or equivalent. All other samples should be unfiltered.

102. The Approval Holder shall ensure that the leachate surge pond, leachate holding pond and disposal cell underdrains at the Facility are sampled on at least 5 different occasions each calendar year and analyzed for GENERAL CHEMISTRY, TRACE METALS and BTEX/TPH.

103. The Approval Holder shall ensure that the leachate discharged from the containment cells at the Facility (MH#1) is sampled monthly and analyzed for the following parameters:

Alkalinity	Ammonia	Barium	Boron
BOD_5	Cadmium	COD	Chromium
Calcium	Chloride	Copper	Cyanide
Iron	Magnesium	Manganese	Lead
Mercury	Nitrite-Nitrate	Nickel	Phenols
Sodium	Sulphate	TSS/TDS	Total Organic Carbon (TOC)
TKN	Total Phosphate	Zinc	

and BTEX/TPH

104. The Approval Holder shall ensure that the groundwater monitoring well nests MW31 thru MW50 are sampled during the Spring and Fall seasons of each calendar year for GENERAL CHEMISTRY, TRACE METALS and BTEX/TPH.

105. The Approval Holder shall ensure that the groundwater monitoring well nests MW51 thru MW54 are sampled in the Spring, Summer and Fall months and analyzed for GENERAL CHEMISTRY, TRACE METALS & BTEX/TPH.

106. The Approval Holder shall ensure that the groundwater monitoring wells MW33U, MW34S, MW34U, MW35S2, MW35L, MW38U, MW41S and MW41U are sampled on at least five different occasions between February and November of each year and analyzed for GENERAL CHEMISTRY.

107. The Approval Holder shall ensure that the surface water sampling stations SW1, SW2, SW3, SW4, SW5, SW6 and the sedimentation pond discharge shall be sampled in the Spring and Fall seasons of each year and analyzed for GENERAL CHEMISTRY, TRACE METALS, BTEX/TPH, TKN, BOD_5 and TSS/TDS.

The sedimentation pond discharge shall be sampled near the mid-point of a discharge event.

108. The Approval Holder shall ensure that the results of all sampling and analysis conducted at the Facility are kept on file in both a hardcopy and electronic version.

109. The Approval Holder shall ensure that in September or October of each year the domestic wells chosen for the Domestic Well Monitoring Program are sampled and analyzed for the following parameters:

Ammonia	Alkalinity (as $CaCO_3$)	Calcium
Chloride	Copper	Iron
Nitrate-Nitrite (as N)	Magnesium	Manganese
o-Phosphate (as P)	Potassium	pH
r-Silica (as SiO_2)	Sodium	Sulphate
Total Disolved Solids	Total Organic Carbon	Turbidity
Zinc	Conductivity	Temperature

with the associated calculated parameters: Bicarbonate, Carbonate, Hydroxide, Cation Sum, Anion Sum, % difference, Theoretical conductance, Hardness (as $CaCO_3$), Ion Sum, Saturation pH (5^0C) and Langelier Index (5^0C).

110. The Approval Holder shall ensure that for each discharge of water from the sedimentation pond at the Facility a sample is obtained at the mid-point of the discharge event and analyzed for Total Suspended Solids (TSS).

111. The Approval Holder shall ensure that all monitoring samples required under this approval are obtained by a qualified technician and, unless otherwise Approved, analyzed by a laboratory that is accredited by the Canadian Association for Laboratory Accreditation (CALA) and having completed the CALA Proficiency Testing Program for the requested parameters.

REPORTING

112. On or before **May 31, August 31 & November 30 of each calendar year**, the Approval Holder shall ensure that an environmental monitoring report is submitted to the Director. It is understood that the May report will include monitoring from January to March, the August report will include monitoring from April to June and the November report will include monitoring from July to September. The 4th quarter report for monitoring of October to December will be included with the Annual Environmental Report. The reports must be prepared or approved by a person who is a member of the Association of Professional Engineers and Geoscientists of the Province of New Brunswick or is licensed to practice as a professional engineer pursuant to the *Engineering Profession Act* and include, as a minimum, a copy of the analysis, a comparison of the analysis with previous analytical results from the Facility, and commentary indicating whether their is an indication of any immediate, or potential threat or impact to the environment, ground or any surface waters. If an impact has occurred or is suspected the report must include a proposal for further investigation and/or remediation.

113. On or before **February 28 of each year**, the Approval Holder shall ensure that an Annual Environmental Report for the previous calendar year is submitted to the Director. The report must include as a minimum:
  a) a copy of the Asbestos Disposal Record;
  b) recommendations for any future monitoring, groundwater well installation or other work at the Facility;
  c) confirmation that all field testing equipment has been calibrated before and after each sampling event conducted at the Facility;
  d) confirmation that each groundwater monitoring well has been appropriately purged prior to obtaining a sample;
  e) dates of all sampling conducted at the Facility;
  f) dates of each discharge from the sedimentation pond;
  g) a copy of the analytical results of the sampling and monitoring data obtained from the Facility for the previous calendar year and a review of those analytical results that is completed by a professional engineer or geoscientist licensed with the Association of Professional Engineers and Geoscientists of New Brunswick that includes as a minimum:
  h) comparisons with historical results from the Facility;
  i) identification of possible analytical anomalies;
  j) an evaluation and discussion of the results for the surface water sampling points, groundwater monitoring wells, any cell or leachate pond underdrains/subdrain collection manholes and commentary on whether or not there is evidence of an immediate or potential impact to the environment, ground or surface waters and if so, recommendations for additional investigation, monitoring and remediation to mitigate the impacts;

k) confirmation that the containment cells and leachate pond(s) have been operated such that the minimum breakthrough requirements have been maintained; and

l) trending graphs for each monitoring well at the Facility and the leachate pond leak detection and cell underdrain manholes for the following indicator parameters showing results vs. time:

Alkalinity, Ammonia, Barium, Boron, Calcium, Chloride, Conductivity, Iron, Magnesium, pH, Sodium, Sulphate, and Dissolved Organic Carbon.

Note: Trending graphs should be completed on an annual basis but an alternate schedule may be accepted if approved in writing by the Director.

114. In the event the Approval Holder violates any Term or Condition of this Approval the Approval Holder is to immediately report this violation to the Department by calling (506) 453-7945. In the event the violation may cause the health or safety of the general public to be at risk and/or harm to the environment could or has resulted, the Approval Holder shall follow the Emergency Reporting procedures contained in this Approval.

115. In the event the Approval Holder receives a complaint from the public regarding unfavourable environmental impacts associated with the Facility, the Approval Holder is to report this complaint to the Department within one business day of receiving the complaint.

116. **Prior to November 30 of each year,** the Approval Holder shall ensure that each homeowner that has their well sampled as part of the Domestic Well Monitoring Program receives a signed copy of the analysis from the laboratory that did the analysis and a summary sheet that highlights any concerns or potential problems found in the analysis.

117. **Prior to November 30 of each year**, the Approval Holder shall ensure that a Domestic Well Monitoring Program report is submitted to the Department of Health. The report, as a minimum, shall include a signed copy of the analytical results and a summary of each well that has been completed by a qualified person that highlights any concerns or potential problems found.

A letter shall also be sent to the Department prior to November 30 of each year indicating that the sampling and analysis has been completed and that 1) a report has been forwarded to the Department of Health and 2) a signed copy of the analysis and summary of the results by a qualified person has been sent to each homeowner participating in the program.

118. The Approval Holder shall submit to the Department an annual status report by **June 30th** of each year, with respect to **Condition 34.** The report shall include a summary of work done in the previous year and any new or modified actions taken to the protocols.

119. **Prior to December 15, 2022**, the Approval Holder shall submit a Report, for review and approval by the Department, summarizing the Landfill Closure Plan and Post Closure Expenses Report to include a review for information or financial gaps. The Report shall demonstrate compliance with both the Landfill Closure Plan and Expenses Report requirements and provide a strategy for addressing any outstanding items.

120. **Beginning in 2021**, the Approval Holder shall submit a greenhouse gas emissions report by June 1st of each year, for the previous calendar year, to the Department by means of the SWIM system. Reporting shall be consistent with Environment Canada's Greenhouse Gas Emissions Reporting Program (GHGRP). Reporting requirements are published annually in the Canada Gazette, Part 1 under the authority of subsection 46(1) of the *Canadian Environmental Protection Act, 1999* (CEPA 1999).

121. **Prior to March 31st, 2022**, the Approval Holder shall prepare and submit a Greenhouse Gas Management Plan to the Department in accordance with the Guidelines for Greenhouse Gas Management for Industrial Emitters in New Brunswick, July 2015, or as may be updated from time to time. The Greenhouse Gas Management Plan shall be renewed every 5 years, as a minimum.

122. **Beginning in 2023**, the Approval Holder shall prepare and submit an Annual Greenhouse Gas Progress Report to the Department by July 1st of each year, for the previous calendar year, in accordance with the Guidelines for Greenhouse Gas Management for Industrial Emitters in New Brunswick.

Prepared by: Sheryl Johnstone

Sheryl Johnstone, P.Eng.
Senior Approvals Engineer, Authorizations

SCHEDULE "B"

PEST CONTROL AT NB LANDFILL SITES AND TRANSFER STATIONS

1. **<u>Terms and Conditions for Rodent Control at NB Landfill Sites and Transfer Stations</u>**

1. All personnel directly involved in the mixing, loading and application of the pesticides for the control of rodents at waste disposal facilities must hold a valid Class E, Class F, or Class L Pesticide Applicator's Certificate, which must be in their immediate possession.

2. Professional companies hired to conduct this work must hold a valid Provincial Operator's License and Pesticide Use Permit.

3. The treatment area must be posted with an approved sign prior to the treatment.

4 The signs are to be conspicuously posted at all ordinary points of access.

5 The applicator shall ensure that the signs are removed after either the completion of treatment or the expiration of their permit.

6 The sign shall be rectangular in shape with a minimum size of 14 cm x 21 cm, rain resistant with type or letters of sufficient size and clarity to be easily read together with a symbol of a cautionary raised hand inside a symbol of a stop sign. The information on the sign must be bilingual and must contain the words "Attention, Pesticide Application", the name of the pesticide, the Pest Control Product registration number, date of application, name of applicator, operator name or logo and telephone number.

7 Industry approved tamper resistant bait stations must be attempted before using other methods of baiting.

8 The Director of Pesticides Control or any member of the Pesticides Management Unit must approve areas that require alternative baiting methods. They can be contacted at (506) 453-7945.

Appendix B: Compliance Monitoring Schedule[1], Fundy Region Service Commission

		Febuary	April	July	September	November
Monitoring Wells	MW 31L, 31S, 31U		GC, TM, BTEX		GC, TM, BTEX	
	MW 32U1, 32U2		GC, TM, BTEX		GC, TM, BTEX	
	MW 33S		GC, TM, BTEX		GC, TM, BTEX	
	MW 33U	GC	GC, TM, BTEX	GC	GC, TM, BTEX	GC
	MW 34S, 34U	GC	GC, TM, BTEX	GC	GC, TM, BTEX	GC
	MW 35L	GC	GC, TM, BTEX	GC	GC, TM, BTEX	GC
	MW 35S1		GC, TM, BTEX		GC, TM, BTEX	
	MW 35S2	GC	GC, TM, BTEX	GC	GC, TM, BTEX	GC
	MW 36L, 36S, 36U		GC, TM, BTEX		GC, TM, BTEX	
	MW 37S		GC, TM, BTEX		GC, TM, BTEX	
	MW 38L, 38S		GC, TM, BTEX		GC, TM, BTEX	
	MW 38U	GC	GC, TM, BTEX	GC	GC, TM, BTEX	GC
	MW 39S		GC, TM, BTEX		GC, TM, BTEX	
	MW 40S, 40U		GC, TM, BTEX		GC, TM, BTEX	
	MW 41L		GC, TM, BTEX		GC, TM, BTEX	
	MW 41S, 41U	GC	GC, TM, BTEX	GC	GC, TM, BTEX	GC
	MW 42L, 42S, 42U		GC, TM, BTEX		GC, TM, BTEX	
	MW 43S, 43U		GC, TM, BTEX		GC, TM, BTEX	
	MW 45L, 45U		GC, TM, BTEX		GC, TM, BTEX	
	MW 46L, 46S		GC, TM, BTEX		GC, TM, BTEX	
	MW 47L, 47S, 47U		GC, TM, BTEX		GC, TM, BTEX	
	MW 48L, 48S, 48U		GC, TM, BTEX		GC, TM, BTEX	
	MW 49L, 49S, 49U		GC, TM, BTEX		GC, TM, BTEX	
	MW 50L, 50S, 50U		GC, TM, BTEX		GC, TM, BTEX	
	MW 51D, 51S1, 51S2		GC, TM, BTEX	GC, TM, BTEX	GC, TM, BTEX	
	MW 52D, 52S		GC, TM, BTEX	GC, TM, BTEX	GC, TM, BTEX	
	MW 53D		GC, TM, BTEX	GC, TM, BTEX	GC, TM, BTEX	
	MW 54S, 54U		GC, TM, BTEX	GC, TM, BTEX	GC, TM, BTEX	
	MW 55S		GC, TM, BTEX	GC, TM, BTEX	GC, TM, BTEX	
	MW 56S		GC, TM, BTEX	GC, TM, BTEX	GC, TM, BTEX	
Under drains	UD 3	GC, TM, BTEX	GC, TM, BTEX	GC, TM, BTEX	GC, TM, BTEX	GC, TM, BTEX
	UD 4	GC, TM, BTEX	GC, TM, BTEX	GC, TM, BTEX	GC, TM, BTEX	GC, TM, BTEX
	UD 5	GC, TM, BTEX	GC, TM, BTEX	GC, TM, BTEX	GC, TM, BTEX	GC, TM, BTEX
	UD 6	GC, TM, BTEX	GC, TM, BTEX	GC, TM, BTEX	GC, TM, BTEX	GC, TM, BTEX
Surface Waters	SW 1		GC, TM, BTEX		GC, TM, BTEX	
	SW 2		GC, TM, BTEX		GC, TM, BTEX	
	SW 3		GC, TM, BTEX		GC, TM, BTEX	
	SW 4		GC, TM, BTEX		GC, TM, BTEX	
	SW 5		GC, TM, BTEX		GC, TM, BTEX	
	SW 6		GC, TM, BTEX		GC, TM, BTEX	
	SW R1		GC, TM, BTEX		GC, TM, BTEX	
	SW R2		GC, TM, BTEX		GC, TM, BTEX	
	Sed Pond	GC, TM, BTEX	GC, TM, BTEX	GC, TM, BTEX	GC, TM, BTEX	GC, TM, BTEX
	Leachate UD	GC, TM, BTEX	GC, TM, BTEX	GC, TM, BTEX	GC, TM, BTEX	GC, TM, BTEX

Notes:

1. Prepared by Saint John Laboratory Services Ltd. to meet COA I-11079.

APPENDIX B

Asbestos Disposal Records

Appendix B-1
Asbestos Locations Record

Asbestos Locations 2022 FRSC

Date	Ticket #	WP ID#	Comments
02-Feb-22	550927	112	Source: Saint John the Baptist Church, 261 Gilbert St.
			1021 Duck Cove Lane, All Tech
			Delivered by: Fero/ Kelson Environmental Services
22-Feb-22	596164	113	Source: Refinery
			Delivered by: Fero / AlumaSafway
01-Mar-22	598031	114	Source: 15 Fenton Drive Saint John
			Delivered by: Service Master
15-Mar-22	602063	115	Source: 11 William Court, Quispamsis
			Delivered by: Belfor
17-Mar-22	602815	116	Source: 629 George St./ Saputo 91 Millidge Ave.
			Delivered by: Kelson Environmental Services
24-Mar-22	605116	117	Source: Refinery
			Delivered by: Fero / AlumaSafway
31-Mar-22	606690	118	Source: 17 Lone Water Farm rd, SJ Museum, 110 Charlotte
	606578	118	Source: 416 Bay Street, 10 princess court, Ridgewood Admin.
			Delivered by: Air Quality Services
05-Apr-22	607961	119	Source: 629 George St.,UNBSJ Ganong Hall, Suputo building Saint John
			Delivered by: Kelson Environmental Services
28-Apr-22	615838/ 615881	120	Source: Refinery
			Delivered by: Fero / AlumaSafway
24-May-22	624511	121	Source: Refinery
			Delivered by: Fero / AlumaSafway
06-Jun-22	628994	122	Source: Refinery
			Delivered by: Fero / AlumaSafway
20-Jun-22	633521	123	Source: Refinery
			Delivered by: Fero / AlumaSafway
21-Jun-22	633917	125	Source: UNB Tucker Hall,NBCC St. Andrews, 45 Gifford Rd, 21 Cannon St, 570 Gondola Point Rd, 674 Dunn Ave, St. Josephs Hospital
			Delivered by: Air Quality Services
21-Jun-22	*633982*	125	Source: Refinery
			Delivered by: Fero / AlumaSafway
21-Jun-22	634030	125	Ridgewood Bld. #2, NB Museum E2K1E5, 110 Charlotte St, Play House E3B1C2, St. Josephs Hospital Boiler Room
			Delivered by: Air Quality Services
18-Jul-22	643037	126	Source: Refinery
			Delivered by: Fero / AlumaSafway
22-Jul-22	644786	127	Source: Coleson Cove, UNBSJ, 202 Gateway St
			Delivered by: Kelson Environmental Services/Fero
09-Aug-22	650781	128	Source: 11 William Court, Quispamsis
			Delivered by: Belfor
29-Aug-22	658204		Source: 491 Ridge st. Saint John
			Delivered by: Kelson Environmental Services
29-Aug-22	658229/658231		Source: Refinery
			Delivered by: Fero / AlumaSafway
08-Sep-22	661676	131	Source: 491 Ridge st. Saint John
			Delivered by: Kelson Environmental Services
15-Sep-22	664434	132	Source: Refinery
			Delivered by: Fero / AlumaSafway
21-Sep-22	666336	133	Source: Refinery

Asbestos Locations 2022 FRSC

Date	Ticket #	WP ID#	Comments
			Delivered by: Fero / AlumaSafway
29-Sep-22	669256	135	Source: Refinery
			Delivered by: Fero / AlumaSafway
03-Oct-22	670582	136	Source: Refinery
			Delivered by: Fero / AlumaSafway
11-Oct-22	673679	137	Source: Refinery
			Delivered by: Fero / AlumaSafway
12-Oct-22	674148	138	Source: Refinery
			Delivered by: Fero / AlumaSafway
26-Oct-22	678918	139	Source: 228 Lancaster Ave. Saint John
			Delivered by: Air Quality Services
24-Nov-22	689603	140	Source: 193 Greedale Cresent, UNB Ganong Hall,
			Delivered by: Kelson Environmental Services
29-Nov-22	691553	141	Source: Saint John Regional Correction Center
			Delivered by: John Flood &Sons 1961 Ltd.
05-Dec-22	693137	142	Source: 228 Lancaster Ave. Saint John
			Delivered by: Air Quality Services
09-Dec-22	694923	143	Source: 228 Lancaster Ave. Saint John
			Delivered by: Air Quality Services
12-Dec-22	695610	144	Source: 228 Lancaster Ave. Saint John
			Delivered by: Air Quality Services
14-Dec-22	696608	145	Source: 228 Lancaster Ave. Saint John
			Delivered by: Air Quality Services
22-Dec-22	699027	146	Source: 228 Lancaster Ave. Saint John
			Delivered by: Air Quality Services

Appendix B-1
Asbestos Locations Record

Asbestos Locations 2022 FRSC

Date	*Ticket #*	*WP ID#*	*Comments*

Appendix B-2
Asbestos Coordinates Record

Asbestos Waypoint Coordinates (WP#) 2022

WP#	Latitude	Longitude	Elevation (feet)
112	45°16.115 N	66°12.607 W	268
113	45°16.114 N	66°12.627 W	279
114	45°16.131 N	66°12.648 W	294
115	45°16.121 N	66°12.638 W	275
116	45°16.1328N	66°12.642 W	276
117	45°16.129 N	66°12.645 W	280
118	45°16.133N	66°12.648 W	284
119	45°16.136 N	66°12.647 W	283
120	45°16.181 N	66°12.747 W	301
121	45°16.169 N	66°12.664 W	303
122	45°16.145 N	66°12.660 W	301
123	45°16.150 N	66°12.635 W	302
125	45°16.151 N	66°12.628 W	300
126	45°16.120 N	66°12.606 W	287
127	45°16.113 N	66°12.623 W	288
128	45°16.113 N	66°12.602 W	289
130	45°16.111 N	66°12.638 W	281
131	45°16.138 N	66°12.622 W	276
132	45°16.146 N	66°12.617 W	273
133	45°16.148 N	66°12.631 W	279
135	45°16.156 N	66°12.643 W	280
136	45°16.157 N	66°12.651 W	277
137	45°16.134 N	66°12.626 W	295
138	45°16.135 N	66°12.626 W	302
139	45°16.139 N	66°12.614 W	291
140	45°16.082 N	66°12.693 W	250
141	45°16.089 N	66°12.702 W	238
142	45°16.093 N	66°12.703 W	252
143	45°16.167 N	66°12.670 W	292
144	45°16.169 N	66°12.669 W	292
145	45°16.162 N	66°12.673 W	293
146	45°16.129 N	66°12.600 W	295

APPENDIX C

2022 Analytical Data

Appendix C1-1: General Chemistry, Monitoring Wells (greater than 10 m from a surface water body)

Sample Station:	Units	MDL[1]	GCDWQ[2]		Atlantic RBCA[4]		MW31L	MW31L	MW31S	MW31S	MW31U	MW31U DUP	MW31U	MW31U DUP	MW32U1
Date:			MAC[3]	AO/OG[3]	HH[5]	Eco[5]	2022/04/11	2022/09/15	2022/04/11	2022/09/15	2022/04/11	2022/04/11	2022/09/15	2022/09/15	2022/04/11
Alkalinity	mg/L	1	-	-	-	-	69	64	8	9	67	67	66	66	204
Ammonia	mg/L	0.5	-	-	-	Variable[6]	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Ammonia (Sample Specific Guideline)	*mg/L*		-	-	-		*0.588*	*0.141*	*5.740*	*1.270*	*0.588*	*0.588*	*1.270*	*1.270*	*0.197*
Calcium	mg/L	-	-	-	-	-	22.6	20.8	4.7	3.8	24.8	24.7	22.1	21.4	63.3
Chloride	mg/L	0.2	-	≤ 250	250	1200	4.0	2.4	4.2	2.8	4.0	3.9	2.9	2.9	20.5
Conductivity	µS/cm	-	-	-	-	-	159	168	34	177	145	145	524	524	447
Copper	mg/L	0.001	2	1	2	0.02	0.001	<0.001	0.003	<0.001	<0.001	<0.001	<0.001	<0.001	0.003
Iron	mg/L	0.002	-	≤ 0.3	0.3	3	<0.002	<0.002	0.041	0.012	<0.002	<0.002	<0.002	<0.002	<0.002
Magnesium	mg/L	-	-	-	-	-	2.6	2.4	0.8	0.8	2.4	2.4	2.3	2.4	8.7
Manganese	mg/L	0.002	0.12	≤ 0.02	0.12	0.43	0.007	<0.002	0.009	<0.002	<0.002	0.003	<0.002	<0.002	***0.089***
Nitrate + Nitrite (as N)	mg/L	0.2	1	-	-	-	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
o-Phosphate	mg/L	0.05	-	-	-	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
pH		-	-	7.0-10.5	-	6.5 to 9	7.9	8.4	***6.6***	7.1	7.7	7.7	7.2	7.2	8.2
Phenols	mg/L	0.002	-	-	0.57	0.04	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Potassium	mg/L	-	-	-	-	-	0.4	0.7	0.2	0.3	0.3	0.3	0.4	0.4	9.0
r-Silica	mg/L	-	-	-	-	-	16.2	16.3	6.0	6.5	12.7	12.5	10.0	9.8	19.1
Sodium	mg/L	-	-	≤ 200	200	-	9.1	8.6	3.1	4.0	3.8	3.6	4.1	4.2	24.6
Sulfate	mg/L	2	-	≤ 500	-	1280	6	5	2	2	2	2	2	2	6
Total Organic Carbon	mg/L	1	-	-	-	-	<1	2	1	1	<1	<1	1	1	4
Turbidity	NTU	-	-	≤ 1.0	-	-	0.53	0.61	***1.03***	1	0.85	0.85	0.75	0.75	***1.06***
Zinc	mg/L	0.002	-	≤ 5.0	5	0.07	0.004	<0.002	0.004	<0.002	0.002	<0.002	<0.002	<0.002	0.002
Calculated Parameters															
Bicarbonate	mg/L	1	-	-	-	-	69	64	8	9	67	67	66	66	204
Carbonate	mg/L	1	-	-	-	-	<1	<1	<1	<1	<1	<1	<1	<1	<1
Hydroxide	mg/L	1	-	-	-	-	<1	<1	<1	<1	<1	<1	<1	<1	<1
Cation sum	meq/L	-	-	-	-	-	1.75	1.63	0.44	0.44	1.61	1.59	1.48	1.46	5.18
Anion sum	meq/L	-	-	-	-	-	1.91	1.76	0.49	0.48	1.68	1.67	1.54	1.54	4.69
% difference	-	-	-	-	-	-	-4.32	-3.95	-4.68	-4.98	-2.23	-2.44	-2.05	-2.65	4.93
Theoretical Conductivity	µS/cm	-	-	-	-	-	165	150	42	39	152	151	141	140	492
Hardness	mg/L	-	-	-	-	-	67	62	15	13	72	72	65	63	194
Ion Sum	mg/L	-	-	-	-	-	114	104	23	23	105	104	100	100	337
Saturation pH	-	-	-	-	-	-	8.68	8.74	10.29	10.33	8.65	8.65	8.70	8.72	7.76
Langelier Index	-	-	-	-	-	-	-0.80	-0.36	-3.73	-3.20	-0.93	-0.93	-1.51	-1.53	0.44
BOD_5	mg/L	3	-	-			-	-	-	-	-	-	-	-	-
COD	mg/L	1	-	-	-	-	<1	7	3	2	<1	<1	2	2	13
Color	TCU	0	-	≤ 15	-	-	3	6	8	6	5	5	6	6	11
Kjeldahl Nitrogen	mg/L	0.5	-	-	-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Total Dissolved Solids	mg/L	-	-	≤ 500			-	-	-	-	-	-		-	-
Total Suspended Solids	mg/L	1	-	-	-	-	<1	8	2	8	1	1	8	8	2

Collection of samples and analysis provided by Saint John Laboratory Services Ltd.

Notes:
1. MDL = Method Detection Limit
2. Guidelines for Canadian Drinking Water Quality (GCDWQ) (Health Canada, Sept. 2022).
3. Maximum Allowable Concentration (MAC).
4. Aesthetic Objective (AO) / Operational Guideline (OG).
5. Atlantic Risk-Based Corrective Action Tier I Environmental Quality Standards (EQS) for an industrial, potable site with coarse-grained soil
6. HH = Human Health
7. Eco = Ecological (> 10m from a freshwater surface water body)
DUP = Field Duplicate
"-" = None established/ not measured.

Results that exceed the AO/OG are bold and italic
Results that exceed the MAC are red font and bolded
Results that exceed the Atlantic RBCA Tier I EQS guidelines (Human Health) are underlined
Results that exceed the Atlantic RBCA Tier I EQS guidelines (Ecological) are shaded

Appendix C1-1: General Chemistry, Monitoring Wells (greater than 10 m from a surface water body)

Sample Station:	Units	MDL[1]	GCDWQ[2]		Atlantic RBCA[4]		MW32U1	MW32U2	MW32U2	MW33S	MW33S	MW33U	MW33U DUP	MW33U	MW33U DUP
Date:			MAC[3]	AO/OG[3]	HH[5]	Eco[5]	2022/09/15	2022/04/11	2022/09/15	2022/04/11	2022/09/15	2022/03/07	2022/03/07	2022/04/11	2022/04/11
Alkalinity	mg/L	1	-	-	-	-	160	120	150	107	188	88	88	89	89
Ammonia	mg/L	0.5	-	-	-	Variable[6]	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Ammonia (Sample Specific Guideline)	*mg/L*		-	-	-		*0.410*	*0.197*	*1.270*	*0.588*	*1.270*	*0.282*	*0.282*	*0.588*	*0.588*
Calcium	mg/L	-	-	-	-	-	56.6	77.5	55.8	35.9	50.4	26.6	26.5	27.9	28.0
Chloride	mg/L	0.2	-	≤ 250	250	1200	35.4	211.6	78.3	10.7	9.6	7.5	7.6	7.9	7.8
Conductivity	µS/cm	-	-	-	-	-	533	895	741	243	292	197	196	212	212
Copper	mg/L	0.001	2	1	2	0.02	<0.001	0.002	<0.001	0.002	<0.001	<0.001	<0.001	<0.001	<0.001
Iron	mg/L	0.002	-	≤ 0.3	0.3	3	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Magnesium	mg/L	-	-	-	-	-	5.9	6.7	3.3	4.7	5.0	3.2	3.1	3.4	3.5
Manganese	mg/L	0.002	0.12	≤ 0.02	0.12	0.43	***0.071***	***0.11***	***0.03***	0.004	0.006	0.006	0.007	0.012	0.011
Nitrate + Nitrite (as N)	mg/L	0.2	1	-	-	-	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
o-Phosphate	mg/L	0.05	-	-	-	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
pH		-	-	7.0-10.5	-	6.5 to 9	7.7	8.2	7.3	7.8	7.1	8.2	8.2	8.0	8.0
Phenols	mg/L	0.002	-	-	0.57	0.04	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Potassium	mg/L	-	-	-	-	-	1.5	4.3	1.6	1.2	1.8	0.3	0.3	0.8	0.8
r-Silica	mg/L	-	-	-	-	-	15.6	13.5	11.3	5.7	6.7	13.5	13.1	15.2	15.0
Sodium	mg/L	-	-	≤ 200	200	-	13.2	84.8	38.1	6.9	8.4	10.9	11	9.9	10.2
Sulfate	mg/L	2	-	≤ 500	-	1280	5	4	4	2	3	8	8	8	8
Total Organic Carbon	mg/L	1	-	-	-	-	4	<1	4	<1	4	<1	<1	<1	<1
Turbidity	NTU	-	-	≤ 1.0	-	-	0.8	0.33	0.54	***4.1***	0.79	0.94	0.95	0.52	0.51
Zinc	mg/L	0.002	-	≤ 5.0	5	0.07	<0.002	<0.002	<0.002	0.004	<0.002	<0.002	<0.002	<0.002	<0.002
Calculated Parameters															
Bicarbonate	mg/L	1	-	-	-	-	160	120	150	107	188	88	88	89	89
Carbonate	mg/L	1	-	-	-	-	<1	<1	<1	<1	<1	<1	<1	<1	<1
Hydroxide	mg/L	1	-	-	-	-	<1	<1	<1	<1	<1	<1	<1	<1	<1
Cation sum	meq/L	-	-	-	-	-	3.92	8.22	4.76	2.51	3.34	2.07	2.06	2.12	2.15
Anion sum	meq/L	-	-	-	-	-	4.25	8.46	5.13	2.28	3.63	2.27	2.26	2.35	2.34
% difference	-	-	-	-	-	-	-3.98	-1.44	-3.78	4.71	-4.17	-4.54	-4.52	-4.97	-4.27
Theoretical Conductivity	µS/cm	-	-	-	-	-	421	994	546	244	350	207	207	211	213
Hardness	mg/L	-	-	-	-	-	166	221	153	109	146	80	79	84	84
Ion Sum	mg/L	-	-	-	-	-	278	509	331	168	266	145	145	146	147
Saturation pH	-	-	-	-	-	-	7.91	7.90	7.95	8.28	7.89	8.50	8.50	8.47	8.47
Langelier Index	-	-	-	-	-	-	-0.26	0.29	-0.63	-0.49	-0.84	-0.26	-0.26	-0.49	-0.49
BOD_5	mg/L	3	-	-			-	-	-	-	-	-	-	-	-
COD	mg/L	1	-	-	-	-	10	<1	11	<1	11	<1	<1	<1	<1
Color	TCU	0	-	≤ 15	-	-	7	5	11	***23***	8	1	1	1	1
Kjeldahl Nitrogen	mg/L	0.5	-	-	-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Total Dissolved Solids	mg/L	-	-	≤ 500			-		-	-	-	-	-	-	-
Total Suspended Solids	mg/L	1	-	-	-	-	9	1	14	7	10	2	2	<1	<1

Collection of samples and analysis provided by Saint John Laboratory Services Ltd.

Notes:

1. MDL = Method Detection Limit
2. Guidelines for Canadian Drinking Water Quality (GCDWQ) (Health Canada, Sept. 2022).
3. Maximum Allowable Concentration (MAC).
4. Aesthetic Objective (AO) / Operational Guideline (OG).
5. Atlantic Risk-Based Corrective Action Tier I Environmental Quality Standards (EQS) for an industrial, potable site with coarse-grained soil
6. HH = Human Health
7. Eco = Ecological (> 10m from a freshwater surface water body)

DUP = Field Duplicate

"-" = None established/ not measured.

Results that exceed the AO/OG are bold and italic
Results that exceed the MAC are red font and bolded
Results that exceed the Atlantic RBCA Tier I EQS guidelines (Human Health) are underlined
Results that exceed the Atlantic RBCA Tier I EQS guidelines (Ecological) are shaded

Appendix C1-1: General Chemistry, Monitoring Wells (greater than 10 m from a surface water body)

Sample Station:	Units	MDL[1]	GCDWQ[2]		Atlantic RBCA[4]		MW33U	MW33U DUP	MW33U	MW33U DUP	MW33U	MW33U DUP	MW34S	MW34S	MW34S
Date:			**MAC[3]**	**AO/OG[3]**	**HH[5]**	**Eco[5]**	**2022/07/21**	**2022/07/21**	**2022/09/15**	**2022/09/15**	**2022/11/24**	**2022/11/24**	**2022/03/07**	**2022/04/11**	**2022/07/21**
Alkalinity	mg/L	1	-	-	-	-	84	85	85	84	83	83	164	182	212
Ammonia	mg/L	0.5	-	-	-	Variable[6]	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Ammonia (Sample Specific Guideline)	*mg/L*		-	-	-		*0.410*	*0.410*	*0.410*	*0.410*	*0.282*	*0.282*	*0.855*	*0.197*	*0.103*
Calcium	mg/L	-	-	-	-	-	27.9	27.5	24.1	23.7	24.9	24.4	47.9	62.5	70.9
Chloride	mg/L	0.2	-	≤ 250	250	1200	10.3	10.4	6.0	6.0	6.2	6.1	26.7	29.5	45.0
Conductivity	µS/cm	-	-	-	-	-	214	214	298	298	210	208	350	442	555
Copper	mg/L	0.001	2	1	2	0.02	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Iron	mg/L	0.002	-	≤ 0.3	0.3	3	<0.002	<0.002	<0.002	<0.002	<0.02	<0.02	<0.002	<0.002	<0.002
Magnesium	mg/L	-	-	-	-	-	3.5	3.5	3.2	3.1	3.6	3.6	6.1	8.2	9.3
Manganese	mg/L	0.002	0.12	≤ 0.02	0.12	0.43	<0.002	<0.002	<0.002	<0.002	<0.02	<0.02	<0.002	0.008	<0.002
Nitrate + Nitrite (as N)	mg/L	0.2	1	-	-	-	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
o-Phosphate	mg/L	0.05	-	-	-	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
pH		-	-	7.0-10.5	-	6.5 to 9	7.7	7.7	7.6	7.6	8.1	8.1	7.9	8.1	8.1
Phenols	mg/L	0.002	-	-	0.57	0.04	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Potassium	mg/L	-	-	-	-	-	0.4	0.4	0.6	0.6	0.6	0.6	1.7	1.5	1.1
r-Silica	mg/L	-	-	-	-	-	14.9	14.3	11.3	11.0	12.0	12.5	11.3	11.8	14.6
Sodium	mg/L	-	-	≤ 200	200	-	10.3	10.5	9.2	8.8	10.8	10.6	17.6	20.6	24.8
Sulfate	mg/L	2	-	≤ 500	-	1280	9	9	7	6	7	7	5	7	10
Total Organic Carbon	mg/L	1	-	-	-	-	1	1	3	2	1	1	<1	<1	1
Turbidity	NTU	-	-	≤ 1.0	-	-	0.65	0.65	***1.41***	***1.42***	0.42	0.42	***1.22***	0.8	***2.45***
Zinc	mg/L	0.002	-	≤ 5.0	5	0.07	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Calculated Parameters															
Bicarbonate	mg/L	1	-	-	-	-	84	85	85	84	83	83	164	182	212
Carbonate	mg/L	1	-	-	-	-	<1	<1	<1	<1	<1	<1	<1	<1	<1
Hydroxide	mg/L	1	-	-	-	-	<1	<1	<1	<1	<1	<1	<1	<1	<1
Cation sum	meq/L	-	-	-	-	-	2.14	2.13	1.88	1.84	2.02	1.99	3.70	4.73	5.41
Anion sum	meq/L	-	-	-	-	-	2.35	2.35	2.08	2.04	2.08	2.09	3.92	4.34	5.44
% difference	-	-	-	-	-	-	-4.73	-4.98	-4.92	-5.19	-1.38	-2.55	-2.89	4.22	-0.26
Theoretical Conductivity	µS/cm	-	-	-	-	-	216	216	189	185	196	194	390	469	566
Hardness	mg/L	-	-	-	-	-	84	83	73	72	77	76	145	190	215
Ion Sum	mg/L	-	-	-	-	-	145	146	135	132	136	135	269	311	373
Saturation pH	-	-	-	-	-	-	8.50	8.50	8.56	8.57	8.55	8.56	7.97	7.81	7.69
Langelier Index	-	-	-	-	-	-	-0.82	-0.82	-0.99	-1.00	-0.46	-0.48	-0.10	0.27	0.39
BOD_5	mg/L	3	-	-			-	-	-	-	-	-	-	-	-
COD	mg/L	1	-	-	-	-	2	2	7	5	4	4	<1	<1	2
Color	TCU	0	-	≤ 15	-	-	6	6	7	7	7	7	9	6	***24***
Kjeldahl Nitrogen	mg/L	0.5	-	-	-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Total Dissolved Solids	mg/L	-	-	≤ 500			-	-	-	-	-	-	-	-	-
Total Suspended Solids	mg/L	1	-	-	-	-	<1	<1	9	8	<1	<1	<1	1	12

Collection of samples and analysis provided by
Saint John Laboratory Services Ltd.

Notes:
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3. Maximum Allowable Concentration (MAC).
4. Aesthetic Objective (AO) / Operational Guideline (OG).
5. Atlantic Risk-Based Corrective Action Tier I Environmental Quality Standards (EQS)
for an industrial, potable site with coarse-grained soil
6. HH = Human Health
7. Eco = Ecological (> 10m from a freshwater surface water body)
DUP = Field Duplicate
"-" = None established/ not measured.

Results that exceed the AO/OG are bold and italic
Results that exceed the MAC are red font and bolded
Results that exceed the Atlantic RBCA Tier I EQS guidelines (Human Health) are underlined
Results that exceed the Atlantic RBCA Tier I EQS guidelines (Ecological) are shaded

Appendix C1-1: General Chemistry, Monitoring Wells (greater than 10 m from a surface water body)

Sample Station:	**Units**	**MDL[1]**	**GCDWQ[2]**		**Atlantic RBCA[4]**		**MW34S**	**MW34S**	**MW34U**	**MW34U**	**MW34U**	**MW34U**	**MW34U**	**MW35L**	**MW35L**
Date:			**MAC[3]**	**AO/OG[3]**	**HH[5]**	**Eco[5]**	**2022/09/15**	**2022/11/24**	**2022/03/07**	**2022/04/11**	**2022/07/21**	**2022/09/15**	**2022/11/24**	**2022/03/07**	**2022/04/11**
Alkalinity	mg/L	1	-	-	-	-	209	158	134	136	132	125	132	96	110
Ammonia	mg/L	0.5	-	-	-	Variable[6]	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Ammonia (Sample Specific Guideline)	*mg/L*		-	-	-		*1.270*	*3.980*	*0.855*	*0.588*	*0.141*	*0.410*	*0.855*	*0.855*	*0.855*
Calcium	mg/L	-	-	-	-	-	50.5	40.7	22.4	29.0	24.9	15.3	24.5	17.2	23.3
Chloride	mg/L	0.2	-	≤ 250	250	1200	29.0	13.0	22.1	21.3	20.8	12.4	22.3	3.7	4.3
Conductivity	µS/cm	-	-	-	-	-	527	369	306	343	330	343	312	203	239
Copper	mg/L	0.001	2	1	2	0.02	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Iron	mg/L	0.002	-	≤ 0.3	0.3	3	<0.002	0.005	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Magnesium	mg/L	-	-	-	-	-	8.4	6.6	2.0	3.0	2.9	1.0	2.1	2.5	2.8
Manganese	mg/L	0.002	0.12	≤ 0.02	0.12	0.43	<0.002	<0.02	***0.085***	0.019	0.013	<0.002	***0.130***	***0.169***	***0.046***
Nitrate + Nitrite (as N)	mg/L	0.2	1	-	-	-	<0.2	<0.2	<0.2	<0.2	0.3	<0.2	<0.2	<0.2	<0.2
o-Phosphate	mg/L	0.05	-	-	-	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
pH		-	-	7.0-10.5	-	6.5 to 9	7.3	7.2	7.9	8.0	8.3	7.8	7.9	8.0	8.0
Phenols	mg/L	0.002	-	-	0.57	0.04	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Potassium	mg/L	-	-	-	-	-	2.3	1.3	0.3	2.9	0.8	1.4	2.3	0.9	1.1
r-Silica	mg/L	-	-	-	-	-	11.9	10.5	9.3	10.8	10.5	8.9	6.8	10.0	11.9
Sodium	mg/L	-	-	≤ 200	200	-	23.9	17.6	41.8	40.3	43	41.2	47.2	22.6	23.7
Sulfate	mg/L	2	-	≤ 500	-	1280	6	2	10	10	11	10	9	6	7
Total Organic Carbon	mg/L	1	-	-	-	-	3	1	1	<1	1	1	<1	<1	<1
Turbidity	NTU	-	-	≤ 1.0	-	-	0.89	***2.27***	0.96	0.51	***1.67***	0.71	0.59	***1.99***	***3.43***
Zinc	mg/L	0.002	-	≤ 5.0	5	0.07	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Calculated Parameters															
Bicarbonate	mg/L	1	-	-	-	-	209	158	134	136	132	125	132	96	110
Carbonate	mg/L	1	-	-	-	-	<1	<1	<1	<1	<1	<1	<1	<1	<1
Hydroxide	mg/L	1	-	-	-	-	<1	<1	<1	<1	<1	<1	<1	<1	<1
Cation sum	meq/L	-	-	-	-	-	4.31	3.37	3.11	3.52	3.37	2.67	3.51	2.08	2.45
Anion sum	meq/L	-	-	-	-	-	4.77	3.35	3.34	3.41	3.10	2.90	3.21	2.14	2.46
% difference	-	-	-	-	-	-	-5.07	0.38	-3.51	1.64	4.21	-4.11	4.55	-1.41	-0.21
Theoretical Conductivity	µS/cm	-	-	-	-	-	460	331	325	350	336	273	344	198	232
Hardness	mg/L	-	-	-	-	-	161	129	64	85	74	42	70	53	70
Ion Sum	mg/L	-	-	-	-	-	329	239	233	243	235	206	240	149	172
Saturation pH	-	-	-	-	-	-	7.84	8.06	8.39	8.27	8.35	8.59	8.36	8.65	8.46
Langelier Index	-	-	-	-	-	-	-0.58	-0.84	-0.51	-0.27	-0.09	-0.79	-0.45	-0.61	-0.46
BOD_5	mg/L	3	-	-			-	-	-	-	-	-	-	-	-
COD	mg/L	1	-	-	-	-	9	3	4	<1	3	2	1	<1	<1
Color	TCU	0	-	≤ 15	-	-	10	***24***	2	4	14	7	9	8	***28***
Kjeldahl Nitrogen	mg/L	0.5	-	-	-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Total Dissolved Solids	mg/L	-	-	≤ 500			-	-	-	-	-	-	-	-	-
Total Suspended Solids	mg/L	1	-	-	-	-	12	18	8	<1	5	8	24	11	8

Collection of samples and analysis provided by Saint John Laboratory Services Ltd.

Notes:

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2. Guidelines for Canadian Drinking Water Quality (GCDWQ) (Health Canada, Sept. 2022).
3. Maximum Allowable Concentration (MAC).
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Results that exceed the AO/OG are bold and italic
Results that exceed the MAC are red font and bolded
Results that exceed the Atlantic RBCA Tier I EQS guidelines (Human Health) are underlined
Results that exceed the Atlantic RBCA Tier I EQS guidelines (Ecological) are shaded

Appendix C1-1: General Chemistry, Monitoring Wells (greater than 10 m from a surface water body)

Sample Station:	Units	MDL[1]	GCDWQ[2]		Atlantic RBCA[4]		MW35L	MW35L	MW35L	MW35S1	MW35S1	MW35S2	MW35S2	MW35S2	MW35S2
Date:			MAC[3]	AO/OG[3]	HH[5]	Eco[5]	2022/07/21	2022/09/15	2022/11/24	2022/04/11	2022/09/15	2022/03/07	2022/04/11	2022/07/21	2022/09/15
Alkalinity	mg/L	1	-	-	-	-	106	104	103	112	112	120	112	111	109
Ammonia	mg/L	0.5	-	-	-	Variable[6]	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Ammonia (Sample Specific Guideline)	*mg/L*		-	-	-		*0.141*	*0.410*	*0.855*	*0.197*	*0.410*	*0.855*	*0.588*	*0.141*	*0.410*
Calcium	mg/L	-	-	-	-	-	20.3	18.3	17.6	41.6	30.2	19.6	25.7	26.2	16.9
Chloride	mg/L	0.2	-	≤ 250	250	1200	5.0	2.9	2.7	13.1	10.0	8.7	8.4	9.9	7.0
Conductivity	µS/cm	-	-	-	-	-	228	274	229	305	311	225	258	254	294
Copper	mg/L	0.001	2	1	2	0.02	<0.001	<0.001	<0.001	0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Iron	mg/L	0.002	-	≤ 0.3	0.3	3	<0.002	<0.002	<0.002	<0.002	<0.002	0.003	0.010	<0.002	0.006
Magnesium	mg/L	-	-	-	-	-	2.7	2.7	2.7	5.1	4.4	3.0	3.9	3.7	4.0
Manganese	mg/L	0.002	0.12	≤ 0.02	0.12	0.43	0.005	0.007	0.004	0.006	<0.002	***0.036***	0.006	0.002	<0.002
Nitrate + Nitrite (as N)	mg/L	0.2	1	-	-	-	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
o-Phosphate	mg/L	0.05	-	-	-	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
pH		-	-	7.0-10.5	-	6.5 to 9	8.2	7.9	7.9	8.2	7.9	7.9	8.0	8.2	8.0
Phenols	mg/L	0.002	-	-	0.57	0.04	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Potassium	mg/L	-	-	-	-	-	0.8	0.9	1.2	1.7	1.4	0.7	1.8	1.4	2.5
r-Silica	mg/L	-	-	-	-	-	11.8	9.3	11.4	9.8	7.6	10.0	11.0	11.2	7.8
Sodium	mg/L	-	-	≤ 200	200	-	23.1	19.5	23.8	13.5	11.8	28.6	26.2	23.4	25.0
Sulfate	mg/L	2	-	≤ 500	-	1280	6	5	5	17	14	5	6	5	<2
Total Organic Carbon	mg/L	1	-	-	-	-	<1	2	<1	<1	1	2	<1	<1	1
Turbidity	NTU	-	-	≤ 1.0	-	-	***1.38***	0.83	***1.59***	0.65	0.51	***16.5***	***9.4***	***18.1***	***28.9***
Zinc	mg/L	0.002	-	≤ 5.0	5	0.07	<0.002	<0.002	<0.002	0.003	<0.002	<0.002	<0.002	<0.002	<0.002
Calculated Parameters															
Bicarbonate	mg/L	1	-	-	-	-	106	104	103	112	112	120	112	111	109
Carbonate	mg/L	1	-	-	-	-	<1	<1	<1	<1	<1	<1	<1	<1	<1
Hydroxide	mg/L	1	-	-	-	-	<1	<1	<1	<1	<1	<1	<1	<1	<1
Cation sum	meq/L	-	-	-	-	-	2.26	2.01	2.17	3.13	2.42	2.49	2.79	2.67	2.32
Anion sum	meq/L	-	-	-	-	-	2.40	2.20	2.25	2.89	2.67	2.65	2.56	2.58	2.24
% difference	-	-	-	-	-	-	-2.91	-4.68	-1.84	3.96	-4.99	-3.13	4.32	1.72	1.75
Theoretical Conductivity	µS/cm	-	-	-	-	-	218	198	204	311	259	246	259	254	218
Hardness	mg/L	-	-	-	-	-	62	57	55	125	94	61	80	81	59
Ion Sum	mg/L	-	-	-	-	-	164	153	156	204	184	186	184	181	164
Saturation pH	-	-	-	-	-	-	8.54	8.59	8.61	8.20	8.34	8.50	8.41	8.40	8.60
Langelier Index	-	-	-	-	-	-	-0.39	-0.71	-0.69	-0.03	-0.40	-0.60	-0.37	-0.22	-0.65
BOD_5	mg/L	3	-	-			-	-	-	-	-	-	-	-	-
COD	mg/L	1	-	-	-	-	1	7	<1	<1	4	2	<1	<1	3
Color	TCU	0	-	≤ 15	-	-	14	8	15	4	7	***104***	***61***	***133***	***211***
Kjeldahl Nitrogen	mg/L	0.5	-	-	-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Total Dissolved Solids	mg/L	-	-	≤ 500			-	-	-	-	-	-	-	-	-
Total Suspended Solids	mg/L	1	-	-	-	-	6	10	86	<1	9	75	18	28	74

Collection of samples and analysis provided by
Saint John Laboratory Services Ltd.

Notes:

1. MDL = Method Detection Limit
2. Guidelines for Canadian Drinking Water Quality (GCDWQ) (Health Canada, Sept. 2022).
3. Maximum Allowable Concentration (MAC).
4. Aesthetic Objective (AO) / Operational Guideline (OG).
5. Atlantic Risk-Based Corrective Action Tier I Environmental Quality Standards (EQS) for an industrial, potable site with coarse-grained soil
6. HH = Human Health
7. Eco = Ecological (> 10m from a freshwater surface water body)

DUP = Field Duplicate
"-" = None established/ not measured.

Results that exceed the AO/OG are bold and italic
Results that exceed the MAC are red font and bolded
Results that exceed the Atlantic RBCA Tier I EQS guidelines (Human Health) are underlined
Results that exceed the Atlantic RBCA Tier I EQS guidelines (Ecological) are shaded

Appendix C1-1: General Chemistry, Monitoring Wells (greater than 10 m from a surface water body)

Sample Station:	**Units**	**MDL[1]**	**GCDWQ[2]**		**Atlantic RBCA[4]**		**MW35S2**	**MW40S**	**MW40S**	**MW40U**	**MW40U**	**MW41L**	**MW41L**	**MW41S**	**MW41S**
Date:			**MAC[3]**	**AO/OG[3]**	**HH[5]**	**Eco[5]**	**2022/11/24**	**2022/04/25**	**2022/09/22**	**2022/04/25**	**2022/09/22**	**2022/04/25**	**2022/09/22**	**2022-03-07**	**2022/04/25**
Alkalinity	mg/L	1	-	-	-	-	110	128	123	104	102	98	96	-	2
Ammonia	mg/L	0.5	-	-	-	Variable[6]	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5
Ammonia (Sample Specific Guideline)	*mg/L*		*-*	*-*	*-*		*0.413*	*0.588*	*0.055*	*0.588*	*0.141*	*0.588*	*0.141*	*-*	*-*
Calcium	mg/L	-	-	-	-	-	18.5	20.8	20.7	18.4	19.7	21.5	23.4	-	2.5
Chloride	mg/L	0.2	-	≤ 250	250	1200	6.9	3.7	2.4	2.9	3.7	3.2	3.3	-	4.7
Conductivity	µS/cm	-	-	-	-	-	255	268	205	209	256	244	227	-	37
Copper	mg/L	0.001	2	1	2	0.02	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	0.002
Iron	mg/L	0.002	-	≤ 0.3	0.3	3	<0.002	<0.002	<0.002	0.020	0.002	<0.002	0.002	-	0.151
Magnesium	mg/L	-	-	-	-	-	3.6	3.0	2.3	2.7	2.3	3.1	2.5	-	0.6
Manganese	mg/L	0.002	0.12	≤ 0.02	0.12	0.43	<0.002	0.008	0.003	0.003	0.002	0.002	<0.002	-	***0.112***
Nitrate + Nitrite (as N)	mg/L	0.2	1	-	-	-	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	-	<0.2
o-Phosphate	mg/L	0.05	-	-	-	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	-	<0.05
pH		-	-	7.0-10.5	-	6.5 to 9	8.1	8.0	8.5	8.0	8.2	7.9	8.4	-	***5.4***
Phenols	mg/L	0.002	-	-	0.57	0.04	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	<0.002
Potassium	mg/L	-	-	-	-	-	1.9	1.7	1.8	1.7	1.3	1.2	1.5	-	0.5
r-Silica	mg/L	-	-	-	-	-	7.8	9.5	8.8	8.6	8.5	14.2	14.1	-	6.0
Sodium	mg/L	-	-	≤ 200	200	-	27.9	32.0	28.6	21.4	19.7	22.4	21.0	-	4.0
Sulfate	mg/L	2	-	≤ 500	-	1280	3	6	<2	2	2	17	21	-	2
Total Organic Carbon	mg/L	1	-	-	-	-	<1	<1	<1	<1	<1	<1	<1	-	5
Turbidity	NTU	-	-	≤ 1.0	-	-	***19.9***	***3.73***	***3.3***	0.31	0.44	0.54	0.66	-	***1.7***
Zinc	mg/L	0.002	-	≤ 5.0	5	0.07	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	0.018
Calculated Parameters															
Bicarbonate	mg/L	1	-	-	-	-	110	128	123	104	102	98	96	-	2
Carbonate	mg/L	1	-	-	-	-	<1	<1	<1	<1	<1	<1	<1	-	<1
Hydroxide	mg/L	1	-	-	-	-	<1	<1	<1	<1	<1	<1	<1	-	<1
Cation sum	meq/L	-	-	-	-	-	2.48	2.72	2.51	2.12	2.06	2.33	2.33	-	0.37
Anion sum	meq/L	-	-	-	-	-	2.32	2.65	2.38	2.12	2.11	2.52	2.57	-	0.41
% difference	-	-	-	-	-	-	3.37	1.24	2.73	-0.08	-1.10	-3.86	-4.97	-	-4.40
Theoretical Conductivity	µS/cm	-	-	-	-	-	231	256	229	199	197	230	236	-	34
Hardness	mg/L	-	-	-	-	-	61	64	61	57	59	66	69	-	9
Ion Sum	mg/L	-	-	-	-	-	172	196	179	153	151	166	168	-	17
Saturation pH	-	-	-	-	-	-	8.56	8.44	8.46	8.59	8.56	8.54	8.52	-	11.17
Langelier Index	-	-	-	-	-	-	-0.47	-0.42	0.06	-0.59	-0.32	-0.65	-0.13	-	-5.74
BOD_5	mg/L	3	-	-			-	-	-	-	-	-	-	-	
COD	mg/L	1	-	-	-	-	1	<1	<1	<1	<1	<1	<1	-	14
Color	TCU	0	-	≤ 15	-	-	***161***	***18***	8	4	<1	3	3	-	***53***
Kjeldahl Nitrogen	mg/L	0.5	-	-	-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5
Total Dissolved Solids	mg/L	-	-	≤ 500			-	-	-	-	-	-	-	-	-
Total Suspended Solids	mg/L	1	-	-	-	-	59	5	3	<1	<1	<1	1	-	16

Collection of samples and analysis provided by
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Notes:
1. MDL = Method Detection Limit
2. Guidelines for Canadian Drinking Water Quality (GCDWQ) (Health Canada, Sept. 2022).
3. Maximum Allowable Concentration (MAC).
4. Aesthetic Objective (AO) / Operational Guideline (OG).
5. Atlantic Risk-Based Corrective Action Tier I Environmental Quality Standards (EQS)
for an industrial, potable site with coarse-grained soil
6. HH = Human Health
7. Eco = Ecological (> 10m from a freshwater surface water body)
DUP = Field Duplicate
"-" = None established/ not measured.

Results that exceed the AO/OG are bold and italic
Results that exceed the MAC are red font and bolded
Results that exceed the Atlantic RBCA Tier I EQS guidelines (Human Health) are underlined
Results that exceed the Atlantic RBCA Tier I EQS guidelines (Ecological) are shaded

Appendix C1-1: General Chemistry, Monitoring Wells (greater than 10 m from a surface water body)

Sample Station:	Units	MDL[1]	GCDWQ[2]		Atlantic RBCA[4]		MW41S	MW41S	MW41S	MW41U	MW41U	MW41U DUP	MW41U	MW41U DUP	MW41U
Date:			MAC[3]	AO/OG[3]	HH[5]	Eco[5]	2022/07/21	2022/09/22	2022/11/24	2022-03-07	2022/04/25	2022/04/25	2022/07/21	2022/07/21	2022/09/22
Alkalinity	mg/L	1	-	-	-	-	2	2	2	-	99	99	98	98	96
Ammonia	mg/L	0.5	-	-	-	Variable[6]	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5
Ammonia (Sample Specific Guideline)	*mg/L*		-	-	-		-	*12.500*	*39.720*	-	*0.855*	*0.855*	*0.141*	*0.141*	*0.410*
Calcium	mg/L	-	-	-	-	-	3.1	3.0	2.7	-	21.6	21.5	22.3	22.6	26.4
Chloride	mg/L	0.2	-	≤ 250	250	1200	4.2	2.7	3.6	-	2.7	2.7	3.6	3.7	3.3
Conductivity	µS/cm	-	-	-	-	-	34	43	40	-	243	243	244	244	234
Copper	mg/L	0.001	2	1	2	0.02	0.002	0.004	0.002	-	<0.001	<0.001	<0.001	<0.001	<0.001
Iron	mg/L	0.002	-	≤ 0.3	0.3	3	0.185	0.270	0.119	-	<0.002	<0.002	<0.002	<0.002	<0.002
Magnesium	mg/L	-	-	-	-	-	0.9	0.4	0.5	-	3.6	3.6	3.3	3.4	2.7
Manganese	mg/L	0.002	0.12	≤ 0.02	0.12	0.43	***0.058***	**0.25**	***0.223***	-	***0.033***	***0.029***	***0.030***	***0.029***	0.002
Nitrate + Nitrite (as N)	mg/L	0.2	1	-	-	-	<0.2	<0.2	<0.2	-	<0.2	<0.2	<0.2	<0.2	<0.2
o-Phosphate	mg/L	0.05	-	-	-	-	<0.05	<0.05	<0.05	-	<0.05	<0.05	<0.05	<0.05	<0.05
pH		-	-	7.0-10.5	-	6.5 to 9	***5.8***	***6.5***	***6.2***	-	7.9	7.9	8.1	8.1	8.0
Phenols	mg/L	0.002	-	-	0.57	0.04	<0.002	<0.002	<0.002	-	<0.002	<0.002	<0.002	<0.002	<0.002
Potassium	mg/L	-	-	-	-	-	0.3	0.7	0.8	-	2.3	2.1	0.6	0.8	1.5
r-Silica	mg/L	-	-	-	-	-	8.5	8.5	7.0	-	13.3	13.7	13.5	13.5	12.3
Sodium	mg/L	-	-	≤ 200	200	-	4.9	4.5	4.3	-	22.3	22.3	22.5	23.1	20.7
Sulfate	mg/L	2	-	≤ 500	-	1280	3	2	2	-	15	16	18	18	19
Total Organic Carbon	mg/L	1	-	-	-	-	12	10	7	-	<1	<1	<1	<1	<1
Turbidity	NTU	-	-	≤ 1.0	-	-	***1.99***	***3.71***	0.78	-	0.42	0.42	0.55	0.54	0.45
Zinc	mg/L	0.002	-	≤ 5.0	5	0.07	0.005	0.007	<0.002	-	<0.002	<0.002	<0.002	<0.002	<0.002
Calculated Parameters															
Bicarbonate	mg/L	1	-	-	-	-	2	2	2	-	99	99	98	98	96
Carbonate	mg/L	1	-	-	-	-	<1	<1	<1	-	<1	<1	<1	<1	<1
Hydroxide	mg/L	1	-	-	-	-	<1	<1	<1	-	<1	<1	<1	<1	<1
Cation sum	meq/L	-	-	-	-	-	0.46	0.40	0.40	-	2.40	2.39	2.38	2.43	2.50
Anion sum	meq/L	-	-	-	-	-	0.50	0.44	0.41	-	2.46	2.49	2.53	2.53	2.48
% difference	-	-	-	-	-	-	-3.64	-4.90	-1.37	-	-1.19	-1.90	-3.11	-2.03	0.52
Theoretical Conductivity	µS/cm	-	-	-	-	-	39	32	33	-	231	231	235	238	242
Hardness	mg/L	-	-	-	-	-	11	9	9	-	69	69	69	70	77
Ion Sum	mg/L	-	-	-	-	-	19	15	16	-	167	167	168	170	170
Saturation pH	-	-	-	-	-	-	11.08	11.09	11.14	-	8.54	8.54	8.53	8.52	8.46
Langelier Index	-	-	-	-	-	-	-5.33	-4.58	-4.96	-	-0.61	-0.61	-0.39	-0.38	-0.51
BOD_5	mg/L	3	-	-			-	-	-	-	-	-	-	-	-
COD	mg/L	1	-	-	-	-	35	27	19	-	<1	<1	<1	<1	<1
Color	TCU	0	-	≤ 15	-	-	***73***	***76***	***42***	-	2	2	9	9	6
Kjeldahl Nitrogen	mg/L	0.5	-	-	-	-	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5
Total Dissolved Solids	mg/L	-	-	≤ 500			-	-	-	-	-	-	-	-	-
Total Suspended Solids	mg/L	1	-	-	-	-	29	81	9	-	<1	<1	5	5	8

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Notes:
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2. Guidelines for Canadian Drinking Water Quality (GCDWQ) (Health Canada, Sept. 2022).
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DUP = Field Duplicate
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Results that exceed the AO/OG are bold and italic
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Results that exceed the Atlantic RBCA Tier I EQS guidelines (Ecological) are shaded

Appendix C1-1: General Chemistry, Monitoring Wells (greater than 10 m from a surface water body)

Sample Station:	Units	MDL[1]	GCDWQ[2]		Atlantic RBCA[4]		MW41U DUP	MW41U	MW42L	MW42L	MW42S	MW42S	MW42U	MW42U	MW43S
Date:			MAC[3]	AO/OG[3]	HH[5]	Eco[5]	2022/09/22	2022/11/24	2022/04/25	2022/09/22	2022/04/25	2022/09/22	2022/04/25	2022/09/22	2022/04/11
Alkalinity	mg/L	1	-	-	-	-	96	94	110	104	114	88	115	109	70
Ammonia	mg/L	0.5	-	-	-	Variable[6]	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Ammonia (Sample Specific Guideline)	*mg/L*		-	-	-		*0.410*	*1.270*	*0.855*	*0.141*	*0.855*	*3.960*	*0.855*	*1.270*	*1.830*
Calcium	mg/L	-	-	-	-	-	26.5	19.6	27.1	32.9	36.5	28.3	24.8	23.2	25.4
Chloride	mg/L	0.2	-	≤ 250	250	1200	3.3	2.5	4.1	4.8	11.5	10.4	3.5	4.2	43.6
Conductivity	µS/cm	-	-	-	-	-	234	230	235	230	253	258	241	224	295
Copper	mg/L	0.001	2	1	2	0.02	<0.001	<0.001	<0.001	<0.001	0.001	<0.001	<0.001	<0.001	0.007
Iron	mg/L	0.002	-	≤ 0.3	0.3	3	<0.002	<0.002	<0.002	<0.002	<0.002	0.003	<0.002	0.002	0.240
Magnesium	mg/L	-	-	-	-	-	2.7	3.2	5.3	4.2	6.1	4.2	4.2	3.3	4.8
Manganese	mg/L	0.002	0.12	≤ 0.02	0.12	0.43	<0.002	<0.002	0.007	0.005	***0.626***	***0.19***	0.01	<0.002	***0.101***
Nitrate + Nitrite (as N)	mg/L	0.2	1	-	-	-	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
o-Phosphate	mg/L	0.05	-	-	-	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
pH		-	-	7.0-10.5	-	6.5 to 9	8.0	7.6	8.0	8.2	7.9	7.0	8.0	7.4	7.4
Phenols	mg/L	0.002	-	-	0.57	0.04	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Potassium	mg/L	-	-	-	-	-	2.2	1.1	1.3	1.0	1.0	0.9	1.0	0.9	3.8
r-Silica	mg/L	-	-	-	-	-	12.2	11.8	10.3	9.9	18.2	15.0	9.4	9.2	5.7
Sodium	mg/L	-	-	≤ 200	200	-	21.1	22.63	10.2	8.9	7.7	6.8	20.9	18.1	23.1
Sulfate	mg/L	2	-	≤ 500	-	1280	20	14	5	6	3	3	4	5	4
Total Organic Carbon	mg/L	1	-	-	-	-	<1	<1	<1	<1	<1	<1	<1	<1	3
Turbidity	NTU	-	-	≤ 1.0	-	-	0.45	0.28	0.31	0.46	***2.03***	***81.8***	0.23	0.54	***19.8***
Zinc	mg/L	0.002	-	≤ 5.0	5	0.07	<0.002	<0.002	0.003	0.003	0.004	0.01	<0.002	0.009	0.003
Calculated Parameters															
Bicarbonate	mg/L	1	-	-	-	-	96	94	110	104	114	88	115	109	70
Carbonate	mg/L	1	-	-	-	-	<1	<1	<1	<1	<1	<1	<1	<1	<1
Hydroxide	mg/L	1	-	-	-	-	<1	<1	<1	<1	<1	<1	<1	<1	<1
Cation sum	meq/L	-	-	-	-	-	2.52	2.25	2.27	2.40	2.71	2.08	2.52	2.24	2.78
Anion sum	meq/L	-	-	-	-	-	2.49	2.30	2.36	2.30	2.85	2.30	2.38	2.31	2.65
% difference	-	-	-	-	-	-	0.61	-0.92	-2.00	2.17	-2.65	-4.87	2.81	-1.62	2.47
Theoretical Conductivity	µS/cm	-	-	-	-	-	246	216	220	230	261	207	233	217	301
Hardness	mg/L	-	-	-	-	-	77	62	89	99	116	88	79	72	83
Ion Sum	mg/L	-	-	-	-	-	172	157	163	162	180	142	173	164	175
Saturation pH	-	-	-	-	-	-	8.46	8.60	8.39	8.33	8.25	8.47	8.41	8.47	8.62
Langelier Index	-	-	-	-	-	-	-0.51	-1.03	-0.44	-0.17	-0.37	-1.46	-0.41	-1.04	-1.24
BOD_5	mg/L	3	-	-			-	-	-	-	-	-	-	-	-
COD	mg/L	1	-	-	-	-	<1	<1	<1	<1	<1	<1	<1	<1	8
Color	TCU	0	-	≤ 15	-	-	6	3	1	5	13	***47***	3	5	***147***
Kjeldahl Nitrogen	mg/L	0.5	-	-	-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Total Dissolved Solids	mg/L	-	-	≤ 500			-	-	-	-	-	-	-	-	-
Total Suspended Solids	mg/L	1	-	-	-	-	8	1	<1	3	4	52	<1	4	44

Collection of samples and analysis provided by Saint John Laboratory Services Ltd.

Notes:

1. MDL = Method Detection Limit
2. Guidelines for Canadian Drinking Water Quality (GCDWQ) (Health Canada, Sept. 2022).
3. Maximum Allowable Concentration (MAC).
4. Aesthetic Objective (AO) / Operational Guideline (OG).
5. Atlantic Risk-Based Corrective Action Tier I Environmental Quality Standards (EQS) for an industrial, potable site with coarse-grained soil
6. HH = Human Health
7. Eco = Ecological (> 10m from a freshwater surface water body)

DUP = Field Duplicate
"-" = None established/ not measured.

Results that exceed the AO/OG are bold and italic
Results that exceed the MAC are red font and bolded
Results that exceed the Atlantic RBCA Tier I EQS guidelines (Human Health) are underlined
Results that exceed the Atlantic RBCA Tier I EQS guidelines (Ecological) are shaded

Appendix C1-1: General Chemistry, Monitoring Wells (greater than 10 m from a surface water body)

Sample Station:	**Units**	**MDL[1]**	**GCDWQ[2]**		**Atlantic RBCA[4]**		**MW43S**	**MW43U**	**MW43U**	**MW44S**	**MW44S**	**MW44U**	**MW44U DUP**	**MW44U**	**MW44U DUP**
Date:			**MAC[3]**	**AO/OG[3]**	**HH[5]**	**Eco[5]**	**2022/09/15**	**2022/04/11**	**2022/09/15**	**2022/04/11**	**2022/09/15**	**2022/04/11**	**2022/04/11**	**2022/09/15**	**2022/09/15**
Alkalinity	mg/L	1	-	-	-	-	133	96	94	48	53	182	182	177	177
Ammonia	mg/L	0.5	-	-	-	Variable[6]	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Ammonia (Sample Specific Guideline)	*mg/L*		-	-	-		*3.960*	*0.197*	*0.141*	*0.588*	*12.500*	*0.197*	*0.197*	*0.410*	*0.410*
Calcium	mg/L	-	-	-	-	-	35.0	9.7	12.1	29.1	26.8	51.6	51.6	58.5	59.6
Chloride	mg/L	0.2	-	≤ 250	250	1200	43.6	5.4	5.6	19.6	16.2	17.1	16.9	18.3	18.4
Conductivity	µS/cm	-	-	-	-	-	351	250	242	243	247	467	469	461	461
Copper	mg/L	0.001	2	1	2	0.02	<0.001	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Iron	mg/L	0.002	-	≤ 0.3	0.3	3	0.093	0.173	0.067	<0.002	0.004	<0.002	<0.002	0.003	0.003
Magnesium	mg/L	-	-	-	-	-	5.0	1.6	1.4	5.3	4.3	8.4	8.4	7.2	7.0
Manganese	mg/L	0.002	0.12	≤ 0.02	0.12	0.43	0.002	0.016	0.002	0.002	<0.002	0.011	0.012	<0.002	<0.002
Nitrate + Nitrite (as N)	mg/L	0.2	1	-	-	-	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.2
o-Phosphate	mg/L	0.05	-	-	-	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
pH		-	-	7.0-10.5	-	6.5 to 9	***6.7***	8.1	8.5	7.7	***6.4***	8.2	8.2	7.6	7.6
Phenols	mg/L	0.002	-	-	0.57	0.04	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Potassium	mg/L	-	-	-	-	-	5.6	1.5	1.1	1.1	1.0	1.2	1.3	1.7	1.7
r-Silica	mg/L	-	-	-	-	-	6.7	10.7	10.4	19.8	13.8	21.1	20.4	23.4	23.6
Sodium	mg/L	-	-	≤ 200	200	-	32.9	43.9	40.4	9.0	10.3	36.8	37.0	32.5	32.2
Sulfate	mg/L	2	-	≤ 500	-	1280	3	13	18	21	24	35	35	41	41
Total Organic Carbon	mg/L	1	-	-	-	-	11	<1	<1	<1	<1	<1	<1	<1	<1
Turbidity	NTU	-	-	≤ 1.0	-	-	***12.1***	***66.3***	***196***	0.76	***1.01***	0.71	0.71	0.37	0.37
Zinc	mg/L	0.002	-	≤ 5.0	5	0.07	0.01	<0.002	0.011	<0.002	0.02	<0.002	<0.002	0.008	0.008
Calculated Parameters															
Bicarbonate	mg/L	1	-	-	-	-	133	96	94	48	53	182	182	177	177
Carbonate	mg/L	1	-	-	-	-	<1	<1	<1	<1	<1	<1	<1	<1	<1
Hydroxide	mg/L	1	-	-	-	-	<1	<1	<1	<1	<1	<1	<1	<1	<1
Cation sum	meq/L	-	-	-	-	-	3.74	2.57	2.51	2.31	2.17	4.90	4.91	4.97	4.99
Anion sum	meq/L	-	-	-	-	-	3.69	2.35	2.43	2.44	2.29	4.89	4.86	5.04	5.06
% difference	-	-	-	-	-	-	0.69	4.63	1.64	-2.83	-2.71	0.09	0.46	-0.76	-0.63
Theoretical Conductivity	µS/cm	-	-	-	-	-	398	233	239	238	230	488	489	504	507
Hardness	mg/L	-	-	-	-	-	108	31	36	94	85	163	163	176	178
Ion Sum	mg/L	-	-	-	-	-	258	171	173	133	136	332	332	336	337
Saturation pH	-	-	-	-	-	-	8.20	8.90	8.81	8.72	8.72	7.90	7.90	7.85	7.84
Langelier Index	-	-	-	-	-	-	-1.48	-0.81	-0.35	-0.98	-2.31	0.31	0.31	-0.27	-0.26
BOD_5	mg/L	3	-	-			-	-	-	-	-	-	-	-	-
COD	mg/L	1	-	-	-	-	32	<1	<1	<1	<1	<1	<1	<1	<1
Color	TCU	0	-	≤ 15	-	-	***135***	***>520***	***>520***	5	13	3	3	6	6
Kjeldahl Nitrogen	mg/L	0.5	-	-	-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Total Dissolved Solids	mg/L	-	-	≤ 500			-	-	-	-	-	-	-	-	-
Total Suspended Solids	mg/L	1	-	-	-	-	112	168	281	1	16	<1	<1	8	7

Collection of samples and analysis provided by Saint John Laboratory Services Ltd.

Notes:
1. MDL = Method Detection Limit
2. Guidelines for Canadian Drinking Water Quality (GCDWQ) (Health Canada, Sept. 2022).
3. Maximum Allowable Concentration (MAC).
4. Aesthetic Objective (AO) / Operational Guideline (OG).
5. Atlantic Risk-Based Corrective Action Tier I Environmental Quality Standards (EQS) for an industrial, potable site with coarse-grained soil
6. HH = Human Health
7. Eco = Ecological (> 10m from a freshwater surface water body)
DUP = Field Duplicate
"-" = None established/ not measured.

Results that exceed the AO/OG are bold and italic
Results that exceed the MAC are red font and bolded
Results that exceed the Atlantic RBCA Tier I EQS guidelines (Human Health) are underlined
Results that exceed the Atlantic RBCA Tier I EQS guidelines (Ecological) are shaded

Appendix C1-1: General Chemistry, Monitoring Wells (greater than 10 m from a surface water body)

Sample Station:	Units	MDL[1]	GCDWQ[2]		Atlantic RBCA[4]		MW45L	MW45L	MW45U	MW45U	MW46L	MW46L	MW48L	MW48L	MW48S
Date:			MAC[3]	AO/OG[3]	HH[5]	Eco[5]	2022/04/11	2022/09/15	2022/04/11	2022/09/15	2022/04/25	2022/09/22	2022/04/25	2022/09/15	2022/04/25
Alkalinity	mg/L	1	-	-	-	-	92	88	88	84	109	113	84	81	81
Ammonia	mg/L	0.5	-	-	-	Variable[6]	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Ammonia (Sample Specific Guideline)	*mg/L*		-	-	-		*0.588*	*0.410*	*0.588*	*0.291*	*0.855*	*0.410*	*0.588*	*0.055*	*0.855*
Calcium	mg/L	-	-	-	-	-	27.8	27.7	52.9	53.1	81.9	87.9	12.0	9.9	25.4
Chloride	mg/L	0.2	-	≤ 250	250	1200	10.2	8.3	57.3	48.2	150.2	125.3	13.5	6.8	4.0
Conductivity	µS/cm	-	-	-	-	-	227	248	399	251	698	697	238	587	187
Copper	mg/L	0.001	2	1	2	0.02	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Iron	mg/L	0.002	-	≤ 0.3	0.3	3	<0.002	0.004	<0.002	0.003	<0.002	0.002	<0.002	0.011	<0.002
Magnesium	mg/L	-	-	-	-	-	6.4	4.9	8.5	6.2	11.9	9.8	1.3	0.5	3.2
Manganese	mg/L	0.002	0.12	≤ 0.02	0.12	0.43	0.006	<0.002	0.011	<0.002	0.018	<0.002	0.007	<0.002	***0.052***
Nitrate + Nitrite (as N)	mg/L	0.2	1	-	-	-	<0.2	0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
o-Phosphate	mg/L	0.05	-	-	-	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
pH		-	-	7.0-10.5	-	6.5 to 9	7.9	8.0	7.9	8.0	7.9	8.0	7.9	8.6	7.8
Phenols	mg/L	0.002	-	-	0.57	0.04	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Potassium	mg/L	-	-	-	-	-	2.5	1.6	1.7	2.0	1.7	2.1	1.2	2.2	1.1
r-Silica	mg/L	-	-	-	-	-	15.8	16.0	13.5	13.0	10.5	10.7	10.6	11.3	9.6
Sodium	mg/L	-	-	≤ 200	200	-	10.8	9.7	9.1	8.6	28.5	28.0	43.9	36.1	10.1
Sulfate	mg/L	2	-	≤ 500	-	1280	8	6	12	10	7	8	17	15	7
Total Organic Carbon	mg/L	1	-	-	-	-	<1	<1	<1	<1	<1	<1	<1	<1	<1
Turbidity	NTU	-	-	≤ 1.0	-	-	***1.52***	***2.37***	0.48	0.63	0.33	0.4	0.39	0.56	0.92
Zinc	mg/L	0.002	-	≤ 5.0	5	0.07	<0.002	0.009	<0.002	0.01	<0.002	0.008	<0.002	0.008	<0.002
Calculated Parameters															
Bicarbonate	mg/L	1	-	-	-	-	92	88	88	84	109	113	84	81	81
Carbonate	mg/L	1	-	-	-	-	<1	<1	<1	<1	<1	<1	<1	<1	<1
Hydroxide	mg/L	1	-	-	-	-	<1	<1	<1	<1	<1	<1	<1	<1	<1
Cation sum	meq/L	-	-	-	-	-	2.45	2.25	3.78	3.59	6.35	6.46	2.65	2.16	2.00
Anion sum	meq/L	-	-	-	-	-	2.48	2.34	3.75	3.38	6.52	5.91	2.47	2.21	1.91
% difference	-	-	-	-	-	-	-0.66	-1.95	0.34	2.92	-1.33	4.46	3.38	-1.05	2.24
Theoretical Conductivity	µS/cm	-	-	-	-	-	235	216	417	383	765	726	254	210	190
Hardness	mg/L	-	-	-	-	-	96	89	167	158	253	260	35	27	77
Ion Sum	mg/L	-	-	-	-	-	157	147	229	212	390	374	173	152	132
Saturation pH	-	-	-	-	-	-	8.46	8.48	8.20	8.22	7.92	7.87	8.86	8.96	8.55
Langelier Index	-	-	-	-	-	-	-0.54	-0.51	-0.32	-0.24	-0.05	0.11	-0.97	-0.32	-0.77
BOD_5	mg/L	3	-	-			-	-	-	-		-		-	
COD	mg/L	1	-	-	-	-	<1	<1	<1	<1	<1	<1	<1	<1	<1
Color	TCU	0	-	≤ 15	-	-	9	11	6	8	2	6	2	7	7
Kjeldahl Nitrogen	mg/L	0.5	-	-	-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Total Dissolved Solids	mg/L	-	-	≤ 500			-	-	-	-	-	-	-	-	-
Total Suspended Solids	mg/L	1	-	-	-	-	3	13	2	10	<1	7	<1	8	2

Collection of samples and analysis provided by
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Notes:
1. MDL = Method Detection Limit
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Results that exceed the MAC are red font and bolded
Results that exceed the Atlantic RBCA Tier I EQS guidelines (Human Health) are underlined
Results that exceed the Atlantic RBCA Tier I EQS guidelines (Ecological) are shaded

Appendix C1-1: General Chemistry, Monitoring Wells (greater than 10 m from a surface water body)

Sample Station:	**Units**	**MDL[1]**	**GCDWQ[2]**		**Atlantic RBCA[4]**		**MW48S**	**MW48U**	**MW48U**	**MW49L**	**MW49L**	**MW49S**	**MW49S**	**MW49U**	**MW49U**
Date:			**MAC[3]**	**AO/OG[3]**	**HH[5]**	**Eco[5]**	**2022/09/15**	**2022/04/25**	**2022/09/15**	**2022/04/25**	**2022/09/22**	**2022/04/25**	**2022/09/22**	**2022/04/25**	**2022/09/22**
Alkalinity	mg/L	1	-	-	-	-	81	86	81	84	78	71	73	82	79
Ammonia	mg/L	0.5	-	-	-	Variable[6]	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Ammonia (Sample Specific Guideline)	*mg/L*		-	-	-		*0.141*	*0.855*	*0.141*	*0.855*	*0.141*	*0.855*	*0.410*	*0.855*	*0.141*
Calcium	mg/L	-	-	-	-	-	28.5	23.1	25.9	25.7	23.4	24.5	23.2	27.6	24.1
Chloride	mg/L	0.2	-	≤ 250	250	1200	3.1	4.8	3.3	6.2	5.1	3.7	3.1	4.4	3.9
Conductivity	µS/cm	-	-	-	-	-	212	221	210	200	204	162	104	184	186
Copper	mg/L	0.001	2	1	2	0.02	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Iron	mg/L	0.002	-	≤ 0.3	0.3	3	0.004	<0.002	0.003	<0.002	0.003	<0.002	0.003	<0.002	0.003
Magnesium	mg/L	-	-	-	-	-	2.2	2.3	1.7	4.0	2.5	4.1	2.7	4.1	2.5
Manganese	mg/L	0.002	0.12	≤ 0.02	0.12	0.43	<0.002	***0.03***	<0.002	0.012	<0.002	0.009	0.003	0.003	<0.002
Nitrate + Nitrite (as N)	mg/L	0.2	1	-	-	-	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
o-Phosphate	mg/L	0.05	-	-	-	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
pH		-	-	7.0-10.5	-	6.5 to 9	8.5	7.9	8.1	7.9	8.1	7.6	7.9	7.8	8.2
Phenols	mg/L	0.002	-	-	0.57	0.04	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Potassium	mg/L	-	-	-	-	-	2.1	1.2	1.6	1.2	1.0	1.0	0.9	1.8	1.1
r-Silica	mg/L	-	-	-	-	-	11.4	12.3	13.2	11.0	11.5	10.2	11.7	10.4	11.5
Sodium	mg/L	-	-	≤ 200	200	-	11.7	21.0	12.3	11.3	9.6	5.7	5.3	7.0	6.7
Sulfate	mg/L	2	-	≤ 500	-	1280	12	14	10	6	5	4	3	4	4
Total Organic Carbon	mg/L	1	-	-	-	-	<1	<1	<1	<1	<1	<1	<1	<1	<1
Turbidity	NTU	-	-	≤ 1.0	-	-	***3.08***	0.38	0.54	0.57	0.76	***1.36***	***1.93***	0.32	0.49
Zinc	mg/L	0.002	-	≤ 5.0	5	0.07	0.008	<0.002	0.008	<0.002	0.01	<0.002	0.008	<0.002	0.009
Calculated Parameters															
Bicarbonate	mg/L	1	-	-	-	-	81	86	81	84	78	71	73	82	79
Carbonate	mg/L	1	-	-	-	-	<1	<1	<1	<1	<1	<1	<1	<1	<1
Hydroxide	mg/L	1	-	-	-	-	<1	<1	<1	<1	<1	<1	<1	<1	<1
Cation sum	meq/L	-	-	-	-	-	2.17	2.29	2.01	2.13	1.82	1.83	1.63	2.07	1.73
Anion sum	meq/L	-	-	-	-	-	2.05	2.24	2.06	2.04	1.91	1.69	1.74	1.90	1.87
% difference	-	-	-	-	-	-	2.84	0.99	-1.30	2.20	-2.39	4.17	-3.27	4.24	-3.90
Theoretical Conductivity	µS/cm	-	-	-	-	-	206	219	193	201	176	168	157	191	169
Hardness	mg/L	-	-	-	-	-	80	67	72	81	69	78	69	86	70
Ion Sum	mg/L	-	-	-	-	-	141	152	136	138	125	114	112	131	121
Saturation pH	-	-	-	-	-	-	8.50	8.57	8.55	8.53	8.61	8.63	8.64	8.51	8.59
Langelier Index	-	-	-	-	-	-	0.00	-0.69	-0.45	-0.62	-0.56	-1.07	-0.72	-0.73	-0.40
BOD_5	mg/L	3	-	-			-		-	-	-	-	-	-	-
COD	mg/L	1	-	-	-	-	<1	<1	<1	<1	<1	<1	<1	<1	<1
Color	TCU	0	-	≤ 15	-	-	***18***	4	7	5	3	7	8	2	2
Kjeldahl Nitrogen	mg/L	0.5	-	-	-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Total Dissolved Solids	mg/L	-	-	≤ 500			-	-	-	-	-	-	-	-	-
Total Suspended Solids	mg/L	1	-	-	-	-	22	<1	8	1	<1	2	10	<1	<1

Collection of samples and analysis provided by Saint John Laboratory Services Ltd.

Notes:

1. MDL = Method Detection Limit
2. Guidelines for Canadian Drinking Water Quality (GCDWQ) (Health Canada, Sept. 2022).
3. Maximum Allowable Concentration (MAC).
4. Aesthetic Objective (AO) / Operational Guideline (OG).
5. Atlantic Risk-Based Corrective Action Tier I Environmental Quality Standards (EQS) for an industrial, potable site with coarse-grained soil
6. HH = Human Health
7. Eco = Ecological (> 10m from a freshwater surface water body)

DUP = Field Duplicate

"-" = None established/ not measured.

Results that exceed the AO/OG are bold and italic
Results that exceed the MAC are red font and bolded
Results that exceed the Atlantic RBCA Tier I EQS guidelines (Human Health) are underlined
Results that exceed the Atlantic RBCA Tier I EQS guidelines (Ecological) are shaded

Appendix C1-1: General Chemistry, Monitoring Wells (greater than 10 m from a surface water body)

Sample Station:	**Units**	**MDL[1]**	**GCDWQ[2]**		**Atlantic RBCA[4]**		**MW50L**	**MW50L**	**MW50S**	**MW50S**	**MW51D**	**MW51D**	**MW51D**	**MW51S1**	**MW51S1**
Date:			**MAC[3]**	**AO/OG[3]**	**HH[5]**	**Eco[5]**	**2022/04/11**	**2022/09/15**	**2022/04/11**	**2022/09/15**	**2022/04/11**	**2022/07/21**	**2022/09/15**	**2022/04/11**	**2022/07/21**
Alkalinity	mg/L	1	-	-	-	-	78	71	92	96	122	120	119	190	186
Ammonia	mg/L	0.5	-	-	-	Variable[6]	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Ammonia (Sample Specific Guideline)	*mg/L*		-	-	-		*0.588*	*0.141*	*0.855*	*0.410*	*0.855*	*0.141*	*0.141*	*0.588*	*0.410*
Calcium	mg/L	-	-	-	-	-	96.1	81.5	58.1	53.9	30.9	27.0	27.4	54.9	53.2
Chloride	mg/L	0.2	-	≤ 250	250	1200	190.4	158.0	82.6	87.1	6.5	4.5	4.2	5.0	5.8
Conductivity	µS/cm	-	-	-	-	-	813	674	570	499	251	254	255	411	417
Copper	mg/L	0.001	2	1	2	0.02	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Iron	mg/L	0.002	-	≤ 0.3	0.3	3	<0.002	0.002	<0.002	0.002	<0.002	<0.002	0.004	<0.002	<0.002
Magnesium	mg/L	-	-	-	-	-	29.0	21.9	17.6	14.8	5.6	4.8	3.9	8.9	8.2
Manganese	mg/L	0.002	0.12	≤ 0.02	0.12	0.43	0.018	0.002	0.011	<0.002	0.004	0.003	<0.002	0.003	0.005
Nitrate + Nitrite (as N)	mg/L	0.2	1	-	-	-	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
o-Phosphate	mg/L	0.05	-	-	-	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
pH		-	-	7.0-10.5	-	6.5 to 9	7.9	8.1	8.0	7.9	7.9	8.2	8.3	8.0	8.0
Phenols	mg/L	0.002	-	-	0.57	0.04	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Potassium	mg/L	-	-	-	-	-	2.5	2.9	2.7	4.1	1.5	0.6	1.6	3.1	1.5
r-Silica	mg/L	-	-	-	-	-	8.2	7.8	9.0	8.7	10.8	10.7	10.4	11.6	11.4
Sodium	mg/L	-	-	≤ 200	200	-	9.7	8.9	9.0	9.7	16.8	18.1	16.7	19.4	20.2
Sulfate	mg/L	2	-	≤ 500	-	1280	10	10	11	6	3	4	3	18	24
Total Organic Carbon	mg/L	1	-	-	-	-	<1	<1	<1	<1	<1	1	<1	<1	1
Turbidity	NTU	-	-	≤ 1.0	-	-	0.15	0.43	0.36	0.53	0.33	0.65	0.79	0.27	0.86
Zinc	mg/L	0.002	-	≤ 5.0	5	0.07	<0.002	0.008	<0.002	0.009	<0.002	<0.002	0.008	<0.002	<0.002
Calculated Parameters															
Bicarbonate	mg/L	1	-	-	-	-	78	71	92	96	122	120	119	190	186
Carbonate	mg/L	1	-	-	-	-	<1	<1	<1	<1	<1	<1	<1	<1	<1
Hydroxide	mg/L	1	-	-	-	-	<1	<1	<1	<1	<1	<1	<1	<1	<1
Cation sum	meq/L	-	-	-	-	-	7.67	6.33	4.81	4.43	2.77	2.54	2.46	4.39	4.25
Anion sum	meq/L	-	-	-	-	-	7.14	6.10	4.37	4.44	2.60	2.53	2.47	4.01	4.09
% difference	-	-	-	-	-	-	3.57	1.89	4.81	-0.12	3.11	0.23	-0.32	4.53	1.86
Theoretical Conductivity	µS/cm	-	-	-	-	-	902	756	525	510	259	241	234	420	419
Hardness	mg/L	-	-	-	-	-	359	294	218	196	100	87	84	174	167
Ion Sum	mg/L	-	-	-	-	-	416	354	273	272	186	179	176	299	299
Saturation pH	-	-	-	-	-	-	7.99	8.11	8.14	8.15	8.29	8.36	8.35	7.85	7.87
Langelier Index	-	-	-	-	-	-	-0.09	-0.02	-0.18	-0.29	-0.35	-0.16	-0.07	0.13	0.11
BOD_5	mg/L	3	-	-			-	-	-	-	-	-	-	-	-
COD	mg/L	1	-	-	-	-	<1	<1	<1	1	<1	2	<1	<1	3
Color	TCU	0	-	≤ 15	-	-	3	5	4	3	3	6	6	2	9
Kjeldahl Nitrogen	mg/L	0.5	-	-	-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Total Dissolved Solids	mg/L	-	-	≤ 500			-	-	-	-	-	-	-	-	-
Total Suspended Solids	mg/L	1	-	-	-	-	<1	6	<1	1	<1	5	7	<1	<1

Collection of samples and analysis provided by
Saint John Laboratory Services Ltd.

Notes:

1. MDL = Method Detection Limit
2. Guidelines for Canadian Drinking Water Quality (GCDWQ) (Health Canada, Sept. 2022).
3. Maximum Allowable Concentration (MAC).
4. Aesthetic Objective (AO) / Operational Guideline (OG).
5. Atlantic Risk-Based Corrective Action Tier I Environmental Quality Standards (EQS) for an industrial, potable site with coarse-grained soil
6. HH = Human Health
7. Eco = Ecological (> 10m from a freshwater surface water body)

DUP = Field Duplicate
"-" = None established/ not measured.

Results that exceed the AO/OG are bold and italic
Results that exceed the MAC are red font and bolded
Results that exceed the Atlantic RBCA Tier I EQS guidelines (Human Health) are underlined
Results that exceed the Atlantic RBCA Tier I EQS guidelines (Ecological) are shaded

Appendix C1-1: General Chemistry, Monitoring Wells (greater than 10 m from a surface water body)

Sample Station:	Units	MDL[1]	GCDWQ[2]		Atlantic RBCA[4]		MW51S1	MW51S2	MW51S2	MW51S2	MW52D	MW52D	MW52D	MW52S	MW52S
Date:			MAC[3]	AO/OG[3]	HH[5]	Eco[5]	2022/09/15	2022/04/11	2022/07/21	2022/09/15	2022/04/11	2022/07/21	2022/09/15	2022/04/11	2022/07/21
Alkalinity	mg/L	1	-	-	-	-	185	140	141	138	353	327	388	101	88
Ammonia	mg/L	0.5	-	-	-	Variable[6]	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Ammonia (Sample Specific Guideline)	*mg/L*		-	-	-		*0.410*	*0.855*	*0.141*	*0.141*	*0.197*	*0.141*	*3.960*	*0.588*	*0.141*
Calcium	mg/L	-	-	-	-	-	51.8	36.0	34.0	33.3	113.6	167.7	105.1	36.7	39.7
Chloride	mg/L	0.2	-	≤ 250	250	1200	4.3	5.2	5.1	4.5	11.3	12.8	12.0	5.3	6.5
Conductivity	µS/cm	-	-	-	-	-	398	286	293	297	1093	1328	1253	313	279
Copper	mg/L	0.001	2	1	2	0.02	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Iron	mg/L	0.002	-	≤ 0.3	0.3	3	0.002	<0.002	<0.002	0.002	<0.002	<0.002	0.003	<0.002	<0.002
Magnesium	mg/L	-	-	-	-	-	6.3	6.4	5.8	4.5	44.8	51.9	42.5	7.6	6.3
Manganese	mg/L	0.002	0.12	≤ 0.02	0.12	0.43	<0.002	0.003	0.004	0.003	***0.064***	***0.040***	<0.002	0.006	0.005
Nitrate + Nitrite (as N)	mg/L	0.2	1	-	-	-	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
o-Phosphate	mg/L	0.05	-	-	-	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
pH		-	-	7.0-10.5	-	6.5 to 9	7.8	8.0	8.1	8.3	8.1	8.2	***6.9***	7.9	8.2
Phenols	mg/L	0.002	-	-	0.57	0.04	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Potassium	mg/L	-	-	-	-	-	3.2	1.9	1.1	1.9	2.0	1.5	3.2	2.1	1.2
r-Silica	mg/L	-	-	-	-	-	11.6	10.9	10.6	11.1	20.3	24.5	24.1	11.4	10.4
Sodium	mg/L	-	-	≤ 200	200	-	18.2	18.6	19.7	17.5	36.3	40.9	38.8	10.8	9.2
Sulfate	mg/L	2	-	≤ 500	-	1280	18	4	3	3	154	325	149	32	39
Total Organic Carbon	mg/L	1	-	-	-	-	<1	<1	1	1	2	7	6	<1	<1
Turbidity	NTU	-	-	≤ 1.0	-	-	0.67	0.38	***2.71***	***3.47***	0.31	0.85	***1.17***	***2.39***	***6.51***
Zinc	mg/L	0.002	-	≤ 5.0	5	0.07	0.007	<0.002	<0.002	0.008	<0.002	<0.002	0.007	<0.002	<0.002
Calculated Parameters															
Bicarbonate	mg/L	1	-	-	-	-	185	140	141	138	353	327	388	101	88
Carbonate	mg/L	1	-	-	-	-	<1	<1	<1	<1	<1	<1	<1	<1	<1
Hydroxide	mg/L	1	-	-	-	-	<1	<1	<1	<1	<1	<1	<1	<1	<1
Cation sum	meq/L	-	-	-	-	-	3.98	3.18	3.06	2.84	10.99	14.46	10.51	2.98	2.93
Anion sum	meq/L	-	-	-	-	-	3.91	2.89	2.87	2.82	10.00	13.31	10.60	2.85	2.78
% difference	-	-	-	-	-	-	0.83	4.86	3.18	0.42	4.72	4.14	-0.45	2.30	2.56
Theoretical Conductivity	µS/cm	-	-	-	-	-	393	293	285	271	1107	1552	1099	298	302
Hardness	mg/L	-	-	-	-	-	155	116	109	102	468	632	437	123	125
Ion Sum	mg/L	-	-	-	-	-	287	212	210	203	715	927	739	195	190
Saturation pH	-	-	-	-	-	-	7.89	8.17	8.19	8.21	7.26	7.13	7.26	8.30	8.32
Langelier Index	-	-	-	-	-	-	-0.05	-0.14	-0.11	0.10	0.87	1.07	-0.33	-0.42	-0.12
BOD_5	mg/L	3	-	-			-	-	-	-	-	-	-	-	-
COD	mg/L	1	-	-	-	-	<1	<1	3	2	7	21	16	<1	<1
Color	TCU	0	-	≤ 15	-	-	6	5	13	***16***	4	10	5	15	***45***
Kjeldahl Nitrogen	mg/L	0.5	-	-	-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Total Dissolved Solids	mg/L	-	-	≤ 500			-	-	-	-	-	-	-	-	-
Total Suspended Solids	mg/L	1	-	-	-	-	7	1	2	20	<1	10	3	5	6

Collection of samples and analysis provided by Saint John Laboratory Services Ltd.

Notes:

1. MDL = Method Detection Limit
2. Guidelines for Canadian Drinking Water Quality (GCDWQ) (Health Canada, Sept. 2022).
3. Maximum Allowable Concentration (MAC).
4. Aesthetic Objective (AO) / Operational Guideline (OG).
5. Atlantic Risk-Based Corrective Action Tier I Environmental Quality Standards (EQS) for an industrial, potable site with coarse-grained soil
6. HH = Human Health
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"-" = None established/ not measured.

Results that exceed the AO/OG are bold and italic
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Results that exceed the Atlantic RBCA Tier I EQS guidelines (Human Health) are underlined
Results that exceed the Atlantic RBCA Tier I EQS guidelines (Ecological) are shaded

Appendix C1-1: General Chemistry, Monitoring Wells (greater than 10 m from a surface water body)

Sample Station:	Units	MDL[1]	GCDWQ[2]		Atlantic RBCA[4]		MW52S	MW53D	MW53D	MW53D	MW54S	MW54S	MW54S	MW54U	MW54U DUP
Date:			**MAC[3]**	**AO/OG[3]**	**HH[5]**	**Eco[5]**	**2022/09/15**	**2022/04/11**	**2022/07/21**	**2022/09/15**	**2022/04/11**	**2022/07/21**	**2022/09/15**	**2022/04/11**	**2020/04/30**
Alkalinity	mg/L	1	-	-	-	-	96	5	2	7	143	154	152	126	126
Ammonia	mg/L	0.5	-	-	-	Variable[6]	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Ammonia (Sample Specific Guideline)	*mg/L*		-	-	-		*0.410*	*18.090*	-	*3.960*	*0.588*	*0.291*	*3.960*	*0.588*	*0.588*
Calcium	mg/L	-	-	-	-	-	37.5	4.6	2.7	2.9	44.7	44.9	52.2	37.4	38.7
Chloride	mg/L	0.2	-	≤ 250	250	1200	4.0	2.5	2.1	1.9	5.9	6.3	5.3	6.9	6.9
Conductivity	μS/cm	-	-	-	-	-	354	24	28	65	296	335	313	341	341
Copper	mg/L	0.001	2	1	2	0.02	<0.001	0.001	0.009	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Iron	mg/L	0.002	-	≤ 0.3	0.3	3	0.003	<0.002	<0.002	0.007	<0.002	<0.002	0.003	<0.002	<0.002
Magnesium	mg/L	-	-	-	-	-	5.0	0.9	0.5	0.5	8.7	8.5	6.4	5.1	5.2
Manganese	mg/L	0.002	0.12	≤ 0.02	0.12	0.43	<0.002	***0.047***	***0.173***	<0.002	***0.749***	***0.469***	0.003	***0.18***	***0.184***
Nitrate + Nitrite (as N)	mg/L	0.2	1	-	-	-	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
o-Phosphate	mg/L	0.05	-	-	-	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.34	0.34
pH		-	-	7.0-10.5	-	6.5 to 9	7.8	***6.2***	***5.7***	***6.8***	7.8	7.9	7.0	7.8	7.8
Phenols	mg/L	0.002	-	-	0.57	0.04	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Potassium	mg/L	-	-	-	-	-	2.8	0.6	0.3	0.6	1.3	0.7	2.1	2.5	2.6
r-Silica	mg/L	-	-	-	-	-	11.2	5.5	5.9	6.9	22.6	20.7	21.5	33.5	34.1
Sodium	mg/L	-	-	≤ 200	200	-	11.7	2.3	2.6	4.7	8.6	7.7	8.7	27.2	27.3
Sulfate	mg/L	2	-	≤ 500	-	1280	27	2	2	2.4	6	5	5	18	19
Total Organic Carbon	mg/L	1	-	-	-	-	<1	<1	1	1	<1	1	2	1	1
Turbidity	NTU	-	-	≤ 1.0	-	-	***4.56***	0.44	0.8	0.67	***1.76***	***1.03***	1	0.46	0.46
Zinc	mg/L	0.002	-	≤ 5.0	5	0.07	0.009	0.005	<0.002	0.008	<0.002	<0.002	0.007	<0.002	<0.002
Calculated Parameters															
Bicarbonate	mg/L	1	-	-	-	-	96	5	2	7	143	154	152	126	126
Carbonate	mg/L	1	-	-	-	-	<1	<1	<1	<1	<1	<1	<1	<1	<1
Hydroxide	mg/L	1	-	-	-	-	<1	<1	<1	<1	<1	<1	<1	<1	<1
Cation sum	meq/L	-	-	-	-	-	2.87	0.42	0.30	0.41	3.38	3.31	3.56	3.54	3.62
Anion sum	meq/L	-	-	-	-	-	2.62	0.38	0.33	0.45	3.38	3.49	3.47	3.77	3.80
% difference	-	-	-	-	-	-	4.43	4.69	-4.24	-4.71	-0.02	-2.72	1.38	-3.15	-2.38
Theoretical Conductivity	μS/cm	-	-	-	-	-	280	36	25	35	311	316	331	328	333
Hardness	mg/L	-	-	-	-	-	114	15	9	9	147	147	157	114	118
Ion Sum	mg/L	-	-	-	-	-	184	18	12	20	219	228	232	224	226
Saturation pH	-	-	-	-	-	-	8.31	10.51	11.14	10.56	8.06	8.03	7.97	8.19	8.18
Langelier Index	-	-	-	-	-	-	-0.47	-4.33	-5.44	-3.77	-0.26	-0.18	-0.96	-0.43	-0.40
BOD_5	mg/L	3	-	-			-	-	-	-	-	-	-	-	-
COD	mg/L	1	-	-	-	-	<1	<1	3	3	<1	2	5	2	2
Color	TCU	0	-	≤ 15	-	-	***26***	5	9	4	***30***	12	9	***27***	***27***
Kjeldahl Nitrogen	mg/L	0.5	-	-	-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Total Dissolved Solids	mg/L	-	-	≤ 500			-	-	-	-	-	-	-	-	-
Total Suspended Solids	mg/L	1	-	-	-	-	32	1	41	2	9	<1	11	8	8

Collection of samples and analysis provided by Saint John Laboratory Services Ltd.

Notes:
1. MDL = Method Detection Limit
2. Guidelines for Canadian Drinking Water Quality (GCDWQ) (Health Canada, Sept. 2022).
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Results that exceed the Atlantic RBCA Tier I EQS guidelines (Human Health) are underlined
Results that exceed the Atlantic RBCA Tier I EQS guidelines (Ecological) are shaded

Appendix C1-1: General Chemistry, Monitoring Wells (greater than 10 m from a surface water body)

Sample Station:	Units	MDL[1]	GCDWQ[2]		Atlantic RBCA[4]		MW54U	MW54U DUP	MW54U	MW54U DUP	MW55S	MW55S	MW55S	MW56S	MW56S
Date:			**MAC[3]**	**AO/OG[3]**	**HH[5]**	**Eco[5]**	**2022/07/21**	**2022/07/21**	**2022/09/15**	**2022/09/15**	**2022/04/11**	**2022/07/21**	**2022/09/15**	**2022/04/11**	**2020/07/21**
Alkalinity	mg/L	1	-	-	-	-	130	130	110	110	117	113	112	76	70
Ammonia	mg/L	0.5	-	-	-	Variable[6]	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Ammonia (Sample Specific Guideline)	*mg/L*		-	-	-		*0.410*	*0.410*	*0.410*	*0.410*	*0.197*	*0.103*	*0.141*	*0.588*	*0.410*
Calcium	mg/L	-	-	-	-	-	38.4	37.7	35.5	34.6	24.0	21.3	26.4	33.2	26.3
Chloride	mg/L	0.2	-	≤ 250	250	1200	5.9	6.0	5.5	5.5	5.1	3.5	10.2	5.5	3.6
Conductivity	µS/cm	-	-	-	-	-	339	340	316	316	261	244	231	192	176
Copper	mg/L	0.001	2	1	2	0.02	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Iron	mg/L	0.002	-	≤ 0.3	0.3	3	<0.002	<0.002	0.003	0.004	<0.002	<0.002	0.005	<0.002	<0.002
Magnesium	mg/L	-	-	-	-	-	5.2	5.0	2.9	2.7	5.1	4.4	3.5	2.2	1.8
Manganese	mg/L	0.002	0.12	≤ 0.02	0.12	0.43	***0.213***	***0.218***	***0.194***	***0.199***	***0.05***	***0.067***	***0.048***	***0.022***	0.017
Nitrate + Nitrite (as N)	mg/L	0.2	1	-	-	-	0.5	<0.2	<0.2	<0.2	<0.2	<0.2	1.9	<0.2	<0.2
o-Phosphate	mg/L	0.05	-	-	-	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
pH		-	-	7.0-10.5	-	6.5 to 9	7.9	7.9	7.9	7.9	8.1	8.2	8.4	7.9	7.9
Phenols	mg/L	0.002	-	-	0.57	0.04	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Potassium	mg/L	-	-	-	-	-	1.0	1.0	2.0	2.1	2.4	1.8	3.0	0.9	0.3
r-Silica	mg/L	-	-	-	-	-	32.2	36.5	32.4	32.1	11.5	11.8	7.5	9.0	9.0
Sodium	mg/L	-	-	≤ 200	200	-	27.6	27.9	27.9	27.7	24.3	26.4	22.8	3.9	3.6
Sulfate	mg/L	2	-	≤ 500	-	1280	15	15	23	24	3	3	6	9	7
Total Organic Carbon	mg/L	1	-	-	-	-	4	4	3	4	<1	1	1	<1	<1
Turbidity	NTU	-	-	≤ 1.0	-	-	0.68	0.68	0.57	0.58	***1.85***	***1.8***	***1.36***	***1.81***	0.65
Zinc	mg/L	0.002	-	≤ 5.0	5	0.07	<0.002	<0.002	0.008	0.008	<0.002	<0.002	0.016	<0.002	<0.002
Calculated Parameters															
Bicarbonate	mg/L	1	-	-	-	-	130	130	110	110	117	113	112	76	70
Carbonate	mg/L	1	-	-	-	-	<1	<1	<1	<1	<1	<1	<1	<1	<1
Hydroxide	mg/L	1	-	-	-	-	<1	<1	<1	<1	<1	<1	<1	<1	<1
Cation sum	meq/L	-	-	-	-	-	3.58	3.54	3.28	3.21	2.74	2.62	2.68	2.03	1.63
Anion sum	meq/L	-	-	-	-	-	3.68	3.83	3.51	3.52	2.51	2.41	2.53	1.89	1.69
% difference	-	-	-	-	-	-	-1.43	-3.90	-3.42	-4.57	4.35	4.29	2.78	3.61	-2.08
Theoretical Conductivity	µS/cm	-	-	-	-	-	325	323	307	305	248	234	261	198	162
Hardness	mg/L	-	-	-	-	-	117	115	101	98	81	71	80	92	73
Ion Sum	mg/L	-	-	-	-	-	223	223	207	207	181	173	186	131	113
Saturation pH	-	-	-	-	-	-	8.17	8.18	8.28	8.29	8.42	8.49	8.40	8.47	8.60
Langelier Index	-	-	-	-	-	-	-0.29	-0.30	-0.39	-0.40	-0.37	-0.34	0.00	-0.55	-0.66
BOD_5	mg/L	3	-	-			-	-	-	-	-	-	-	-	-
COD	mg/L	1	-	-	-	-	10	10	9	11	<1	2	3	<1	<1
Color	TCU	0	-	≤ 15	-	-	***23***	***23***	***30***	***30***	14	15	8	9	8
Kjeldahl Nitrogen	mg/L	0.5	-	-	-	-	<0.5	<0.5	0.8	0.8	<0.5	<0.5	<0.5	<0.5	<0.5
Total Dissolved Solids	mg/L	-	-	≤ 500			-	-	-	-	-	-	-	-	-
Total Suspended Solids	mg/L	1	-	-	-	-	1	1	37	37	4	1	10	3	8

Collection of samples and analysis provided by Saint John Laboratory Services Ltd.

Notes:

1. MDL = Method Detection Limit
2. Guidelines for Canadian Drinking Water Quality (GCDWQ) (Health Canada, Sept. 2022).
3. Maximum Allowable Concentration (MAC).
4. Aesthetic Objective (AO) / Operational Guideline (OG).
5. Atlantic Risk-Based Corrective Action Tier I Environmental Quality Standards (EQS) for an industrial, potable site with coarse-grained soil
6. HH = Human Health
7. Eco = Ecological (> 10m from a freshwater surface water body)

DUP = Field Duplicate

"-" = None established/ not measured.

Results that exceed the AO/OG are bold and italic
Results that exceed the MAC are red font and bolded
Results that exceed the Atlantic RBCA Tier I EQS guidelines (Human Health) are underlined
Results that exceed the Atlantic RBCA Tier I EQS guidelines (Ecological) are shaded

Appendix C1-1: General Chemistry, Monitoring Wells (greater than 10 m from a surface water body)

Sample Station:	Units	MDL[1]	GCDWQ[2]		Atlantic RBCA[4]		MW56S	MW57S	MW57D
Date:			MAC[3]	AO/OG[3]	HH[5]	Eco[5]	2022/09/15	2022/09/22	2022/09/22
Alkalinity	mg/L	1	-	-	-	-	68	14	77
Ammonia	mg/L	0.5	-	-	-	Variable[6]	<0.5	<0.5	<0.5
Ammonia (Sample Specific Guideline)	*mg/L*		-	-	-		*0.141*	*1.270*	*0.410*
Calcium	mg/L	-	-	-	-	-	30.3	7.4	23.6
Chloride	mg/L	0.2	-	≤ 250	250	1200	4.9	4.0	21.4
Conductivity	µS/cm	-	-	-	-	-	139	109	275
Copper	mg/L	0.001	2	1	2	0.02	<0.001	<0.001	<0.001
Iron	mg/L	0.002	-	≤ 0.3	0.3	3	0.004	0.048	0.019
Magnesium	mg/L	-	-	-	-	-	1.4	0.4	2.9
Manganese	mg/L	0.002	0.12	≤ 0.02	0.12	0.43	<0.002	***0.195***	<0.002
Nitrate + Nitrite (as N)	mg/L	0.2	1	-	-	-	2.0	<0.2	<0.2
o-Phosphate	mg/L	0.05	-	-	-	-	<0.05	<0.05	<0.05
pH		-	-	7.0-10.5	-	6.5 to 9	8.1	7.1	7.7
Phenols	mg/L	0.002	-	-	0.57	0.04	<0.002	<0.002	<0.002
Potassium	mg/L	-	-	-	-	-	0.7	0.7	4.1
r-Silica	mg/L	-	-	-	-	-	8.7	9.3	8.2
Sodium	mg/L	-	-	≤ 200	200	-	3.7	4.8	22.6
Sulfate	mg/L	2	-	≤ 500	-	1280	7	2	9
Total Organic Carbon	mg/L	1	-	-	-	-	<1	6	3
Turbidity	NTU	-	-	≤ 1.0	-	-	***1.76***	***1.25***	***72.5***
Zinc	mg/L	0.002	-	≤ 5.0	5	0.07	0.015	0.03	0.01
Calculated Parameters									
Bicarbonate	mg/L	1	-	-	-	-	68	14	77
Carbonate	mg/L	1	-	-	-	-	<1	<1	<1
Hydroxide	mg/L	1	-	-	-	-	<1	<1	<1
Cation sum	meq/L	-	-	-	-	-	1.81	0.64	2.51
Anion sum	meq/L	-	-	-	-	-	1.73	0.69	2.32
% difference	-	-	-	-	-	-	2.24	-4.02	3.84
Theoretical Conductivity	µS/cm	-	-	-	-	-	178	57	253
Hardness	mg/L	-	-	-	-	-	81	20	71
Ion Sum	mg/L	-	-	-	-	-	118	34	160
Saturation pH	-	-	-	-	-	-	8.55	9.85	8.61
Langelier Index	-	-	-	-	-	-	-0.44	-2.71	-0.96
BOD_5	mg/L	3	-	-			-	-	-
COD	mg/L	1	-	-	-	-	<1	17	9
Color	TCU	0	-	≤ 15	-	-	9	***41***	***>520***
Kjeldahl Nitrogen	mg/L	0.5	-	-	-	-	<0.5	<0.5	<0.5
Total Dissolved Solids	mg/L	-	-	≤ 500			-	-	-
Total Suspended Solids	mg/L	1	-	-	-	-	11	2	61

Collection of samples and analysis provided by Saint John Laboratory Services Ltd.

Notes:
1. MDL = Method Detection Limit
2. Guidelines for Canadian Drinking Water Quality (GCDWQ) (Health Canada, Sept. 2022).
3. Maximum Allowable Concentration (MAC).
4. Aesthetic Objective (AO) / Operational Guideline (OG).
5. Atlantic Risk-Based Corrective Action Tier I Environmental Quality Standards (EQS) for an industrial, potable site with coarse-grained soil
6. HH = Human Health
7. Eco = Ecological (> 10m from a freshwater surface water body)
DUP = Field Duplicate
"-" = None established/ not measured.

Results that exceed the AO/OG are bold and italic
Results that exceed the MAC are red font and bolded
Results that exceed the Atlantic RBCA Tier I EQS guidelines (Human Health) are underlined
Results that exceed the Atlantic RBCA Tier I EQS guidelines (Ecological) are shaded

Appendix C1-2: General Chemistry, Monitoring Wells (less than 10 m from a surface water body)

Sample Station:	Units	MDL[1]	GCDWQ[2]		Atlantic RBCA[4]		MW36L	MW36L	MW36S	MW36S	MW36U	MW36U DUP
Date:			**MAC[3]**	**AO/OG[3]**	**HH[5]**	**Eco[5]**	**2022/04/11**	**2022/09/15**	**2022/04/11**	**2022/09/15**	**2022/04/11**	**2022/04/11**
Alkalinity	mg/L	1	-	-	-	-	89	85	23	86	89	89
Ammonia	mg/L	0.5	-	-	-	Variable[6]	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Ammonia (Sample Specific Guideline)	*mg/L*						*0.282*	*0.41*	*2.68*	*3.96*	*0.282*	*0.282*
Calcium	mg/L	-	-	-	-	-	10.2	10.8	11.1	25.5	12.7	12.5
Chloride	mg/L	0.2	-	≤ 250	250	120	4.7	7.6	4.9	4.7	3.9	3.8
Conductivity	µS/cm	-	-	-	-	-	329	319	82	238	192	192
Copper	mg/L	0.001	2	1	2	0.002	0.001	<0.001	0.007	0.005	<0.001	<0.001
Iron	mg/L	0.002	-	≤ 0.3	0.3	0.3	0.007	0.002	***1.003***	0.239	0.027	0.024
Magnesium	mg/L	-	-	-	-	-	1.0	1.1	2.1	3.4	1.2	1.2
Manganese	mg/L	0.002	0.12	≤ 0.02	0.12	0.43	0.008	<0.002	**0.674**	**4.495**	0.011	0.008
Nitrate + Nitrite (as N)	mg/L	0.2	1	-	-	-	<0.2	<0.2	<0.2	0.4	<0.2	<0.2
o-Phosphate	mg/L	0.05	-	-	-	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
pH		-	-	7.0-10.5	-	6.5 to 9	8.1	7.9	7.4	***6.7***	8.1	8.1
Phenols	mg/L	0.002	-	-	0.57	0.004	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Potassium	mg/L	-	-	-	-	-	1.7	1.9	1.5	2.8	0.9	0.9
r-Silica	mg/L	-	-	-	-	-	8.4	7.5	8.7	18.6	11.4	11.3
Sodium	mg/L	-	-	≤ 200	200	-	60.2	54.0	4.4	8.4	29.2	29.3
Sulfate	mg/L	2	-	≤ 500	-	128	56	43	10	4	3	3
Total Organic Carbon	mg/L	1	-	-	-	-	<1	3	1	9	<1	<1
Turbidity	NTU	-	-	≤ 1.0	-	-	0.58	***1.04***	***60.9***	***29.9***	***6.16***	***6.17***
Zinc	mg/L	0.002	-	≤ 5.0	5	0.007	<0.002	<0.002	0.014	<0.002	<0.002	<0.002
Calculated Parameters												
Bicarbonate	mg/L	1	-	-	-	-	89	85	23	86	89	89
Carbonate	mg/L	1	-	-	-	-	<1	<1	<1	<1	<1	<1
Hydroxide	mg/L	1	-	-	-	-	<1	<1	<1	<1	<1	<1
Cation sum	meq/L	-	-	-	-	-	3.25	3.03	1.04	2.17	2.03	2.02
Anion sum	meq/L	-	-	-	-	-	3.05	2.75	1.02	2.24	2.02	2.01
% difference	-	-	-	-	-	-	3.30	4.76	0.96	-1.74	0.25	0.24
Theoretical Conductivity	µS/cm	-	-	-	-	-	329	301	96	190	185	184
Hardness	mg/L	-	-	-	-	-	30	31	36	78	37	36
Ion Sum	mg/L	-	-	-	-	-	223	203	59	140	140	140
Saturation pH	-	-	-	-	-	-	8.91	8.91	9.46	8.53	8.81	8.82
Langelier Index	-	-	-	-	-	-	-0.86	-1.06	-2.08	-1.83	-0.76	-0.77
BOD_5	mg/L	3	-	-								
COD	mg/L	1	-	-	-	-	<1	8	4	24	<1	<1
Color	TCU	0	-	≤ 15	-	-	10	8	***507***	***328***	***38***	***38***
Kjeldahl Nitrogen	mg/L	0.5	-	-	-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Total Dissolved Solids	mg/L	-	-	≤ 500			-	-	-	-	-	-
Total Suspended Solids	mg/L	1	-	-	-	-	3	11	150	81	11	11

Collection of samples and analysis provided by Saint John Laboratory Services Ltd.

Notes:

1. MDL = Method Detection Limit
2. Guidelines for Canadian Drinking Water Quality (GCDWQ) (Health Canada, Sept. 2022).
3. Maximum Allowable Concentration (MAC).
4. Aesthetic Objective (AO) / Operational Guideline (OG).
5. Atlantic Risk-Based Corrective Action Tier I Environmental Quality Standards (EQS) for an industrial, potable site with coarse-grained soil
6. HH = Human Health
7. Eco = Ecological (< 10m from a freshwater surface water body)

DUP = Field Duplicate
"-" = None established/ not measured.

Results that exceed the AO/OG are bold and italic
Results that exceed the MAC are red font and bolded
Results that exceed the Atlantic RBCA Tier I EQS guidelines (Human Health) are underlined
Results that exceed the Atlantic RBCA Tier I EQS guidelines (Ecological) are shaded

Appendix C1-2: General Chemistry, Monitoring Wells (less than 10 m from a surface water body)

Sample Station:	**Units**	**MDL[1]**	**GCDWQ[2]**		**Atlantic RBCA[4]**		**MW36U**	**MW36U DUP**	**MW37S**	**MW37S**	**MW38L**	**MW38L**	**MW38S**	**MW38S**	**MW38U**
Date:			**MAC[3]**	**AO/OG[3]**	**HH[5]**	**Eco[5]**	**2022/09/15**	**2022/09/15**	**2022/04/11**	**2022/09/15**	**2022/04/11**	**2022/09/15**	**2022/04/11**	**2022/09/15**	**2022/03/07**
Alkalinity	mg/L	1	-	-	-	-	86	86	181	186	120	119	205	199	206
Ammonia	mg/L	0.5	-	-	-	Variable[6]	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Ammonia (Sample Specific Guideline)	*mg/L*						*0.41*	*0.41*	*0.855*	*1.27*	*0.197*	*0.41*	*0.282*	*0.41*	*0.197*
Calcium	mg/L	-	-	-	-	-	13.1	12.8	52.2	53.3	25.3	27.2	56.9	60.7	51.4
Chloride	mg/L	0.2	-	≤ 250	250	120	3	3	12.2	7	10.4	7.9	12.2	9.1	13.1
Conductivity	µS/cm	-	-	-	-	-	192	196	369	369	291	285	414	411	375
Copper	mg/L	0.001	2	1	2	0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Iron	mg/L	0.002	-	≤ 0.3	0.3	0.3	0.042	0.011	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Magnesium	mg/L	-	-	-	-	-	1.1	1.0	8.9	7.2	3.9	3.1	9.4	7.9	8.7
Manganese	mg/L	0.002	0.12	≤ 0.02	0.12	0.43	0.018	0.004	0.007	0.003	0.006	0.002	0.002	0.002	**0.891**
Nitrate + Nitrite (as N)	mg/L	0.2	1	-	-	-	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
o-Phosphate	mg/L	0.05	-	-	-	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
pH		-	-	7.0-10.5	-	6.5 to 9	7.7	7.7	8.0	7.2	8.2	7.8	8.1	7.6	7.8
Phenols	mg/L	0.002	-	-	0.57	0.004	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Potassium	mg/L	-	-	-	-	-	0.8	0.9	1.5	2.3	1.6	1.6	1.5	2.7	0.6
r-Silica	mg/L	-	-	-	-	-	10.5	10.7	24.9	23.8	12.9	11.4	21.3	21.8	14.3
Sodium	mg/L	-	-	≤ 200	200	-	25.2	24.9	10.1	11.6	29.7	28.3	9.5	10.8	12
Sulfate	mg/L	2	-	≤ 500	-	128	3	3	2	<2	10	9	<2	2	<2
Total Organic Carbon	mg/L	1	-	-	-	-	3	3	<1	<1	<1	<1	<1	<1	<1
Turbidity	NTU	-	-	≤ 1.0	-	-	***4.67***	***4.68***	0.45	***1.52***	***2.38***	0.88	0.97	***1.2***	0.89
Zinc	mg/L	0.002	-	≤ 5.0	5	0.007	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Calculated Parameters															
Bicarbonate	mg/L	1	-	-	-	-	86	86	181	186	120	119	205	199	206
Carbonate	mg/L	1	-	-	-	-	<1	<1	<1	<1	<1	<1	<1	<1	<1
Hydroxide	mg/L	1	-	-	-	-	<1	<1	<1	<1	<1	<1	<1	<1	<1
Cation sum	meq/L	-	-	-	-	-	1.86	1.83	3.81	3.82	2.92	2.88	4.06	4.22	3.85
Anion sum	meq/L	-	-	-	-	-	1.90	1.91	4.17	4.06	2.90	2.74	4.44	4.28	4.22
% difference	-	-	-	-	-	-	-1.03	-2.27	-4.48	-3.12	0.21	2.49	-4.44	-0.68	-4.60
Theoretical Conductivity	µS/cm	-	-	-	-	-	172	170	372	366	282	274	404	404	389
Hardness	mg/L	-	-	-	-	-	37	36	167	163	79	81	181	184	164
Ion Sum	mg/L	-	-	-	-	-	132	132	268	269	201	196	296	292	293
Saturation pH	-	-	-	-	-	-	8.82	8.83	7.89	7.87	8.39	8.36	7.80	7.79	7.84
Langelier Index	-	-	-	-	-	-	-1.08	-1.09	0.15	-0.69	-0.21	-0.56	0.25	-0.19	-0.02
BOD_5	mg/L	3	-	-											-
COD	mg/L	1	-	-	-	-	9	8	<1	<1	<1	<1	<1	1	<1
Color	TCU	0	-	≤ 15	-	-	***26***	***26***	4	8	***19***	5	4	2	2
Kjeldahl Nitrogen	mg/L	0.5	-	-	-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Total Dissolved Solids	mg/L	-	-	≤ 500			-	-	-	-	-		-		-
Total Suspended Solids	mg/L	1	-	-	-	-	32	32	<1	9	6	3	<1	<1	4

Collection of samples and analysis provided by
Saint John Laboratory Services Ltd.

Notes:

1. MDL = Method Detection Limit
2. Guidelines for Canadian Drinking Water Quality (GCDWQ) (Health Canada, Sept. 2022).
3. Maximum Allowable Concentration (MAC).
4. Aesthetic Objective (AO) / Operational Guideline (OG).
5. Atlantic Risk-Based Corrective Action Tier I Environmental Quality Standards (EQS) for an industrial, potable site with coarse-grained soil
6. HH = Human Health
7. Eco = Ecological (< 10m from a freshwater surface water body)

DUP = Field Duplicate
"-" = None established/ not measured.

Results that exceed the AO/OG are bold and italic
Results that exceed the MAC are red font and bolded
Results that exceed the Atlantic RBCA Tier I EQS guidelines (Human Health) are underlined
Results that exceed the Atlantic RBCA Tier I EQS guidelines (Ecological) are shaded

Appendix C1-2: General Chemistry, Monitoring Wells (less than 10 m from a surface water body)

Sample Station:	Units	MDL[1]	GCDWQ[2]		Atlantic RBCA[4]		MW38U	MW38U	MW38U	MW38U
Date:			MAC[3]	AO/OG[3]	HH[5]	Eco[5]	2022/04/11	2022/07/21	2022/09/15	2022/11/24
Alkalinity	mg/L	1	-	-	-	-	214	181	204	186
Ammonia	mg/L	0.5	-	-	-	Variable[6]	<0.5	<0.5	<0.5	<0.5
Ammonia (Sample Specific Guideline)	*mg/L*						*0.855*	*0.141*	*0.41*	*1.3*
Calcium	mg/L	-	-	-	-	-	55.3	56.5	59.6	48.5
Chloride	mg/L	0.2	-	≤ 250	250	120	12.7	14.1	9.2	9.6
Conductivity	µS/cm	-	-	-	-	-	412	425	423	414
Copper	mg/L	0.001	2	1	2	0.002	<0.001	<0.001	<0.001	<0.001
Iron	mg/L	0.002	-	≤ 0.3	0.3	0.3	<0.002	<0.002	<0.002	<0.002
Magnesium	mg/L	-	-	-	-	-	9.7	9.1	7.6	9.2
Manganese	mg/L	0.002	0.12	≤ 0.02	0.12	0.43	**0.181**	**0.100**	0.003	**0.062**
Nitrate + Nitrite (as N)	mg/L	0.2	1	-	-	-	<0.2	<0.2	<0.2	<0.2
o-Phosphate	mg/L	0.05	-	-	-	-	<0.05	<0.05	<0.05	<0.05
pH		-	-	7.0-10.5	-	6.5 to 9	8.2	8.2	7.8	7.9
Phenols	mg/L	0.002	-	-	0.57	0.004	<0.002	<0.002	<0.002	<0.002
Potassium	mg/L	-	-	-	-	-	1.6	1.1	2.6	2.7
r-Silica	mg/L	-	-	-	-	-	19.1	18.1	16.4	15.0
Sodium	mg/L	-	-	≤ 200	200	-	11.8	11.0	10.9	14.7
Sulfate	mg/L	2	-	≤ 500	-	128	<2	2	<2	<2
Total Organic Carbon	mg/L	1	-	-	-	-	<1	3	<1	1
Turbidity	NTU	-	-	≤ 1.0	-	-	0.26	0.92	0.64	0.64
Zinc	mg/L	0.002	-	≤ 5.0	5	0.007	<0.002	<0.002	<0.002	<0.002
Calculated Parameters										
Bicarbonate	mg/L	1	-	-	-	-	214	181	204	186
Carbonate	mg/L	1	-	-	-	-	<1	<1	<1	<1
Hydroxide	mg/L	1	-	-	-	-	<1	<1	<1	<1
Cation sum	meq/L	-	-	-	-	-	4.12	4.08	4.14	3.89
Anion sum	meq/L	-	-	-	-	-	4.51	4.01	4.16	3.82
% difference	-	-	-	-	-	-	-4.52	0.86	-0.20	0.90
Theoretical Conductivity	µS/cm	-	-	-	-	-	411	392	401	370
Hardness	mg/L	-	-	-	-	-	178	179	180	159
Ion Sum	mg/L	-	-	-	-	-	306	275	294	271
Saturation pH	-	-	-	-	-	-	7.79	7.86	7.78	7.91
Langelier Index	-	-	-	-	-	-	0.41	0.32	0.00	0.00
BOD_5	mg/L	3	-	-						
COD	mg/L	1	-	-	-	-	<1	7	<1	3
Color	TCU	0	-	≤ 15	-	-	5	9	2	8
Kjeldahl Nitrogen	mg/L	0.5	-	-	-	-	<0.5	<0.5	<0.5	<0.5
Total Dissolved Solids	mg/L	-	-	≤ 500			-			
Total Suspended Solids	mg/L	1	-	-	-	-	<1	8	<1	1

Collection of samples and analysis provided by Saint John Laboratory Services Ltd.

Notes:

1. MDL = Method Detection Limit
2. Guidelines for Canadian Drinking Water Quality (GCDWQ) (Health Canada, Sept. 2022).
3. Maximum Allowable Concentration (MAC).
4. Aesthetic Objective (AO) / Operational Guideline (OG).
5. Atlantic Risk-Based Corrective Action Tier I Environmental Quality Standards (EQS) for an industrial, potable site with coarse-grained soil
6. HH = Human Health
7. Eco = Ecological (< 10m from a freshwater surface water body)

DUP = Field Duplicate

"-" = None established/ not measured.

Results that exceed the AO/OG are bold and italic
Results that exceed the MAC are red font and bolded
Results that exceed the Atlantic RBCA Tier I EQS guidelines (Human Health) are underlined
Results that exceed the Atlantic RBCA Tier I EQS guidelines (Ecological) are shaded

Appendix C1-3: Trace Metals, Monitoring Wells (greater than 10m from a surface water body)

Sample Station:	Units	MDL[1]	GCDWQ[2]		Atlantic RBCA[5]		MW31L	MW31L	MW31S	MW31S	MW31U	MW31U DUP
Date:			MAC[3]	AO/OG[4]	HH[6]	Eco[7]	2022/04/11	2022/09/15	2022/04/11	2022/09/15	2022/04/11	2022/04/11
Aluminium	µg/L	5	2900	<100	100	50	<5	<5	<5	<5	<5	<5
Antimony	µg/L	2	6	-	6	90	<2	<2	<2	<2	<2	<2
Arsenic	µg/L	1	10	-	10	50	1	2	<1	<1	<1	<1
Barium	µg/L	10	2000	-	1000	10000	<10	<10	<10	<10	<10	<10
Beryllium	µg/L	1	-	-	4	1.5	<1	<1	<1	<1	<1	<1
Bismuth	µg/L	1	-	-	-	-	<1	<1	<1	<1	<1	<1
Boron	µg/L	100	5000	-	5000	15000	210	202	<100	<100	<100	<100
Cadmium	µg/L	0.02	7	-	5	0.9	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Chromium	µg/L	1	50	-	50	89	<1	<1	<1	<1	<1	<1
Cobalt	µg/L	2	-	-	3.8	10	<2	<2	<2	<2	<2	<2
Copper	µg/L	1	2000	1000	2000	20	1	<1	3	<1	<1	<1
Iron	µg/L	2	-	≤ 300	300	3000	<2	<2	41	12	<2	<2
Lead	µg/L	1	5	-	5	10	<1	<1	<1	<1	<1	<1
Manganese	µg/L	2	120	20	120	4300	7	<2	9	<2	<2	3
Mercury	µg/L	0.02	1	-	1	0.26	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Molybdenum	µg/L	5	-	-	70	730	<5	<5	<5	<5	<5	<5
Nickel	µg/L	2	-	-	100	250	<2	<2	<2	<2	<2	<2
Selenium	µg/L	1	50	-	50	10	<1	<1	<1	<1	<1	<1
Silver	µg/L	0.1	-	-	-	2.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Strontium	µg/L	10	7000	-	2400	210000	35	38	<10	<10	19	19
Thallium[8]	µg/L	0.50	-	-	2	8	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Tin	µg/L	1	-	-	2400	-	<1	<1	<1	<1	<1	<1
Uranium[8]	µg/L	0.5	20	-	20	150	0.8	<0.5	<0.5	<0.5	<0.5	<0.5
Vanadium	µg/L	10	-	-	6.2*	1200	<10	<10	<10	<10	<10	<10
Zinc	µg/L	2	-	≤ 5000	5000	70	4	<2	4	<2	2	<2

Collection of samples and analysis provided by Saint John Laboratory Services Ltd.

Notes:

1. MDL = Method Detection Limit
2. Guidelines for Canadian Drinking Water Quality (GCDWQ) (Health Canada
3. Maximum Allowable Concentration (MAC).
4. Aesthetic Objective (AO) / Operational Guideline (OG).
5. Atlantic Risk-Based Corrective Action Tier I Environmental Quality Standards (EQS) for an industrial, potable site with coarse-grained soil
6. HH = Human Health
7. Eco = Ecological (> 10m from a freshwater surface water body)
8. Analysis conducted by RPC in Fredericton, NB

Results that exceed the AO/OG are bold and italic
Results that exceed the MAC are red font and bolded
Results that exceed the Atlantic RBCA Tier I EQS guidelines (Human Health) are underlined
Results that exceed the Atlantic RBCA Tier I EQS guidelines (Ecological) are shaded

Appendix C1-3: Trace Metals, Monitoring Wells (greater than 10m from a surface water body)

Sample Station:	Units	MDL[1]	GCDWQ[2]		Atlantic RBCA[5]		MW31U	MW31U DUP	MW32U1	MW32U1	MW32U2	MW32U2
Date:			MAC[3]	AO/OG[4]	HH[6]	Eco[7]	2022/09/15	2022/09/15	2022/04/11	2022/09/15	2022/04/11	2022/09/15
Aluminium	µg/L	5	2900	<100	100	50	<5	<5	<5	<5	<5	<5
Antimony	µg/L	2	6	-	6	90	<2	<2	<2	<2	<2	<2
Arsenic	µg/L	1	10	-	10	50	<1	<1	<1	<1	<1	<1
Barium	µg/L	10	2000	-	1000	10000	<10	<10	<10	<10	7	<10
Beryllium	µg/L	1	-	-	4	1.5	<1	<1	<1	<1	<1	<1
Bismuth	µg/L	1	-	-	-	-	<1	<1	<1	<1	<1	<1
Boron	µg/L	100	5000	-	5000	15000	<100	<100	<100	<100	<100	<100
Cadmium	µg/L	0.02	7	-	5	0.9	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Chromium	µg/L	1	50	-	50	89	<1	<1	<1	<1	<1	<1
Cobalt	µg/L	2	-	-	3.8	10	<2	<2	<2	<2	<2	<2
Copper	µg/L	1	2000	1000	2000	20	<1	<1	3	<1	2	<1
Iron	µg/L	2	-	≤ 300	300	3000	<2	<2	<2	<2	<2	<2
Lead	µg/L	1	5	-	5	10	<1	<1	<1	<1	<1	<1
Manganese	µg/L	2	120	20	120	4300	<2	<2	***89***	***71***	***110***	***30***
Mercury	µg/L	0.02	1	-	1	0.26	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Molybdenum	µg/L	5	-	-	70	730	<5	<5	<5	<5	<5	<5
Nickel	µg/L	2	-	-	100	250	<2	<2	<2	<2	<2	<2
Selenium	µg/L	1	50	-	50	10	<1	<1	<1	<1	<1	<1
Silver	µg/L	0.1	-	-	-	2.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Strontium	µg/L	10	7000	-	2400	210000	24	24	75	83	136	153
Thallium[8]	µg/L	0.50	-	-	2	8	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Tin	µg/L	1	-	-	2400	-	<1	<1	<1	<1	<1	<1
Uranium[8]	µg/L	0.5	20	-	20	150	<0.5	<0.5	<0.5	<0.5	2.1	0.6
Vanadium	µg/L	10	-	-	6.2*	1200	<10	<10	<10	<10	<10	<10
Zinc	µg/L	2	-	≤ 5000	5000	70	<2	<2	2	<2	<2	<2

Collection of samples and analysis provided by Saint John Laboratory Services Ltd.

Notes:

1. MDL = Method Detection Limit
2. Guidelines for Canadian Drinking Water Quality (GCDWQ) (Health Canada
3. Maximum Allowable Concentration (MAC).
4. Aesthetic Objective (AO) / Operational Guideline (OG).
5. Atlantic Risk-Based Corrective Action Tier I Environmental Quality Standards (EQS) for an industrial, potable site with coarse-grained soil
6. HH = Human Health
7. Eco = Ecological (> 10m from a freshwater surface water body)
8. Analysis conducted by RPC in Fredericton, NB

Results that exceed the AO/OG are bold and italic
Results that exceed the MAC are red font and bolded
Results that exceed the Atlantic RBCA Tier I EQS guidelines (Human Health) are underlined
Results that exceed the Atlantic RBCA Tier I EQS guidelines (Ecological) are shaded

Appendix C1-3: Trace Metals, Monitoring Wells (greater than 10m from a surface water body)

Sample Station:	Units	MDL[1]	GCDWQ[2]		Atlantic RBCA[5]		MW33S	MW33S	MW33U	MW33U DUP	MW33U	MW33U DUP
Date:			MAC[3]	AO/OG[4]	HH[6]	Eco[7]	2022/04/11	2022/09/15	2022/04/11	2022/04/11	2022/09/15	2022/09/15
Aluminium	µg/L	5	2900	<100	100	50	15	8	10	<5	<5	<5
Antimony	µg/L	2	6	-	6	90	<2	<2	<2	<2	<2	<2
Arsenic	µg/L	1	10	-	10	50	<1	<1	1	<1	<1	<1
Barium	µg/L	10	2000	-	1000	10000	11	14	19	18	14	15
Beryllium	µg/L	1	-	-	4	1.5	<1	<1	<1	<1	<1	<1
Bismuth	µg/L	1	-	-	-	-	<1	<1	<1	<1	<1	<1
Boron	µg/L	100	5000	-	5000	15000	<100	<100	<100	<100	<100	<100
Cadmium	µg/L	0.02	7	-	5	0.9	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Chromium	µg/L	1	50	-	50	89	<1	<1	<1	<1	<1	<1
Cobalt	µg/L	2	-	-	3.8	10	<2	<2	<2	<2	<2	<2
Copper	µg/L	1	2000	1000	2000	20	2	<1	<1	<1	<1	<1
Iron	µg/L	2	-	≤ 300	300	3000	<2	<2	<2	<2	<2	<2
Lead	µg/L	1	5	-	5	10	<1	<1	<1	<1	<1	<1
Manganese	µg/L	2	120	20	120	4300	4	6	12	11	<2	<2
Mercury	µg/L	0.02	1	-	1	0.26	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Molybdenum	µg/L	5	-	-	70	730	<5	<5	<5	<5	<5	<5
Nickel	µg/L	2	-	-	100	250	<2	<2	<2	<2	<2	<2
Selenium	µg/L	1	50	-	50	10	<1	<1	<1	<1	<1	<1
Silver	µg/L	0.1	-	-	-	2.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Strontium	µg/L	10	7000	-	2400	210000	48	95	53	55	61	62
Thallium[8]	µg/L	0.50	-	-	2	8	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Tin	µg/L	1	-	-	2400	-	<1	<1	<1	<1	<1	<1
Uranium[8]	µg/L	0.5	20	-	20	150	<0.5	<0.5	10.4	10.1	<0.5	<0.5
Vanadium	µg/L	10	-	-	6.2*	1200	<10	<10	<10	<10	<10	<10
Zinc	µg/L	2	-	≤ 5000	5000	70	4	<2	<2	<2	<2	<2

Collection of samples and analysis provided by
Saint John Laboratory Services Ltd.

Notes:

1. MDL = Method Detection Limit
2. Guidelines for Canadian Drinking Water Quality (GCDWQ) (Health Canada
3. Maximum Allowable Concentration (MAC).
4. Aesthetic Objective (AO) / Operational Guideline (OG).
5. Atlantic Risk-Based Corrective Action Tier I Environmental Quality Standards (EQS) for an industrial, potable site with coarse-grained soil
6. HH = Human Health
7. Eco = Ecological (> 10m from a freshwater surface water body)
8. Analysis conducted by RPC in Fredericton, NB

Results that exceed the AO/OG are bold and italic
Results that exceed the MAC are red font and bolded
Results that exceed the Atlantic RBCA Tier I EQS guidelines (Human Health) are underlined
Results that exceed the Atlantic RBCA Tier I EQS guidelines (Ecological) are shaded

Appendix C1-3: Trace Metals, Monitoring Wells (greater than 10m from a surface water body)

Sample Station:	Units	MDL[1]	GCDWQ[2]		Atlantic RBCA[5]		MW34S	MW34S	MW34U	MW34U	MW35L	MW35L
Date:			**MAC[3]**	**AO/OG[4]**	**HH[6]**	**Eco[7]**	**2022/04/11**	**2022/09/15**	**2022/04/11**	**2022/09/15**	**2022/04/11**	**2022/09/15**
Aluminium	µg/L	5	2900	<100	100	50	<5	<5	7	<5	26	<5
Antimony	µg/L	2	6	-	6	90	<2	<2	<2	<2	<2	<2
Arsenic	µg/L	1	10	-	10	50	<1	1	4	4	8	8
Barium	µg/L	10	2000	-	1000	10000	22	27	41	40	15	19
Beryllium	µg/L	1	-	-	4	1.5	<1	<1	<1	<1	<1	<1
Bismuth	µg/L	1	-	-	-	-	<1	<1	<1	<1	<1	<1
Boron	µg/L	100	5000	-	5000	15000	<100	<100	<100	<100	<100	<100
Cadmium	µg/L	0.02	7	-	5	0.9	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Chromium	µg/L	1	50	-	50	89	<1	<1	<1	<1	<1	<1
Cobalt	µg/L	2	-	-	3.8	10	<2	<2	<2	<2	<2	<2
Copper	µg/L	1	2000	1000	2000	20	<1	<1	<1	<1	<1	<1
Iron	µg/L	2	-	≤ 300	300	3000	<2	<2	<2	<2	<2	<2
Lead	µg/L	1	5	-	5	10	<1	<1	<1	<1	<1	<1
Manganese	µg/L	2	120	20	120	4300	8	<2	19	<2	***46***	7
Mercury	µg/L	0.02	1	-	1	0.26	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Molybdenum	µg/L	5	-	-	70	730	<5	<5	<5	<5	16	14
Nickel	µg/L	2	-	-	100	250	<2	<2	<2	<2	<2	<2
Selenium	µg/L	1	50	-	50	10	<1	<1	<1	<1	<1	<1
Silver	µg/L	0.1	-	-	-	2.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Strontium	µg/L	10	7000	-	2400	210000	139	186	95	90	77	87
Thallium[8]	µg/L	0.50	-	-	2	8	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Tin	µg/L	1	-	-	2400	-	<1	<1	<1	<1	<1	<1
Uranium[8]	µg/L	0.5	20	-	20	150	1.3	3.0	7.5	0.3	1.6	<0.5
Vanadium	µg/L	10	-	-	6.2*	1200	<10	<10	<10	<10	<10	<10
Zinc	µg/L	2	-	≤ 5000	5000	70	<2	<2	<2	<2	<2	<2

Collection of samples and analysis provided by
Saint John Laboratory Services Ltd.

Notes:

1. MDL = Method Detection Limit
2. Guidelines for Canadian Drinking Water Quality (GCDWQ) (Health Canada
3. Maximum Allowable Concentration (MAC).
4. Aesthetic Objective (AO) / Operational Guideline (OG).
5. Atlantic Risk-Based Corrective Action Tier I Environmental Quality Standards (EQS) for an industrial, potable site with coarse-grained soil
6. HH = Human Health
7. Eco = Ecological (> 10m from a freshwater surface water body)
8. Analysis conducted by RPC in Fredericton, NB

Results that exceed the AO/OG are bold and italic
Results that exceed the MAC are red font and bolded
Results that exceed the Atlantic RBCA Tier I EQS guidelines (Human Health) are underlined
Results that exceed the Atlantic RBCA Tier I EQS guidelines (Ecological) are shaded

Appendix C1-3: Trace Metals, Monitoring Wells (greater than 10m from a surface water body)

Sample Station:	Units	MDL[1]	GCDWQ[2]		Atlantic RBCA[5]		MW35S1	MW35S1	MW35S2	MW35S2	MW40S	MW40S
Date:			MAC[3]	AO/OG[4]	HH[6]	Eco[7]	2022/04/11	2022/09/15	2022/04/11	2022/09/15	2022/04/25	2022/09/22
Aluminium	µg/L	5	2900	<100	100	50	<5	<5	34	18	18	<5
Antimony	µg/L	2	6	-	6	90	<2	<2	<2	<2	<2	<2
Arsenic	µg/L	1	10	-	10	50	1	1	1	1	1	1
Barium	µg/L	10	2000	-	1000	10000	15	15	12	14	10	14
Beryllium	µg/L	1	-	-	4	1.5	<1	<1	<1	<1	<1	<1
Bismuth	µg/L	1	-	-	-	-	<1	<1	<1	<1	<1	<1
Boron	µg/L	100	5000	-	5000	15000	<100	<100	<100	<100	<100	<100
Cadmium	µg/L	0.02	7	-	5	0.9	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Chromium	µg/L	1	50	-	50	89	<1	<1	<1	<1	<1	<1
Cobalt	µg/L	2	-	-	3.8	10	<2	<2	<2	<2	<2	<2
Copper	µg/L	1	2000	1000	2000	20	1	<1	<1	<1	<1	<1
Iron	µg/L	2	-	≤ 300	300	3000	<2	<2	10	6	<2	<2
Lead	µg/L	1	5	-	5	10	<1	<1	<1	<1	<1	<1
Manganese	µg/L	2	120	20	120	4300	6	<2	6	<2	8	3
Mercury	µg/L	0.02	1	-	1	0.26	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Molybdenum	µg/L	5	-	-	70	730	<5	<5	<5	<5	17	<5
Nickel	µg/L	2	-	-	100	250	<2	<2	<2	<2	<2	<2
Selenium	µg/L	1	50	-	50	10	<1	<1	<1	<1	<1	<1
Silver	µg/L	0.1	-	-	-	2.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Strontium	µg/L	10	7000	-	2400	210000	131	150	90	103	69	139
Thallium[8]	µg/L	0.50	-	-	2	8	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Tin	µg/L	1	-	-	2400	-	<1	<1	<1	<1	<1	<1
Uranium[8]	µg/L	0.5	20	-	20	150	5.0	<0.5	2.1	3.9	<0.5	0.9
Vanadium	µg/L	10	-	-	6.2*	1200	<10	<10	<10	<10	<10	<10
Zinc	µg/L	2	-	≤ 5000	5000	70	3	<2	<2	<2	<2	<2

Collection of samples and analysis provided by Saint John Laboratory Services Ltd.

Notes:

1. MDL = Method Detection Limit
2. Guidelines for Canadian Drinking Water Quality (GCDWQ) (Health Canada
3. Maximum Allowable Concentration (MAC).
4. Aesthetic Objective (AO) / Operational Guideline (OG).
5. Atlantic Risk-Based Corrective Action Tier I Environmental Quality Standards (EQS) for an industrial, potable site with coarse-grained soil
6. HH = Human Health
7. Eco = Ecological (> 10m from a freshwater surface water body)
8. Analysis conducted by RPC in Fredericton, NB

Results that exceed the AO/OG are bold and italic
Results that exceed the MAC are red font and bolded
Results that exceed the Atlantic RBCA Tier I EQS guidelines (Human Health) are underlined
Results that exceed the Atlantic RBCA Tier I EQS guidelines (Ecological) are shaded

Appendix C1-3: Trace Metals, Monitoring Wells (greater than 10m from a surface water body)

Sample Station:	Units	MDL[1]	GCDWQ[2]		Atlantic RBCA[5]		MW40U	MW40U	MW41L	MW41L	MW41S	MW41S
Date:			MAC[3]	AO/OG[4]	HH[6]	Eco[7]	2022/04/25	2022/09/22	2022/04/25	2022/09/22	2022/04/25	2022/09/22
Aluminium	µg/L	5	2900	<100	100	50	17	8	<5	7	***242***	***328***
Antimony	µg/L	2	6	-	6	90	<2	<2	<2	<2	<2	<2
Arsenic	µg/L	1	10	-	10	50	<1	1	1	<1	<1	<1
Barium	µg/L	10	2000	-	1000	10000	45	<10	58	47	<10	15
Beryllium	µg/L	1	-	-	4	1.5	<1	<1	<1	<1	<1	<1
Bismuth	µg/L	1	-	-	-	-	<1	<1	<1	<1	<1	<1
Boron	µg/L	100	5000	-	5000	15000	<100	<100	<100	<100	<100	<100
Cadmium	µg/L	0.02	7	-	5	0.9	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Chromium	µg/L	1	50	-	50	89	<1	<1	<1	<1	<1	<1
Cobalt	µg/L	2	-	-	3.8	10	<2	<2	<2	<2	<2	<2
Copper	µg/L	1	2000	1000	2000	20	<1	<1	<1	<1	2	4
Iron	µg/L	2	-	≤ 300	300	3000	20	2	<2	2	151	270
Lead	µg/L	1	5	-	5	10	<1	<1	<1	<1	<1	<1
Manganese	µg/L	2	120	20	120	4300	3	2	2	<2	***112***	***250***
Mercury	µg/L	0.02	1	-	1	0.26	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Molybdenum	µg/L	5	-	-	70	730	17	14	11	14	<5	<5
Nickel	µg/L	2	-	-	100	250	<2	<2	<2	<2	<2	<2
Selenium	µg/L	1	50	-	50	10	<1	<1	<1	<1	<1	<1
Silver	µg/L	0.1	-	-	-	2.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Strontium	µg/L	10	7000	-	2400	210000	83	80	84	95	<10	<10
Thallium[8]	µg/L	0.50	-	-	2	8	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Tin	µg/L	1	-	-	2400	-	<1	<1	<1	<1	<1	<1
Uranium[8]	µg/L	0.5	20	-	20	150	<0.5	0.7	<0.5	<0.5	0.7	0.6
Vanadium	µg/L	10	-	-	6.2*	1200	<10	<10	<10	<10	<10	<10
Zinc	µg/L	2	-	≤ 5000	5000	70	<2	<2	<2	<2	18	<2

Collection of samples and analysis provided by
Saint John Laboratory Services Ltd.

Notes:

1. MDL = Method Detection Limit
2. Guidelines for Canadian Drinking Water Quality (GCDWQ) (Health Canad
3. Maximum Allowable Concentration (MAC).
4. Aesthetic Objective (AO) / Operational Guideline (OG).
5. Atlantic Risk-Based Corrective Action Tier I Environmental Quality Standards (EQS) for an industrial, potable site with coarse-grained soil
6. HH = Human Health
7. Eco = Ecological (> 10m from a freshwater surface water body)
8. Analysis conducted by RPC in Fredericton, NB

Results that exceed the AO/OG are bold and italic
Results that exceed the MAC are red font and bolded
Results that exceed the Atlantic RBCA Tier I EQS guidelines (Human Health) are underlined
Results that exceed the Atlantic RBCA Tier I EQS guidelines (Ecological) are shaded

Appendix C1-3: Trace Metals, Monitoring Wells (greater than 10m from a surface water body)

Sample Station:	Units	MDL[1]	GCDWQ[2]		Atlantic RBCA[5]		MW41U	MW41U DUP	MW41U	MW41U DUP	MW42L	MW42L
Date:			MAC[3]	AO/OG[4]	HH[6]	Eco[7]	2022/04/25	2022/04/25	2022/09/22	2022/09/22	2022/04/25	2022/09/22
Aluminium	µg/L	5	2900	<100	100	50	<5	<5	5	10	<5	<5
Antimony	µg/L	2	6	-	6	90	<2	<2	<2	<2	<2	<2
Arsenic	µg/L	1	10	-	10	50	4	4	1	4	<1	<1
Barium	µg/L	10	2000	-	1000	10000	60	60	62	69	10	<10
Beryllium	µg/L	1	-	-	4	1.5	<1	<1	<1	<1	<1	<1
Bismuth	µg/L	1	-	-	-	-	<1	<1	<1	<1	<1	<1
Boron	µg/L	100	5000	-	5000	15000	<100	<100	<100	<100	<100	<100
Cadmium	µg/L	0.02	7	-	5	0.9	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Chromium	µg/L	1	50	-	50	89	<1	<1	<1	<1	<1	<1
Cobalt	µg/L	2	-	-	3.8	10	<2	<2	<2	<2	<2	<2
Copper	µg/L	1	2000	1000	2000	20	<1	<1	<1	<1	<1	<1
Iron	µg/L	2	-	≤ 300	300	3000	<2	<2	<2	<2	<2	<2
Lead	µg/L	1	5	-	5	10	<1	<1	<1	<1	<1	<1
Manganese	µg/L	2	120	20	120	4300	***33***	***29***	2	<2	7	5
Mercury	µg/L	0.02	1	-	1	0.26	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Molybdenum	µg/L	5	-	-	70	730	12	10	8	5	<5	<5
Nickel	µg/L	2	-	-	100	250	<2	<2	<2	<2	<2	<2
Selenium	µg/L	1	50	-	50	10	<1	<1	<1	<1	<1	<1
Silver	µg/L	0.1	-	-	-	2.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Strontium	µg/L	10	7000	-	2400	210000	74	77	96	86	68	71
Thallium[8]	µg/L	0.50	-	-	2	8	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Tin	µg/L	1	-	-	2400	-	<1	<1	<1	<1	<1	<1
Uranium[8]	µg/L	0.5	20	-	20	150	<0.5	<0.5	<0.5	<0.5	2.1	2.3
Vanadium	µg/L	10	-	-	6.2*	1200	<10	<10	<10	<10	<10	<10
Zinc	µg/L	2	-	≤ 5000	5000	70	<2	<2	7	<2	3	3

Collection of samples and analysis provided by Saint John Laboratory Services Ltd.

Notes:

1. MDL = Method Detection Limit
2. Guidelines for Canadian Drinking Water Quality (GCDWQ) (Health Canada
3. Maximum Allowable Concentration (MAC).
4. Aesthetic Objective (AO) / Operational Guideline (OG).
5. Atlantic Risk-Based Corrective Action Tier I Environmental Quality Standards (EQS) for an industrial, potable site with coarse-grained soil
6. HH = Human Health
7. Eco = Ecological (> 10m from a freshwater surface water body)
8. Analysis conducted by RPC in Fredericton, NB

Results that exceed the AO/OG are bold and italic
Results that exceed the MAC are red font and bolded
Results that exceed the Atlantic RBCA Tier I EQS guidelines (Human Health) are underlined
Results that exceed the Atlantic RBCA Tier I EQS guidelines (Ecological) are shaded

Appendix C1-3: Trace Metals, Monitoring Wells (greater than 10m from a surface water body)

Sample Station:	Units	MDL[1]	GCDWQ[2]		Atlantic RBCA[5]		MW42S	MW42S	MW42U	MW42U	MW43S	MW43S
Date:			MAC[3]	AO/OG[4]	HH[6]	Eco[7]	2022/04/25	2022/09/22	2022/04/25	2022/09/22	2022/04/11	2022/09/15
Aluminium	µg/L	5	2900	<100	100	50	<5	5	5	10	***<u>255</u>***	94
Antimony	µg/L	2	6	-	6	90	<2	<2	<2	<2	<2	<2
Arsenic	µg/L	1	10	-	10	50	<1	1	1	1	<1	1
Barium	µg/L	10	2000	-	1000	10000	<10	11	<10	<10	18	16
Beryllium	µg/L	1	-	-	4	1.5	<1	<1	<1	<1	<1	<1
Bismuth	µg/L	1	-	-	-	-	<1	<1	<1	<1	<1	<1
Boron	µg/L	100	5000	-	5000	15000	<100	<100	<100	<100	<100	<100
Cadmium	µg/L	0.02	7	-	5	0.9	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Chromium	µg/L	1	50	-	50	89	<1	<1	<1	<1	<1	<1
Cobalt	µg/L	2	-	-	3.8	10	<2	<2	<2	<2	<2	<2
Copper	µg/L	1	2000	1000	2000	20	1	<1	<1	<1	7	<1
Iron	µg/L	2	-	≤ 300	300	3000	<2	3	<2	2	240	93
Lead	µg/L	1	5	-	5	10	<1	<1	<1	<1	<1	<1
Manganese	µg/L	2	120	20	120	4300	***<u>626</u>***	***<u>190</u>***	10	<2	***101***	5
Mercury	µg/L	0.02	1	-	1	0.26	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Molybdenum	µg/L	5	-	-	70	730	<5	<5	9	<5	<5	<5
Nickel	µg/L	2	-	-	100	250	<2	<2	<2	<2	<2	<2
Selenium	µg/L	1	50	-	50	10	<1	<1	<1	<1	<1	<1
Silver	µg/L	0.1	-	-	-	2.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Strontium	µg/L	10	7000	-	2400	210000	82	75	90	95	55	78
Thallium[8]	µg/L	0.50	-	-	2	8	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Tin	µg/L	1	-	-	2400	-	<1	<1	<1	<1	<1	<1
Uranium[8]	µg/L	0.5	20	-	20	150	<0.5	1.1	0.5	5.1	0.7	0.5
Vanadium	µg/L	10	-	-	6.2*	1200	<10	<10	<10	<10	<10	<10
Zinc	µg/L	2	-	≤ 5000	5000	70	4	10	<2	9	3	10

Collection of samples and analysis provided by Saint John Laboratory Services Ltd.

Notes:

1. MDL = Method Detection Limit
2. Guidelines for Canadian Drinking Water Quality (GCDWQ) (Health Canada
3. Maximum Allowable Concentration (MAC).
4. Aesthetic Objective (AO) / Operational Guideline (OG).
5. Atlantic Risk-Based Corrective Action Tier I Environmental Quality Standards (EQS) for an industrial, potable site with coarse-grained soil
6. HH = Human Health
7. Eco = Ecological (> 10m from a freshwater surface water body)
8. Analysis conducted by RPC in Fredericton, NB

Results that exceed the AO/OG are bold and italic
Results that exceed the MAC are red font and bolded
Results that exceed the Atlantic RBCA Tier I EQS guidelines (Human Health) are underlined
Results that exceed the Atlantic RBCA Tier I EQS guidelines (Ecological) are shaded

Appendix C1-3: Trace Metals, Monitoring Wells (greater than 10m from a surface water body)

Sample Station:	Units	MDL[1]	GCDWQ[2]		Atlantic RBCA[5]		MW43U	MW43U	MW44S	MW44S	MW44U	MW44U DUP
Date:			MAC[3]	AO/OG[4]	HH[6]	Eco[7]	2022/04/11	2022/09/15	2022/04/11	2022/09/15	2022/04/11	2022/04/11
Aluminium	µg/L	5	2900	<100	100	50	***480***	***183***	7	7	<5	<5
Antimony	µg/L	2	6	-	6	90	<2	<2	<2	<2	<2	<2
Arsenic	µg/L	1	10	-	10	50	4	6	<1	1	***53***	***52***
Barium	µg/L	10	2000	-	1000	10000	<10	<10	<10	<10	11	13
Beryllium	µg/L	1	-	-	4	1.5	<1	<1	<1	<1	<1	<1
Bismuth	µg/L	1	-	-	-	-	<1	<1	<1	<1	<1	<1
Boron	µg/L	100	5000	-	5000	15000	<100	<100	<100	<100	<100	<100
Cadmium	µg/L	0.02	7	-	5	0.9	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Chromium	µg/L	1	50	-	50	89	<1	<1	<1	<1	<1	<1
Cobalt	µg/L	2	-	-	3.8	10	<2	<2	<2	<2	<2	<2
Copper	µg/L	1	2000	1000	2000	20	1	<1	<1	<1	<1	<1
Iron	µg/L	2	-	≤ 300	300	3000	173	67	<2	4	<2	<2
Lead	µg/L	1	5	-	5	10	<1	<1	<1	<1	<1	<1
Manganese	µg/L	2	120	20	120	4300	16	2	2	<2	11	12
Mercury	µg/L	0.02	1	-	1	0.26	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Molybdenum	µg/L	5	-	-	70	730	7	<5	<5	<5	<5	<5
Nickel	µg/L	2	-	-	100	250	<2	<2	<2	<2	<2	<2
Selenium	µg/L	1	50	-	50	10	<1	<1	<1	<1	<1	<1
Silver	µg/L	0.1	-	-	-	2.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Strontium	µg/L	10	7000	-	2400	210000	13	19	32	37	56	55
Thallium[8]	µg/L	0.50	-	-	2	8	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Tin	µg/L	1	-	-	2400	-	<1	<1	<1	<1	<1	<1
Uranium[8]	µg/L	0.5	20	-	20	150	0.8	1.1	0.6	0.7	4.3	4.6
Vanadium	µg/L	10	-	-	6.2*	1200	<10	<10	<10	<10	<10	<10
Zinc	µg/L	2	-	≤ 5000	5000	70	<2	11	<2	20	<2	<2

Collection of samples and analysis provided by Saint John Laboratory Services Ltd.

Notes:

1. MDL = Method Detection Limit
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3. Maximum Allowable Concentration (MAC).
4. Aesthetic Objective (AO) / Operational Guideline (OG).
5. Atlantic Risk-Based Corrective Action Tier I Environmental Quality Standards (EQS) for an industrial, potable site with coarse-grained soil
6. HH = Human Health
7. Eco = Ecological (> 10m from a freshwater surface water body)
8. Analysis conducted by RPC in Fredericton, NB

Results that exceed the AO/OG are bold and italic
Results that exceed the MAC are red font and bolded
Results that exceed the Atlantic RBCA Tier I EQS guidelines (Human Health) are underlined
Results that exceed the Atlantic RBCA Tier I EQS guidelines (Ecological) are shaded

Appendix C1-3: Trace Metals, Monitoring Wells (greater than 10m from a surface water body)

Sample Station:	Units	MDL[1]	GCDWQ[2]		Atlantic RBCA[5]		MW44U	MW44U DUP	MW45L	MW45L	MW45U	MW45U
Date:			MAC[3]	AO/OG[4]	HH[6]	Eco[7]	2022/09/15	2022/09/15	2022/04/11	2022/09/15	2022/04/11	2022/09/15
Aluminium	µg/L	5	2900	<100	100	50	<5	6	6	9	<5	15
Antimony	µg/L	2	6	-	6	90	<2	<2	<2	<2	<2	<2
Arsenic	µg/L	1	10	-	10	50	***51***	***58***	***73***	***80***	1	2
Barium	µg/L	10	2000	-	1000	10000	15	14	<10	<10	<10	<10
Beryllium	µg/L	1	-	-	4	1.5	<1	<1	<1	<1	<1	<1
Bismuth	µg/L	1	-	-	-	-	<1	<1	<1	<1	<1	<1
Boron	µg/L	100	5000	-	5000	15000	<100	<100	<100	<100	<100	<100
Cadmium	µg/L	0.02	7	-	5	0.9	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Chromium	µg/L	1	50	-	50	89	<1	<1	<1	<1	<1	<1
Cobalt	µg/L	2	-	-	3.8	10	<2	<2	<2	<2	<2	<2
Copper	µg/L	1	2000	1000	2000	20	<1	<1	<1	<1	<1	<1
Iron	µg/L	2	-	≤ 300	300	3000	3	3	<2	4	<2	3
Lead	µg/L	1	5	-	5	10	<1	<1	<1	<1	<1	<1
Manganese	µg/L	2	120	20	120	4300	<2	<2	6	<2	11	<2
Mercury	µg/L	0.02	1	-	1	0.26	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Molybdenum	µg/L	5	-	-	70	730	<5	<5	<5	<5	13	<5
Nickel	µg/L	2	-	-	100	250	<2	<2	<2	<2	<2	<2
Selenium	µg/L	1	50	-	50	10	<1	<1	<1	<1	<1	<1
Silver	µg/L	0.1	-	-	-	2.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Strontium	µg/L	10	7000	-	2400	210000	66	64	47	54	109	121
Thallium[8]	µg/L	0.50	-	-	2	8	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Tin	µg/L	1	-	-	2400	-	<1	<1	<1	<1	<1	<1
Uranium[8]	µg/L	0.5	20	-	20	150	1.0	2.9	<0.5	1.6	<0.5	<0.5
Vanadium	µg/L	10	-	-	6.2*	1200	<10	<10	<10	<10	<10	<10
Zinc	µg/L	2	-	≤ 5000	5000	70	8	8	<2	9	<2	10

Collection of samples and analysis provided by
Saint John Laboratory Services Ltd.

Notes:

1. MDL = Method Detection Limit
2. Guidelines for Canadian Drinking Water Quality (GCDWQ) (Health Canada
3. Maximum Allowable Concentration (MAC).
4. Aesthetic Objective (AO) / Operational Guideline (OG).
5. Atlantic Risk-Based Corrective Action Tier I Environmental Quality Standards (EQS) for an industrial, potable site with coarse-grained soil
6. HH = Human Health
7. Eco = Ecological (> 10m from a freshwater surface water body)
8. Analysis conducted by RPC in Fredericton, NB

Results that exceed the AO/OG are bold and italic
Results that exceed the MAC are red font and bolded
Results that exceed the Atlantic RBCA Tier I EQS guidelines (Human Health) are underlined
Results that exceed the Atlantic RBCA Tier I EQS guidelines (Ecological) are shaded

Appendix C1-3: Trace Metals, Monitoring Wells (greater than 10m from a surface water body)

Sample Station:	Units	MDL[1]	GCDWQ[2]		Atlantic RBCA[5]		MW46L	MW46L	MW48L	MW48L	MW48S	MW48S
Date:			MAC[3]	AO/OG[4]	HH[6]	Eco[7]	2022/04/25	2022/09/22	2022/04/25	2022/09/15	2022/04/25	2022/09/15
Aluminium	µg/L	5	2900	<100	100	50	<5	5	<5	8	<5	6
Antimony	µg/L	2	6	-	6	90	<2	<2	<2	<2	<2	<2
Arsenic	µg/L	1	10	-	10	50	<1	1	2	3	1	2
Barium	µg/L	10	2000	-	1000	10000	<10	<10	31	39	38	64
Beryllium	µg/L	1	-	-	4	1.5	<1	<1	<1	<1	<1	<1
Bismuth	µg/L	1	-	-	-	-	<1	<1	<1	<1	<1	<1
Boron	µg/L	100	5000	-	5000	15000	<100	<100	<100	<100	<100	<100
Cadmium	µg/L	0.02	7	-	5	0.9	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Chromium	µg/L	1	50	-	50	89	<1	<1	<1	<1	<1	<1
Cobalt	µg/L	2	-	-	3.8	10	<2	<2	<2	<2	<2	<2
Copper	µg/L	1	2000	1000	2000	20	<1	<1	<1	<1	<1	<1
Iron	µg/L	2	-	≤ 300	300	3000	<2	2	<2	11	<2	4
Lead	µg/L	1	5	-	5	10	<1	<1	<1	<1	<1	<1
Manganese	µg/L	2	120	20	120	4300	18	<2	7	<2	***52***	<2
Mercury	µg/L	0.02	1	-	1	0.26	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Molybdenum	µg/L	5	-	-	70	730	<5	<5	<5	<5	<5	<5
Nickel	µg/L	2	-	-	100	250	<2	<2	<2	<2	<2	<2
Selenium	µg/L	1	50	-	50	10	<1	<1	<1	<1	<1	<1
Silver	µg/L	0.1	-	-	-	2.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Strontium	µg/L	10	7000	-	2400	210000	147	176	88	90	87	110
Thallium[8]	µg/L	0.50	-	-	2	8	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Tin	µg/L	1	-	-	2400	-	<1	<1	<1	<1	<1	<1
Uranium[8]	µg/L	0.5	20	-	20	150	6.6	1.3	0.9	0.9	<0.5	0.7
Vanadium	µg/L	10	-	-	6.2*	1200	<10	<10	<10	<10	<10	<10
Zinc	µg/L	2	-	≤ 5000	5000	70	<2	8	<2	8	<2	8

Collection of samples and analysis provided by Saint John Laboratory Services Ltd.

Notes:

1. MDL = Method Detection Limit
2. Guidelines for Canadian Drinking Water Quality (GCDWQ) (Health Canada
3. Maximum Allowable Concentration (MAC).
4. Aesthetic Objective (AO) / Operational Guideline (OG).
5. Atlantic Risk-Based Corrective Action Tier I Environmental Quality Standards (EQS) for an industrial, potable site with coarse-grained soil
6. HH = Human Health
7. Eco = Ecological (> 10m from a freshwater surface water body)
8. Analysis conducted by RPC in Fredericton, NB

Results that exceed the AO/OG are bold and italic
Results that exceed the MAC are red font and bolded
Results that exceed the Atlantic RBCA Tier I EQS guidelines (Human Health) are underlined
Results that exceed the Atlantic RBCA Tier I EQS guidelines (Ecological) are shaded

Appendix C1-3: Trace Metals, Monitoring Wells (greater than 10m from a surface water body)

Sample Station:	Units	MDL[1]	GCDWQ[2]		Atlantic RBCA[5]		MW48U	MW48U	MW49L	MW49L	MW49S	MW49S
Date:			MAC[3]	AO/OG[4]	HH[6]	Eco[7]	2022/04/25	2022/09/15	2022/04/25	2022/09/22	2022/04/25	2022/09/22
Aluminium	µg/L	5	2900	<100	100	50	<5	9	<5	7	<5	5
Antimony	µg/L	2	6	-	6	90	<2	<2	<2	<2	<2	<2
Arsenic	µg/L	1	10	-	10	50	1	2	1	1	<1	1
Barium	µg/L	10	2000	-	1000	10000	53	74	<10	<10	<10	<10
Beryllium	µg/L	1	-	-	4	1.5	<1	<1	<1	<1	<1	<1
Bismuth	µg/L	1	-	-	-	-	<1	<1	<1	<1	<1	<1
Boron	µg/L	100	5000	-	5000	15000	<100	<100	<100	<100	<100	<100
Cadmium	µg/L	0.02	7	-	5	0.9	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Chromium	µg/L	1	50	-	50	89	<1	<1	<1	<1	<1	<1
Cobalt	µg/L	2	-	-	3.8	10	<2	<2	<2	<2	<2	<2
Copper	µg/L	1	2000	1000	2000	20	<1	<1	<1	<1	<1	<1
Iron	µg/L	2	-	≤ 300	300	3000	<2	3	<2	3	<2	3
Lead	µg/L	1	5	-	5	10	<1	<1	<1	<1	<1	<1
Manganese	µg/L	2	120	20	120	4300	***30***	<2	12	<2	9	3
Mercury	µg/L	0.02	1	-	1	0.26	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Molybdenum	µg/L	5	-	-	70	730	<5	<5	<5	<5	<5	<5
Nickel	µg/L	2	-	-	100	250	<2	<2	<2	<2	<2	<2
Selenium	µg/L	1	50	-	50	10	<1	<1	<1	<1	<1	<1
Silver	µg/L	0.1	-	-	-	2.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Strontium	µg/L	10	7000	-	2400	210000	135	120	51	53	34	38
Thallium[8]	µg/L	0.50	-	-	2	8	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Tin	µg/L	1	-	-	2400	-	<1	<1	<1	<1	<1	<1
Uranium[8]	µg/L	0.5	20	-	20	150	<0.5	<0.5	6.8	6.0	1.8	0.6
Vanadium	µg/L	10	-	-	6.2*	1200	<10	<10	<10	<10	<10	<10
Zinc	µg/L	2	-	≤ 5000	5000	70	<2	8	<2	10	<2	8

Collection of samples and analysis provided by Saint John Laboratory Services Ltd.

Notes:

1. MDL = Method Detection Limit
2. Guidelines for Canadian Drinking Water Quality (GCDWQ) (Health Canada
3. Maximum Allowable Concentration (MAC).
4. Aesthetic Objective (AO) / Operational Guideline (OG).
5. Atlantic Risk-Based Corrective Action Tier I Environmental Quality Standards (EQS) for an industrial, potable site with coarse-grained soil
6. HH = Human Health
7. Eco = Ecological (> 10m from a freshwater surface water body)
8. Analysis conducted by RPC in Fredericton, NB

Results that exceed the AO/OG are bold and italic
Results that exceed the MAC are red font and bolded
Results that exceed the Atlantic RBCA Tier I EQS guidelines (Human Health) are underlined
Results that exceed the Atlantic RBCA Tier I EQS guidelines (Ecological) are shaded

Appendix C1-3: Trace Metals, Monitoring Wells (greater than 10m from a surface water body)

Sample Station:	Units	MDL[1]	GCDWQ[2]		Atlantic RBCA[5]		MW49U	MW49U	MW50L	MW50L	MW50S	MW50S
Date:			MAC[3]	AO/OG[4]	HH[6]	Eco[7]	2022/04/25	2022/09/22	2022/04/11	2022/09/15	2022/04/11	2022/09/15
Aluminium	µg/L	5	2900	<100	100	50	<5	5	<5	9	<5	<5
Antimony	µg/L	2	6	-	6	90	<2	<2	<2	<2	<2	<2
Arsenic	µg/L	1	10	-	10	50	1	1	<1	1	<1	1
Barium	µg/L	10	2000	-	1000	10000	<10	<10	17	22	16	15
Beryllium	µg/L	1	-	-	4	1.5	<1	<1	<1	<1	<1	<1
Bismuth	µg/L	1	-	-	-	-	<1	<1	<1	<1	<1	<1
Boron	µg/L	100	5000	-	5000	15000	<100	<100	<100	<100	<100	<100
Cadmium	µg/L	0.02	7	-	5	0.9	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Chromium	µg/L	1	50	-	50	89	<1	<1	<1	<1	<1	<1
Cobalt	µg/L	2	-	-	3.8	10	<2	<2	<2	<2	<2	<2
Copper	µg/L	1	2000	1000	2000	20	<1	<1	<1	<1	<1	<1
Iron	µg/L	2	-	≤ 300	300	3000	<2	3	<2	2	<2	2
Lead	µg/L	1	5	-	5	10	<1	<1	<1	<1	<1	<1
Manganese	µg/L	2	120	20	120	4300	3	<2	18	2	11	<2
Mercury	µg/L	0.02	1	-	1	0.26	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Molybdenum	µg/L	5	-	-	70	730	<5	<5	<5	<5	<5	<5
Nickel	µg/L	2	-	-	100	250	<2	<2	<2	<2	<2	<2
Selenium	µg/L	1	50	-	50	10	<1	<1	<1	<1	<1	<1
Silver	µg/L	0.1	-	-	-	2.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Strontium	µg/L	10	7000	-	2400	210000	41	44	117	128	99	91
Thallium[8]	µg/L	0.50	-	-	2	8	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Tin	µg/L	1	-	-	2400	-	<1	<1	<1	<1	<1	<1
Uranium[8]	µg/L	0.5	20	-	20	150	3.3	0.8	<0.5	3.2	<0.5	0.5
Vanadium	µg/L	10	-	-	6.2*	1200	<10	<10	<10	<10	<10	<10
Zinc	µg/L	2	-	≤ 5000	5000	70	<2	9	<2	8	<2	9

Collection of samples and analysis provided by
Saint John Laboratory Services Ltd.

Notes:
1. MDL = Method Detection Limit
2. Guidelines for Canadian Drinking Water Quality (GCDWQ) (Health Canada
3. Maximum Allowable Concentration (MAC).
4. Aesthetic Objective (AO) / Operational Guideline (OG).
5. Atlantic Risk-Based Corrective Action Tier I Environmental Quality Standards (EQS) for an industrial, potable site with coarse-grained soil
6. HH = Human Health
7. Eco = Ecological (> 10m from a freshwater surface water body)
8. Analysis conducted by RPC in Fredericton, NB

Results that exceed the AO/OG are bold and italic
Results that exceed the MAC are red font and bolded
Results that exceed the Atlantic RBCA Tier I EQS guidelines (Human Health) are underlined
Results that exceed the Atlantic RBCA Tier I EQS guidelines (Ecological) are shaded

Appendix C1-3: Trace Metals, Monitoring Wells (greater than 10m from a surface water body)

Sample Station:	Units	MDL[1]	GCDWQ[2]		Atlantic RBCA[5]		MW51D	MW51D	MW51D	MW51S1	MW51S1	MW51S1
Date:			MAC[3]	AO/OG[4]	HH[6]	Eco[7]	2022/04/11	2022/07/21	2022/09/15	2022/04/11	2022/07/21	2022/09/15
Aluminium	µg/L	5	2900	<100	100	50	5	<5	6	<5	<5	<5
Antimony	µg/L	2	6	-	6	90	<2	<2	<2	<2	<2	<2
Arsenic	µg/L	1	10	-	10	50	<1	<1	1	<1	<1	1
Barium	µg/L	10	2000	-	1000	10000	13	11	12	20	20	19
Beryllium	µg/L	1	-	-	4	1.5	<1	<1	<1	<1	<1	<1
Bismuth	µg/L	1	-	-	-	-	<1	<1	<1	<1	<1	<1
Boron	µg/L	100	5000	-	5000	15000	<100	<100	<100	<100	<100	<100
Cadmium	µg/L	0.02	7	-	5	0.9	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Chromium	µg/L	1	50	-	50	89	<1	<1	<1	<1	<1	<1
Cobalt	µg/L	2	-	-	3.8	10	<2	<2	<2	<2	<2	<2
Copper	µg/L	1	2000	1000	2000	20	<1	<1	<1	<1	<1	<1
Iron	µg/L	2	-	≤ 300	300	3000	<2	<2	4	<2	<2	2
Lead	µg/L	1	5	-	5	10	<1	<1	<1	<1	<1	<1
Manganese	µg/L	2	120	20	120	4300	4	3	<2	3	5	<2
Mercury	µg/L	0.02	1	-	1	0.26	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Molybdenum	µg/L	5	-	-	70	730	12	7	<5	9	7	<5
Nickel	µg/L	2	-	-	100	250	<2	<2	<2	<2	<2	<2
Selenium	µg/L	1	50	-	50	10	<1	<1	<1	<1	<1	<1
Silver	µg/L	0.1	-	-	-	2.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Strontium	µg/L	10	7000	-	2400	210000	85	80	96	141	131	148
Thallium[8]	µg/L	0.50	-	-	2	8	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Tin	µg/L	1	-	-	2400	-	<1	<1	<1	<1	<1	<1
Uranium[8]	µg/L	0.5	20	-	20	150	1.2	3.4	1.7	3.6	3.8	2.4
Vanadium	µg/L	10	-	-	6.2*	1200	<10	<10	<10	<10	<10	<10
Zinc	µg/L	2	-	≤ 5000	5000	70	<2	<2	8	<2	<2	7

Collection of samples and analysis provided by
Saint John Laboratory Services Ltd.

Notes:

1. MDL = Method Detection Limit
2. Guidelines for Canadian Drinking Water Quality (GCDWQ) (Health Canada
3. Maximum Allowable Concentration (MAC).
4. Aesthetic Objective (AO) / Operational Guideline (OG).
5. Atlantic Risk-Based Corrective Action Tier I Environmental Quality Standards (EQS) for an industrial, potable site with coarse-grained soil
6. HH = Human Health
7. Eco = Ecological (> 10m from a freshwater surface water body)
8. Analysis conducted by RPC in Fredericton, NB

Results that exceed the AO/OG are bold and italic
Results that exceed the MAC are red font and bolded
Results that exceed the Atlantic RBCA Tier I EQS guidelines (Human Health) are underlined
Results that exceed the Atlantic RBCA Tier I EQS guidelines (Ecological) are shaded

Appendix C1-3: Trace Metals, Monitoring Wells (greater than 10m from a surface water body)

Sample Station:	Units	MDL[1]	GCDWQ[2]		Atlantic RBCA[5]		MW51S2	MW51S2	MW51S2	MW52D	MW52D	MW52D
Date:			MAC[3]	AO/OG[4]	HH[6]	Eco[7]	2022/04/11	2022/07/21	2022/09/15	2022/04/11	2022/07/21	2022/09/15
Aluminium	µg/L	5	2900	<100	100	50	<5	<5	6	<5	<5	<5
Antimony	µg/L	2	6	-	6	90	<2	<2	<2	<2	<2	<2
Arsenic	µg/L	1	10	-	10	50	1	<1	1	<1	<1	1
Barium	µg/L	10	2000	-	1000	10000	20	19	18	46	48	42
Beryllium	µg/L	1	-	-	4	1.5	<1	<1	<1	<1	<1	<1
Bismuth	µg/L	1	-	-	-	-	<1	<1	<1	<1	<1	<1
Boron	µg/L	100	5000	-	5000	15000	<100	<100	<100	1815	1311	2217
Cadmium	µg/L	0.02	7	-	5	0.9	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Chromium	µg/L	1	50	-	50	89	<1	<1	<1	<1	<1	<1
Cobalt	µg/L	2	-	-	3.8	10	<2	<2	<2	<2	<2	<2
Copper	µg/L	1	2000	1000	2000	20	<1	<1	<1	<1	<1	<1
Iron	µg/L	2	-	≤ 300	300	3000	<2	<2	2	<2	<2	3
Lead	µg/L	1	5	-	5	10	<1	<1	<1	<1	<1	<1
Manganese	µg/L	2	120	20	120	4300	3	4	3	***64***	***40***	<2
Mercury	µg/L	0.02	1	-	1	0.26	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Molybdenum	µg/L	5	-	-	70	730	11	10	<5	<5	<5	<5
Nickel	µg/L	2	-	-	100	250	<2	<2	<2	2	<2	<2
Selenium	µg/L	1	50	-	50	10	<1	<1	<1	<1	<1	<1
Silver	µg/L	0.1	-	-	-	2.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Strontium	µg/L	10	7000	-	2400	210000	11	163	120	348	315	332
Thallium[8]	µg/L	0.50	-	-	2	8	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Tin	µg/L	1	-	-	2400	-	<1	<1	<1	<1	<1	<1
Uranium[8]	µg/L	0.5	20	-	20	150	1.7	6.9	5.9	6.4	1.4	2.8
Vanadium	µg/L	10	-	-	6.2*	1200	<10	<10	<10	<10	<10	<10
Zinc	µg/L	2	-	≤ 5000	5000	70	<2	<2	8	<2	<2	7

Collection of samples and analysis provided by
Saint John Laboratory Services Ltd.

Notes:

1. MDL = Method Detection Limit
2. Guidelines for Canadian Drinking Water Quality (GCDWQ) (Health Canada
3. Maximum Allowable Concentration (MAC).
4. Aesthetic Objective (AO) / Operational Guideline (OG).
5. Atlantic Risk-Based Corrective Action Tier I Environmental Quality Standards (EQS) for an industrial, potable site with coarse-grained soil
6. HH = Human Health
7. Eco = Ecological (> 10m from a freshwater surface water body)
8. Analysis conducted by RPC in Fredericton, NB

Results that exceed the AO/OG are bold and italic
Results that exceed the MAC are red font and bolded
Results that exceed the Atlantic RBCA Tier I EQS guidelines (Human Health) are underlined
Results that exceed the Atlantic RBCA Tier I EQS guidelines (Ecological) are shaded

Appendix C1-3: Trace Metals, Monitoring Wells (greater than 10m from a surface water body)

Sample Station:	Units	MDL[1]	GCDWQ[2]		Atlantic RBCA[5]		MW52S	MW52S	MW52S	MW53D	MW53D	MW53D
Date:			MAC[3]	AO/OG[4]	HH[6]	Eco[7]	2022/04/11	2022/07/21	2022/09/15	2022/04/11	2022/07/21	2022/09/15
Aluminium	µg/L	5	2900	<100	100	50	<5	<5	12	6	<5	14
Antimony	µg/L	2	6	-	6	90	<2	<2	<2	<2	<2	<2
Arsenic	µg/L	1	10	-	10	50	1	<1	1	<1	<1	1
Barium	µg/L	10	2000	-	1000	10000	12	10	14	<10	<10	<10
Beryllium	µg/L	1	-	-	4	1.5	<1	<1	<1	<1	<1	<1
Bismuth	µg/L	1	-	-	-	-	<1	<1	<1	<1	<1	<1
Boron	µg/L	100	5000	-	5000	15000	104	<100	<100	<100	<100	<100
Cadmium	µg/L	0.02	7	-	5	0.9	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Chromium	µg/L	1	50	-	50	89	<1	<1	<1	<1	<1	<1
Cobalt	µg/L	2	-	-	3.8	10	<2	<2	<2	<2	<2	<2
Copper	µg/L	1	2000	1000	2000	20	<1	<1	<1	1	9	<1
Iron	µg/L	2	-	≤ 300	300	3000	<2	<2	3	<2	<2	7
Lead	µg/L	1	5	-	5	10	<1	<1	<1	<1	<1	<1
Manganese	µg/L	2	120	20	120	4300	6	5	<2	***47***	***173***	<2
Mercury	µg/L	0.02	1	-	1	0.26	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Molybdenum	µg/L	5	-	-	70	730	8	<5	<5	<5	<5	<5
Nickel	µg/L	2	-	-	100	250	<2	<2	<2	<2	<2	<2
Selenium	µg/L	1	50	-	50	10	<1	<1	<1	<1	<1	<1
Silver	µg/L	0.1	-	-	-	2.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Strontium	µg/L	10	7000	-	2400	210000	85	68	90	6	15	10
Thallium[8]	µg/L	0.50	-	-	2	8	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Tin	µg/L	1	-	-	2400	-	<1	<1	<1	<1	<1	<1
Uranium[8]	µg/L	0.5	20	-	20	150	<0.5	1.4	3.4	1.1	<0.5	0.5
Vanadium	µg/L	10	-	-	6.2*	1200	<10	<10	<10	<10	<10	<10
Zinc	µg/L	2	-	≤ 5000	5000	70	<2	<2	9	5	<2	8

Collection of samples and analysis provided by
Saint John Laboratory Services Ltd.

Notes:

1. MDL = Method Detection Limit
2. Guidelines for Canadian Drinking Water Quality (GCDWQ) (Health Canada
3. Maximum Allowable Concentration (MAC).
4. Aesthetic Objective (AO) / Operational Guideline (OG).
5. Atlantic Risk-Based Corrective Action Tier I Environmental Quality Standards (EQS) for an industrial, potable site with coarse-grained soil
6. HH = Human Health
7. Eco = Ecological (> 10m from a freshwater surface water body)
8. Analysis conducted by RPC in Fredericton, NB

Results that exceed the AO/OG are bold and italic
Results that exceed the MAC are red font and bolded
Results that exceed the Atlantic RBCA Tier I EQS guidelines (Human Health) are underlined
Results that exceed the Atlantic RBCA Tier I EQS guidelines (Ecological) are shaded

Appendix C1-3: Trace Metals, Monitoring Wells (greater than 10m from a surface water body)

Sample Station:	**Units**	**MDL[1]**	**GCDWQ[2]**		**Atlantic RBCA[5]**		**MW54S**	**MW54S**	**MW54S**	**MW54U**	**MW54U DUP**	**MW54U**
Date:			**MAC[3]**	**AO/OG[4]**	**HH[6]**	**Eco[7]**	**2022/04/11**	**2022/07/21**	**2022/09/15**	**2022/04/11**	**2022/04/11**	**2022/07/21**
Aluminium	µg/L	5	2900	<100	100	50	<5	<5	<5	<5	<5	<5
Antimony	µg/L	2	6	-	6	90	<2	<2	<2	<2	<2	<2
Arsenic	µg/L	1	10	-	10	50	2	2	3	4	5	3
Barium	µg/L	10	2000	-	1000	10000	21	19	15	20	19	15
Beryllium	µg/L	1	-	-	4	1.5	<1	<1	<1	<1	<1	<1
Bismuth	µg/L	1	-	-	-	-	<1	<1	<1	<1	<1	<1
Boron	µg/L	100	5000	-	5000	15000	<100	<100	<100	<100	<100	<100
Cadmium	µg/L	0.02	7	-	5	0.9	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Chromium	µg/L	1	50	-	50	89	<1	<1	<1	<1	<1	<1
Cobalt	µg/L	2	-	-	3.8	10	<2	<2	<2	<2	<2	<2
Copper	µg/L	1	2000	1000	2000	20	<1	<1	<1	<1	<1	<1
Iron	µg/L	2	-	≤ 300	300	3000	<2	<2	3	<2	<2	<2
Lead	µg/L	1	5	-	5	10	<1	<1	<1	<1	<1	<1
Manganese	µg/L	2	120	20	120	4300	***749***	***469***	3	***180***	***184***	***213***
Mercury	µg/L	0.02	1	-	1	0.26	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Molybdenum	µg/L	5	-	-	70	730	<5	<5	<5	7	7	<5
Nickel	µg/L	2	-	-	100	250	<2	<2	<2	<2	<2	<2
Selenium	µg/L	1	50	-	50	10	<1	<1	<1	<1	<1	<1
Silver	µg/L	0.1	-	-	-	2.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Strontium	µg/L	10	7000	-	2400	210000	83	74	86	97	94	75
Thallium[8]	µg/L	0.50	-	-	2	8	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Tin	µg/L	1	-	-	2400	-	<1	<1	<1	<1	<1	<1
Uranium[8]	µg/L	0.5	20	-	20	150	<0.5	<0.5	0.5	<0.5	<0.5	<0.5
Vanadium	µg/L	10	-	-	6.2*	1200	<10	<10	<10	<10	<10	<10
Zinc	µg/L	2	-	≤ 5000	5000	70	<2	<2	7	<2	<2	<2

Collection of samples and analysis provided by Saint John Laboratory Services Ltd.

Notes:

1. MDL = Method Detection Limit
2. Guidelines for Canadian Drinking Water Quality (GCDWQ) (Health Canada
3. Maximum Allowable Concentration (MAC).
4. Aesthetic Objective (AO) / Operational Guideline (OG).
5. Atlantic Risk-Based Corrective Action Tier I Environmental Quality Standards (EQS) for an industrial, potable site with coarse-grained soil
6. HH = Human Health
7. Eco = Ecological (> 10m from a freshwater surface water body)
8. Analysis conducted by RPC in Fredericton, NB

Results that exceed the AO/OG are bold and italic
Results that exceed the MAC are red font and bolded
Results that exceed the Atlantic RBCA Tier I EQS guidelines (Human Health) are underlined
Results that exceed the Atlantic RBCA Tier I EQS guidelines (Ecological) are shaded

Appendix C1-3: Trace Metals, Monitoring Wells (greater than 10m from a surface water body)

Sample Station:	Units	MDL[1]	GCDWQ[2]		Atlantic RBCA[5]		MW54U DUP	MW54U	MW54U DUP	MW55S	MW55S	MW55S
Date:			MAC[3]	AO/OG[4]	HH[6]	Eco[7]	2022/07/21	2022/09/15	2022/09/15	2022/04/11	2022/07/21	2022/09/15
Aluminium	µg/L	5	2900	<100	100	50	<5	<5	9	9	7	29
Antimony	µg/L	2	6	-	6	90	<2	<2	<2	<2	<2	<2
Arsenic	µg/L	1	10	-	10	50	3	3	4	1	<1	1
Barium	µg/L	10	2000	-	1000	10000	16	13	12	11	<10	19
Beryllium	µg/L	1	-	-	4	1.5	<1	<1	<1	<1	<1	<1
Bismuth	µg/L	1	-	-	-	-	<1	<1	<1	<1	<1	<1
Boron	µg/L	100	5000	-	5000	15000	<100	<100	<100	<100	<100	<100
Cadmium	µg/L	0.02	7	-	5	0.9	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Chromium	µg/L	1	50	-	50	89	<1	<1	<1	<1	<1	<1
Cobalt	µg/L	2	-	-	3.8	10	<2	<2	<2	<2	<2	<2
Copper	µg/L	1	2000	1000	2000	20	<1	<1	<1	<1	<1	<1
Iron	µg/L	2	-	≤ 300	300	3000	<2	3	4	<2	<2	5
Lead	µg/L	1	5	-	5	10	<1	<1	<1	<1	<1	<1
Manganese	µg/L	2	120	20	120	4300	***218***	***194***	***199***	***50***	***67***	***48***
Mercury	µg/L	0.02	1	-	1	0.26	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Molybdenum	µg/L	5	-	-	70	730	<5	<5	<5	32	22	<5
Nickel	µg/L	2	-	-	100	250	<2	<2	<2	<2	<2	<2
Selenium	µg/L	1	50	-	50	10	<1	<1	<1	<1	<1	<1
Silver	µg/L	0.1	-	-	-	2.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Strontium	µg/L	10	7000	-	2400	210000	77	88	88	103	80	112
Thallium[8]	µg/L	0.50	-	-	2	8	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Tin	µg/L	1	-	-	2400	-	<1	<1	<1	<1	<1	<1
Uranium[8]	µg/L	0.5	20	-	20	150	<0.5	<0.5	0.8	<0.5	<0.5	3.1
Vanadium	µg/L	10	-	-	6.2*	1200	<10	<10	<10	<10	<10	<10
Zinc	µg/L	2	-	≤ 5000	5000	70	<2	8	8	<2	<2	16

Collection of samples and analysis provided by
Saint John Laboratory Services Ltd.

Notes:
1. MDL = Method Detection Limit
2. Guidelines for Canadian Drinking Water Quality (GCDWQ) (Health Canada
3. Maximum Allowable Concentration (MAC).
4. Aesthetic Objective (AO) / Operational Guideline (OG).
5. Atlantic Risk-Based Corrective Action Tier I Environmental Quality Standards (EQS) for an industrial, potable site with coarse-grained soil
6. HH = Human Health
7. Eco = Ecological (> 10m from a freshwater surface water body)
8. Analysis conducted by RPC in Fredericton, NB

Results that exceed the AO/OG are bold and italic
Results that exceed the MAC are red font and bolded
Results that exceed the Atlantic RBCA Tier I EQS guidelines (Human Health) are underlined
Results that exceed the Atlantic RBCA Tier I EQS guidelines (Ecological) are shaded

Appendix C1-3: Trace Metals, Monitoring Wells (greater than 10m from a surface water body)

Sample Station:	Units	MDL[1]	GCDWQ[2]		Atlantic RBCA[5]		MW56S	MW56S	MW56S	MW57S	MW57D
Date:			MAC[3]	AO/OG[4]	HH[6]	Eco[7]	2022/04/11	2022/07/21	2022/09/15	2022/09/22	2022/09/22
Aluminium	µg/L	5	2900	<100	100	50	7	<5	12	***144***	77
Antimony	µg/L	2	6	-	6	90	<2	<2	<2	<2	<2
Arsenic	µg/L	1	10	-	10	50	<1	<1	1	1	1
Barium	µg/L	10	2000	-	1000	10000	<10	<10	<10	<10	<10
Beryllium	µg/L	1	-	-	4	1.5	<1	<1	<1	<1	<1
Bismuth	µg/L	1	-	-	-	-	<1	<1	<1	<1	<1
Boron	µg/L	100	5000	-	5000	15000	<100	<100	<100	<100	<100
Cadmium	µg/L	0.02	7	-	5	0.9	<0.02	<0.02	<0.02	<0.02	<0.02
Chromium	µg/L	1	50	-	50	89	<1	<1	<1	<1	<1
Cobalt	µg/L	2	-	-	3.8	10	<2	<2	<2	<2	<2
Copper	µg/L	1	2000	1000	2000	20	<1	<1	<1	<1	<1
Iron	µg/L	2	-	≤ 300	300	3000	<2	<2	4	48	19
Lead	µg/L	1	5	-	5	10	<1	<1	<1	<1	<1
Manganese	µg/L	2	120	20	120	4300	***22***	17	<2	***195***	<2
Mercury	µg/L	0.02	1	-	1	0.26	<0.2	<0.2	<0.2	<0.2	<0.2
Molybdenum	µg/L	5	-	-	70	730	10	7	<5	<5	<5
Nickel	µg/L	2	-	-	100	250	<2	<2	<2	<2	<2
Selenium	µg/L	1	50	-	50	10	<1	<1	<1	<1	<1
Silver	µg/L	0.1	-	-	-	2.5	<0.1	<0.1	<0.1	<0.1	<0.1
Strontium	µg/L	10	7000	-	2400	210000	18	14	18	11	89
Thallium[8]	µg/L	0.50	-	-	2	8	<0.5	<0.5	<0.5	<0.5	<0.5
Tin	µg/L	1	-	-	2400	-	<1	<1	<1	<1	<1
Uranium[8]	µg/L	0.5	20	-	20	150	1.6	<0.5	1.4	1.1	0.9
Vanadium	µg/L	10	-	-	6.2*	1200	<10	<10	<10	<10	<10
Zinc	µg/L	2	-	≤ 5000	5000	70	<2	<2	15	30	10

Collection of samples and analysis provided by
Saint John Laboratory Services Ltd.

Notes:

1. MDL = Method Detection Limit
2. Guidelines for Canadian Drinking Water Quality (GCDWQ) (Health Canada
3. Maximum Allowable Concentration (MAC).
4. Aesthetic Objective (AO) / Operational Guideline (OG).
5. Atlantic Risk-Based Corrective Action Tier I Environmental Quality Standards (EQS) for an industrial, potable site with coarse-grained soil
6. HH = Human Health
7. Eco = Ecological (> 10m from a freshwater surface water body)
8. Analysis conducted by RPC in Fredericton, NB

Results that exceed the AO/OG are bold and italic
Results that exceed the MAC are red font and bolded
Results that exceed the Atlantic RBCA Tier I EQS guidelines (Human Health) are underlined
Results that exceed the Atlantic RBCA Tier I EQS guidelines (Ecological) are shaded

Appendix C1-4: Trace Metals, Monitoring Wells (less than 10m from a surface water body)

Sample Stat	Units	MDL[1]	GCDWQ[2]		Atlantic RBCA[5]		MW36L	MW36L	MW36S	MW36S	MW36U	MW36U DUP	MW36U	MW36U DUP	MW37S
Date:			MAC[3]	AO/OG[4]	HH[6]	Eco[7]	2022/04/11	2022/09/15	2022/04/11	2022/09/15	2022/04/11	2022/04/11	2022/09/15	2022/09/15	2022/04/11
Aluminium	µg/L	5	2900	<100	100	5	50	9	***832***	***111***	79	80	54	24	<5
Antimony	µg/L	2	6	-	6	9	<2	<2	<2	<2	<2	<2	<2	<2	<2
Arsenic	µg/L	1	10	-	10	5	8	9	1	1	1	1	<1	<1	<1
Barium	µg/L	10	2000	-	1000	1000	14	18	13	22	14	12	12	14	15
Beryllium	µg/L	1	-	-	4	0.15*	<1	<1	<1	<1	<1	<1	<1	<1	<1
Bismuth	µg/L	1	-	-	-	-	<1	<1	<1	<1	<1	<1	<1	<1	<1
Boron	µg/L	100	5000	-	5000	1500	437	433	<100	<100	273	271	268	271	<100
Cadmium	µg/L	0.02	7	-	5	0.09	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Chromium	µg/L	1	50	-	50	8.9	<1	<1	<1	<1	<1	<1	<1	<1	<1
Cobalt	µg/L	2	-	-	3.8	1*	<2	<2	<2	<2	<2	<2	<2	<2	<2
Copper	µg/L	1	2000	1000	2000	2	1	<1	7	5	<1	<1	<1	<1	<1
Iron	µg/L	2	-	≤ 300	300	300	7	2	***1003***	239	27	24	42	11	<2
Lead	µg/L	1	5	-	5	1	<1	<1	1	<1	<1	<1	<1	<1	<1
Manganese	µg/L	2	120	20	120	430	8	<2	***674***	***4495***	11	8	18	4	7
Mercury	µg/L	0.02	1	-	1	0.026*	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Molybdenum	µg/L	5	-	-	70	73	13	12	<5	<5	6	5	<5	<5	<5
Nickel	µg/L	2	-	-	100	25	<2	<2	<2	<2	<2	<2	<2	<2	<2
Selenium	µg/L	1	50	-	50	1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Silver	µg/L	0.1	-	-	-	0.25	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Strontium	µg/L	10	7000	-	2400	21000	44	49	24	69	39	35	42	42	97
Thallium[8]	µg/L	0.50	-	-	2	0.8	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Tin	µg/L	1	-	-	2400	-	<1	<1	<1	<1	<1	<1	<1	<1	<1
Uranium[8]	µg/L	0.5	20	-	20	15	***28.0***	2.0	0.9	<0.5	6.4	6.2	<0.5	<0.5	<0.5
Vanadium	µg/L	10	-	-	6.2*	120	<10	<10	<10	<10	<10	<10	<10	<10	<10
Zinc	µg/L	2	-	≤ 5000	5000	7	<2	<2	14	<2	<2	<2	<2	<2	<2

Collection of samples and analysis provided
Saint John Laboratory Services Ltd.

Notes:

1. MDL = Method Detection Limit
2. Guidelines for Canadian Drinking Water Quality (GCDWQ) (Health Canada, Sept. 2022).
3. Maximum Allowable Concentration (MAC).
4. Aesthetic Objective (AO) / Operational Guideline (OG).
5. Atlantic Risk-Based Corrective Action Tier I Environmental Quality Standards (EQS) for an industrial, potable site with coarse-grained soil
6. HH = Human Health
7. Eco = Ecological (< 10m from a freshwater surface water body)
8. Analysis conducted by RPC in Fredericton, NB

DUP = Field Duplicate
"-" = None established/ not measured.

Results that exceed the AO/OG are bold and italic
Results that exceed the MAC are red font and bolded
Results that exceed the Atlantic RBCA Tier I EQS guidelines (Human Health) are underlined
Results that exceed the Atlantic RBCA Tier I EQS guidelines (Ecological) are shaded

Appendix C1-4: Trace Metals, Monitoring Wells (less than 10m from a surface

Sample Stat	Units	MDL[1]	GCDWQ[2]		Atlantic RBCA[5]		MW37S	MW38L	MW38L	MW38S	MW38S	MW38U	MW38U
Date:			MAC[3]	AO/OG[4]	HH[6]	Eco[7]	2022/09/15	2022/04/11	2022/09/15	2022/04/11	2022/09/15	2022/04/11	2022/09/15
Aluminium	µg/L	5	2900	<100	100	5	<5	9	6	<5	<5	<5	<5
Antimony	µg/L	2	6	-	6	9	<2	<2	<2	<2	<2	<2	<2
Arsenic	µg/L	1	10	-	10	5	<1	1	1	4	4	1	5
Barium	µg/L	10	2000	-	1000	1000	18	24	28	32	33	14	39
Beryllium	µg/L	1	-	-	4	0.15*	<1	<1	<1	<1	<1	<1	<1
Bismuth	µg/L	1	-	-	-	-	<1	<1	<1	<1	<1	<1	<1
Boron	µg/L	100	5000	-	5000	1500	<100	<100	<100	<100	<100	<100	<100
Cadmium	µg/L	0.02	7	-	5	0.09	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Chromium	µg/L	1	50	-	50	8.9	<1	<1	<1	<1	<1	<1	<1
Cobalt	µg/L	2	-	-	3.8	1*	<2	<2	<2	<2	<2	<2	<2
Copper	µg/L	1	2000	1000	2000	2	<1	<1	<1	<1	<1	<1	<1
Iron	µg/L	2	-	≤ 300	300	300	<2	<2	<2	<2	<2	<2	<2
Lead	µg/L	1	5	-	5	1	<1	<1	<1	<1	<1	<1	<1
Manganese	µg/L	2	120	20	120	430	3	6	2	2	2	***181***	3
Mercury	µg/L	0.02	1	-	1	0.026*	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Molybdenum	µg/L	5	-	-	70	73	<5	17	13	<5	<5	<5	<5
Nickel	µg/L	2	-	-	100	25	<2	<2	<2	<2	<2	<2	<2
Selenium	µg/L	1	50	-	50	1	<1	<1	<1	<1	<1	<1	<1
Silver	µg/L	0.1	-	-	-	0.25	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Strontium	µg/L	10	7000	-	2400	21000	116	85	96	137	140	129	146
Thallium[8]	µg/L	0.50	-	-	2	0.8	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Tin	µg/L	1	-	-	2400	-	<1	<1	<1	<1	<1	<1	<1
Uranium[8]	µg/L	0.5	20	-	20	15	<0.5	<0.5	<0.5	3.6	3.7	0.7	2.4
Vanadium	µg/L	10	-	-	6.2*	120	<10	<10	<10	<10	<10	<10	<10
Zinc	µg/L	2	-	≤ 5000	5000	7	<2	<2	<2	<2	<2	<2	<2

Collection of samples and analysis provided
Saint John Laboratory Services Ltd.

Notes:

1. MDL = Method Detection Limit
2. Guidelines for Canadian Drinking Water Quality (GCDWQ) (Health Canada, Sep
3. Maximum Allowable Concentration (MAC).
4. Aesthetic Objective (AO) / Operational Guideline (OG).
5. Atlantic Risk-Based Corrective Action Tier I Environmental Quality Standards (E for an industrial, potable site with coarse-grained soil
6. HH = Human Health
7. Eco = Ecological (< 10m from a freshwater surface water body)
8. Analysis conducted by RPC in Fredericton, NB

DUP = Field Duplicate
"-" = None established/ not measured.

Results that exceed the AO/OG are bold and italic
Results that exceed the MAC are red font and bolded
Results that exceed the Atlantic RBCA Tier I EQS guidelines (Human Health) are
Results that exceed the Atlantic RBCA Tier I EQS guidelines (Ecological) are shad

Appendix C1-5: Petroleum Hydrocarbons, Monitoring Wells

Sample Station:	Units	MDL[1]	RBCA[2]	MW31L	MW31L	MW31S	MW31S	MW31U	MW31U DUP	MW31U	MW31U DUP	MW32U1	MW32U1
Date:				2022/04/11	2022/09/15	2022/04/11	2022/09/15	2022/04/11	2022/04/11	2022/09/15	2022/09/15	2022/04/11	2022/09/15
Benzene	µg/L	1	5	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Toluene	µg/L	1	24.0	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Ethylbenzene	µg/L	1	1.6	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Xylenes	µg/L	1	20	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
TPH C6-C10 Range	µg/L	5	-	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
TPH C10-C21 Range	µg/L	10	-	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
TPH C21-C32 Range	µg/L	10	-	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Modified TPH	µg/L	10	3200	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10

Collection of samples and analysis provided by Saint John Laboratory Services Ltd.

Notes:

1. MDL = Method Detection Limit
2. Atlantic Risk-Based Corrective Action Tier I Environmental Quality Standards (EQS) for an industrial, potable site with coarse-grained soil (July, 2022)

DUP = Field Duplicate

"-" = None established/ not measured.

"*" = Guideline less than reporting limit

Results that exceed the Atlantic RBCA Tier I EQS guidelines (Ecological) are shaded

Appendix C1-5: Petroleum Hydrocarbons, Monitoring Wells

Sample Station:	Units	MDL[1]	RBCA[2]	MW32U2	MW32U2	MW33S	MW33S	MW33U	MW33U DUP	MW33U	MW33U DUP	MW34S	MW34S
Date:				2022/04/11	2022/09/15	2022/04/11	2022/09/15	2022/04/11	2022/04/11	2022/09/15	2022/09/15	2022/04/11	2022/09/15
Benzene	µg/L	1	5	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Toluene	µg/L	1	24.0	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Ethylbenzene	µg/L	1	1.6	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Xylenes	µg/L	1	20	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
TPH C6-C10 Range	µg/L	5	-	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
TPH C10-C21 Range	µg/L	10	-	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
TPH C21-C32 Range	µg/L	10	-	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Modified TPH	µg/L	10	3200	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10

Collection of samples and analysis provided by Saint John Laboratory Services Ltd.

Notes:

1. MDL = Method Detection Limit
2. Atlantic Risk-Based Corrective Action Tier I Environmental Quality Standards (EQS) for an industrial, potable site with coarse-grained soil (July, 2022)

DUP = Field Duplicate
"-" = None established/ not measured.
"*" = Guideline less than reporting limit

Results that exceed the Atlantic RBCA Tier I EQS guidelines (Ecological) are shaded

Appendix C1-5: Petroleum Hydrocarbons, Monitoring Wells

Sample Station:	Units	MDL[1]	RBCA[2]	MW34U	MW34U	MW35L	MW35L	MW35S1	MW35S1	MW35S2	MW35S2	MW36L	MW36L
Date:				2022/04/11	2022/09/15	2022/04/11	2022/09/15	2022/04/11	2022/09/15	2022/04/11	2022/09/15	2022/04/11	2022/09/15
Benzene	µg/L	1	5	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Toluene	µg/L	1	24.0	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Ethylbenzene	µg/L	1	1.6	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Xylenes	µg/L	1	20	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
TPH C6-C10 Range	µg/L	5	-	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
TPH C10-C21 Range	µg/L	10	-	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
TPH C21-C32 Range	µg/L	10	-	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Modified TPH	µg/L	10	3200	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10

Collection of samples and analysis provided by Saint John Laboratory Services Ltd.

Notes:

1. MDL = Method Detection Limit
2. Atlantic Risk-Based Corrective Action Tier I Environmental Quality Standards (EQS) for an industrial, potable site with coarse-grained soil (July, 2022)

DUP = Field Duplicate
"-" = None established/ not measured.
"*" = Guideline less than reporting limit

Results that exceed the Atlantic RBCA Tier I EQS guidelines (Ecological) are shaded

Appendix C1-5: Petroleum Hydrocarbons, Monitoring Wells

Sample Station:	Units	MDL[1]	RBCA[2]	MW36S	MW36S	MW36U	MW36U DUP	MW36U	MW36U DUP	MW37S	MW37S	MW38L	MW38L
Date:				2022/04/11	2022/09/15	2022/04/11	2022/04/11	2022/09/15	2022/09/15	2022/04/11	2022/09/15	2022/04/11	2022/09/15
Benzene	µg/L	1	5	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Toluene	µg/L	1	24.0	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Ethylbenzene	µg/L	1	1.6	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Xylenes	µg/L	1	20	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
TPH C6-C10 Range	µg/L	5	-	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
TPH C10-C21 Range	µg/L	10	-	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
TPH C21-C32 Range	µg/L	10	-	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Modified TPH	µg/L	10	3200	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10

Collection of samples and analysis provided by Saint John Laboratory Services Ltd.

Notes:

1. MDL = Method Detection Limit
2. Atlantic Risk-Based Corrective Action Tier I Environmental Quality Standards (EQS) for an industrial, potable site with coarse-grained soil (July, 2022)

DUP = Field Duplicate

"-" = None established/ not measured.

"*" = Guideline less than reporting limit

Results that exceed the Atlantic RBCA Tier I EQS guidelines (Ecological) are shaded

Appendix C1-5: Petroleum Hydrocarbons, Monitoring Wells

Sample Station:	Units	MDL[1]	RBCA[2]	MW38S	MW38S	MW38U	MW38U	MW40S	MW40S	MW40U	MW40U	MW41L	MW41L
Date:				2022/04/11	2022/09/15	2022/04/11	2022/09/15	2022/04/25	2022/09/22	2022/04/25	2022/09/22	2022/04/25	2022/09/22
Benzene	µg/L	1	5	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Toluene	µg/L	1	24.0	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Ethylbenzene	µg/L	1	1.6	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Xylenes	µg/L	1	20	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
TPH C6-C10 Range	µg/L	5	-	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
TPH C10-C21 Range	µg/L	10	-	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
TPH C21-C32 Range	µg/L	10	-	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Modified TPH	µg/L	10	3200	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10

Collection of samples and analysis provided by Saint John Laboratory Services Ltd.

Notes:

1. MDL = Method Detection Limit
2. Atlantic Risk-Based Corrective Action Tier I Environmental Quality Standards (EQS) for an industrial, potable site with coarse-grained soil (July, 2022)

DUP = Field Duplicate
"-" = None established/ not measured.
"*" = Guideline less than reporting limit

Results that exceed the Atlantic RBCA Tier I EQS guidelines (Ecological) are shaded

Appendix C1-5: Petroleum Hydrocarbons, Monitoring Wells

Sample Station:	Units	MDL[1]	RBCA[2]	MW41S	MW41S	MW41U	MW41U DUP	MW41U	MW41U DUP	MW42L	MW42L	MW42S	MW42S
Date:				2022/04/25	2022/09/22	2022/04/25	2022/04/25	2022/09/22	2022/09/22	2022/04/25	2022/09/22	2022/04/25	2022/09/22
Benzene	µg/L	1	5	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Toluene	µg/L	1	24.0	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Ethylbenzene	µg/L	1	1.6	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Xylenes	µg/L	1	20	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
TPH C6-C10 Range	µg/L	5	-	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
TPH C10-C21 Range	µg/L	10	-	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
TPH C21-C32 Range	µg/L	10	-	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Modified TPH	µg/L	10	3200	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10

Collection of samples and analysis provided by Saint John Laboratory Services Ltd.

Notes:

1. MDL = Method Detection Limit
2. Atlantic Risk-Based Corrective Action Tier I Environmental Quality Standards (EQS) for an industrial, potable site with coarse-grained soil (July, 2022)

DUP = Field Duplicate

"-" = None established/ not measured.

"*" = Guideline less than reporting limit

Results that exceed the Atlantic RBCA Tier I EQS guidelines (Ecological) are shaded

Appendix C1-5: Petroleum Hydrocarbons, Monitoring Wells

Sample Station:	Units	MDL[1]	RBCA[2]	MW42U	MW42U	MW43S	MW43S	MW43U	MW43U	MW44S	MW44S	MW44U	MW44U DUP
Date:				2022/04/25	2022/09/22	2022/04/11	2022/09/15	2022/04/11	2022/09/15	2022/04/11	2022/09/15	2022/04/11	2022/04/11
Benzene	µg/L	1	5	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Toluene	µg/L	1	24.0	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Ethylbenzene	µg/L	1	1.6	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Xylenes	µg/L	1	20	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
TPH C6-C10 Range	µg/L	5	-	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
TPH C10-C21 Range	µg/L	10	-	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
TPH C21-C32 Range	µg/L	10	-	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Modified TPH	µg/L	10	3200	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10

Collection of samples and analysis provided by Saint John Laboratory Services Ltd.

Notes:

1. MDL = Method Detection Limit
2. Atlantic Risk-Based Corrective Action Tier I Environmental Quality Standards (EQS) for an industrial, potable site with coarse-grained soil (July, 2022)

DUP = Field Duplicate
"-" = None established/ not measured.
"*" = Guideline less than reporting limit

Results that exceed the Atlantic RBCA Tier I EQS guidelines (Ecological) are shaded

Appendix C1-5: Petroleum Hydrocarbons, Monitoring Wells

Sample Station:	Units	MDL[1]	RBCA[2]	MW44U	MW44U DUP	MW45L	MW45L	MW45U	MW45U	MW46L	MW46L	MW48L	MW48L
Date:				2022/09/15	2022/09/15	2022/04/11	2022/09/15	2022/04/11	2022/09/15	2022/04/25	2022/09/22	2022/04/25	2022/09/15
Benzene	µg/L	1	5	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Toluene	µg/L	1	24.0	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Ethylbenzene	µg/L	1	1.6	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Xylenes	µg/L	1	20	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
TPH C6-C10 Range	µg/L	5	-	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
TPH C10-C21 Range	µg/L	10	-	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
TPH C21-C32 Range	µg/L	10	-	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Modified TPH	µg/L	10	3200	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10

Collection of samples and analysis provided by Saint John Laboratory Services Ltd.

Notes:

1. MDL = Method Detection Limit
2. Atlantic Risk-Based Corrective Action Tier I Environmental Quality Standards (EQS) for an industrial, potable site with coarse-grained soil (July, 2022)

DUP = Field Duplicate

"-" = None established/ not measured.

"*" = Guideline less than reporting limit

Results that exceed the Atlantic RBCA Tier I EQS guidelines (Ecological) are shaded

Appendix C1-5: Petroleum Hydrocarbons, Monitoring Wells

Sample Station:	Units	MDL[1]	RBCA[2]	MW48S	MW48S	MW48U	MW48U	MW49L	MW49L	MW49S	MW49S	MW49U	MW49U
Date:				2022/04/25	2022/09/15	2022/04/25	2022/09/15	2022/04/25	2022/09/22	2022/04/25	2022/09/22	2022/04/25	2022/09/22
Benzene	µg/L	1	5	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Toluene	µg/L	1	24.0	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Ethylbenzene	µg/L	1	1.6	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Xylenes	µg/L	1	20	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
TPH C6-C10 Range	µg/L	5	-	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
TPH C10-C21 Range	µg/L	10	-	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
TPH C21-C32 Range	µg/L	10	-	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Modified TPH	µg/L	10	3200	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10

Collection of samples and analysis provided by Saint John Laboratory Services Ltd.

Notes:

1. MDL = Method Detection Limit
2. Atlantic Risk-Based Corrective Action Tier I Environmental Quality Standards (EQS) for an industrial, potable site with coarse-grained soil (July, 2022)

DUP = Field Duplicate

"-" = None established/ not measured.

"*" = Guideline less than reporting limit

Results that exceed the Atlantic RBCA Tier I EQS guidelines (Ecological) are shaded

Appendix C1-5: Petroleum Hydrocarbons, Monitoring Wells

Sample Station:	Units	MDL[1]	RBCA[2]	MW50L	MW50L	MW50S	MW50S	MW51D	MW51D	MW51D	MW51S1	MW51S1	MW51S1
Date:				2022/04/11	2022/09/15	2022/04/11	2022/09/15	2022/04/11	2022/07/21	2022/09/15	2022/04/11	2022/07/21	2022/09/15
Benzene	µg/L	1	5	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Toluene	µg/L	1	24.0	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Ethylbenzene	µg/L	1	1.6	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Xylenes	µg/L	1	20	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
TPH C6-C10 Range	µg/L	5	-	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
TPH C10-C21 Range	µg/L	10	-	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
TPH C21-C32 Range	µg/L	10	-	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Modified TPH	µg/L	10	3200	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10

Collection of samples and analysis provided by Saint John Laboratory Services Ltd.

Notes:

1. MDL = Method Detection Limit
2. Atlantic Risk-Based Corrective Action Tier I Environmental Quality Standards (EQS) for an industrial, potable site with coarse-grained soil (July, 2022)

DUP = Field Duplicate

"-" = None established/ not measured.

"*" = Guideline less than reporting limit

Results that exceed the Atlantic RBCA Tier I EQS guidelines (Ecological) are shaded

Appendix C1-5: Petroleum Hydrocarbons, Monitoring Wells

Sample Station:	Units	MDL[1]	RBCA[2]	MW51S2	MW51S2	MW51S2	MW52D	MW52D	MW52D	MW52S	MW52S	MW52S	MW53D
Date:				2022/04/11	2022/07/21	2022/09/15	2022/04/11	2022/07/21	2022/09/15	2022/04/11	2022/07/21	2022/09/15	2022/04/11
Benzene	µg/L	1	5	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Toluene	µg/L	1	24.0	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Ethylbenzene	µg/L	1	1.6	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Xylenes	µg/L	1	20	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
TPH C6-C10 Range	µg/L	5	-	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
TPH C10-C21 Range	µg/L	10	-	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
TPH C21-C32 Range	µg/L	10	-	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Modified TPH	µg/L	10	3200	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10

Collection of samples and analysis provided by Saint John Laboratory Services Ltd.

Notes:

1. MDL = Method Detection Limit
2. Atlantic Risk-Based Corrective Action Tier I Environmental Quality Standards (EQS) for an industrial, potable site with coarse-grained soil (July, 2022)

DUP = Field Duplicate

"-" = None established/ not measured.

"*" = Guideline less than reporting limit

Results that exceed the Atlantic RBCA Tier I EQS guidelines (Ecological) are shaded

Appendix C1-5: Petroleum Hydrocarbons, Monitoring Wells

Sample Station:	Units	MDL[1]	RBCA[2]	MW53D	MW53D	MW54S	MW54S	MW54S	MW54U	MW54U DUP	MW54U	MW54U DUP	MW54U
Date:				2022/07/21	2022/09/15	2022/04/11	2022/07/21	2022/09/15	2022/04/11	2022/04/11	2022/07/21	2022/07/21	2022/09/15
Benzene	µg/L	1	5	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Toluene	µg/L	1	24.0	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Ethylbenzene	µg/L	1	1.6	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Xylenes	µg/L	1	20	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
TPH C6-C10 Range	µg/L	5	-	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
TPH C10-C21 Range	µg/L	10	-	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
TPH C21-C32 Range	µg/L	10	-	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Modified TPH	µg/L	10	3200	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10

Collection of samples and analysis provided by Saint John Laboratory Services Ltd.

Notes:

1. MDL = Method Detection Limit
2. Atlantic Risk-Based Corrective Action Tier I Environmental Quality Standards (EQS) for an industrial, potable site with coarse-grained soil (July, 2022)

DUP = Field Duplicate

"-" = None established/ not measured.

"*" = Guideline less than reporting limit

Results that exceed the Atlantic RBCA Tier I EQS guidelines (Ecological) are shaded

Appendix C1-5: Petroleum Hydrocarbons, Monitoring Wells

Sample Station:	Units	MDL[1]	RBCA[2]	MW54U DUP	MW55S	MW55S	MW55S	MW56S	MW56S	MW56S	MW57S	MW57D
Date:				2022/09/15	2022/04/11	2022/07/21	2022/09/15	2022/04/11	2022/07/21	2022/09/15	2022/09/22	2022/09/22
Benzene	µg/L	1	5	<1	<1	<1	<1	<1	<1	<1	<1	<1
Toluene	µg/L	1	24.0	<1	<1	<1	<1	<1	<1	<1	<1	<1
Ethylbenzene	µg/L	1	1.6	<1	<1	<1	<1	<1	<1	<1	<1	<1
Xylenes	µg/L	1	20	<1	<1	<1	<1	<1	<1	<1	<1	<1
TPH C6-C10 Range	µg/L	5	-	<5	<5	<5	<5	<5	<5	<5	<5	<5
TPH C10-C21 Range	µg/L	10	-	<10	<10	<10	<10	<10	<10	<10	<10	<10
TPH C21-C32 Range	µg/L	10	-	<10	<10	<10	<10	<10	<10	<10	<10	<10
Modified TPH	µg/L	10	3200	<10	<10	<10	<10	<10	<10	<10	<10	<10

Collection of samples and analysis provided by Saint John Laboratory Services Ltd.

Notes:

1. MDL = Method Detection Limit
2. Atlantic Risk-Based Corrective Action Tier I Environmental Quality Standards (EQS) for an industrial, potable site with coarse-grained soil (July, 2022)

DUP = Field Duplicate

"-" = None established/ not measured.

"*" = Guideline less than reporting limit

Results that exceed the Atlantic RBCA Tier I EQS guidelines (Ecological) are shaded

Appendix C1-6: Field Data, Monitoring Wells

Sample Station	Units	GCDWQ[1,2]	MW31L	MW31L	MW31S	MW31S	MW31U	MW31U DUP	MW31U	MW31U DUP	MW32U1	MW32U1
Date:			2022/04/11	2022/09/15	2022/04/11	2022/09/15	2022/04/11	2022/04/11	2022/09/15	2022/09/15	2022/04/11	2022/09/15
pH	-	7.0 - 10.5	7.9	8.38	***6.6***	7.13	7.7	7.7	7.19	7.19	8.2	7.65
Temperature	°C	15	10.6	***18.6***	11.2	***16.3***	10.7	10.5	***16.9***	***16.9***	10.3	***16.0***
Conductivity	μS/cm	-	159	168	34	177	145	145	524	524	447	533
Dissolved Oxygen	mg/L	-	3.5	4.49	5.11	4.02	6.4	6.33	4.13	4.13	4.63	5.15

Collection of samples and measurement provided by Saint John Laboratory Services Ltd.

Notes:

1. Guidelines for Canadian Drinking Water Quality (GCDWQ) (Health Canada, Sept. 2022).
2. Aesthetic Objective (AO) / Operational Guideline (OG).

DUP = Field Duplicate

"-" = None established/ not measured.

Results that exceed the AO/OG are bold and italic

Appendix C1-6: Field Data, Monitoring Wells

Sample Station	Units	GCDWQ[1,2]	MW32U2	MW32U2	MW33S	MW33S	MW33U	MW33U DUP	MW33U	MW33U DUP	MW33U	MW33U DUP
Date:			2022/04/11	2022/09/15	2022/04/11	2022/09/15	2022/03/07	2022/03/07	2022/04/11	2022/04/11	2022/07/21	2022/07/21
pH	-	7.0 - 10.5	8.2	7.32	7.8	7.05	8.2	8.2	8.0	8.0	7.68	7.68
Temperature	°C	15	10.3	***16.4***	11.3	***15.9***	9.5	9.5	10.8	10.8	***18.9***	***18.9***
Conductivity	µS/cm	-	895	741	243	292	197	196	212	212	214	214
Dissolved Oxygen	mg/L	-	4.39	3.02	7.26	4.63	6.21	6.22	6.07	6.19	4.86	4.81

Collection of samples and measurement provided by Saint John Laboratory Services Ltd.

Notes:

1. Guidelines for Canadian Drinking Water Quality (GCDWQ) (Health Canada, Sept. 2022).
2. Aesthetic Objective (AO) / Operational Guideline (OG).

DUP = Field Duplicate

"-" = None established/ not measured.

Results that exceed the AO/OG are bold and italic

Appendix C1-6: Field Data, Monitoring Wells

Sample Station	Units	GCDWQ[1,2]	MW33U	MW33U DUP	MW33U	MW33U DUP	MW34S	MW34S	MW34S	MW34S	MW34S	MW34U
Date:			2022/09/15	2022/09/15	2022/11/24	2022/11/24	2022/03/07	2022/04/11	2022/07/21	2022/09/15	2022/11/24	2022/03/07
pH	-	7.0 - 10.5	7.57	7.57	8.1	8.1	7.9	8.1	8.08	7.26	7.2	7.9
Temperature	°C	15	***15.8***	***15.8***	5.2	5.2	7	11.6	***20.1***	***16.6***	4.9	8.9
Conductivity	µS/cm	-	298	298	210	208	350	442	555	527	369	306
Dissolved Oxygen	mg/L	-	3.97	3.97	3.36	3.41	4.81	4.96	2.73	4.79	4.52	4.68

Collection of samples and measurement provided by Saint John Laboratory Services Ltd.

Notes:

1. Guidelines for Canadian Drinking Water Quality (GCDWQ) (Health Canada, Sept. 2022).
2. Aesthetic Objective (AO) / Operational Guideline (OG).

DUP = Field Duplicate

"-" = None established/ not measured.

Results that exceed the AO/OG are bold and italic

Appendix C1-6: Field Data, Monitoring Wells

Sample Station	Units	GCDWQ[1,2]	MW34U	MW34U	MW34U	MW34U	MW35L	MW35L	MW35L	MW35L	MW35L	MW35S1
Date:			**2022/04/11**	**2022/07/21**	**2022/09/15**	**2022/11/24**	**2022/03/07**	**2022/04/11**	**2022/07/21**	**2022/09/15**	**2022/11/24**	**2022/04/11**
pH	**-**	7.0 - 10.5	8.0	8.3	7.80	7.9	8.0	8.0	8.2	7.88	7.9	8.2
Temperature	**°C**	15	11.4	***19.2***	***16.4***	5.1	9.1	9.4	***17.3***	***16.8***	5.6	10.3
Conductivity	**µS/cm**	-	343	330	343	312	203	239	228	274	229	305
Dissolved Oxygen	**mg/L**	-	5.11	4.88	3.92	3.57	4.02	3.59	3.84	3.12	2.24	5.77

Collection of samples and measurement provided by Saint John Laboratory Services Ltd.

Notes:

1. Guidelines for Canadian Drinking Water Quality (GCDWQ) (Health Canada, Sept. 2022).
2. Aesthetic Objective (AO) / Operational Guideline (OG).

DUP = Field Duplicate

"-" = None established/ not measured.

Results that exceed the AO/OG are bold and italic

Appendix C1-6: Field Data, Monitoring Wells

Sample Station	Units	GCDWQ[1,2]	MW35S1	MW35S2	MW35S2	MW35S2	MW35S2	MW35S2	MW36L	MW36L	MW36S	MW36S
Date:			2022/09/15	2022/03/07	2022/04/11	2022/07/21	2022/09/15	2022/11/24	2022/04/11	2022/09/15	2022/04/11	2022/09/15
pH	-	7.0 - 10.5	7.94	7.9	8.0	8.2	7.95	8.1	8.1	7.85	7.4	***6.70***
Temperature	°C	15	***17.2***	9.3	10.9	***16.1***	***17.0***	4.4	8.8	**16.3**	9.5	***17.2***
Conductivity	µS/cm	-	311	225	258	254	294	255	329	319	82	238
Dissolved Oxygen	mg/L	-	2.86	5.45	5.78	3.05	3.15	3.41	4.03	5.14	2.9	2.18

Collection of samples and measurement provided by Saint John Laboratory Services Ltd.

Notes:

1. Guidelines for Canadian Drinking Water Quality (GCDWQ) (Health Canada, Sept. 2022).
2. Aesthetic Objective (AO) / Operational Guideline (OG).

DUP = Field Duplicate

"-" = None established/ not measured.

Results that exceed the AO/OG are bold and italic

Appendix C1-6: Field Data, Monitoring Wells

Sample Station	Units	GCDWQ[1,2]	MW36U	MW36U DUP	MW36U	MW36U DUP	MW37S	MW37S	MW38L	MW38L	MW38S	MW38S
Date:			2022/04/11	2022/04/11	2022/09/15	2022/09/15	2022/04/11	2022/09/15	2022/04/11	2022/09/15	2022/04/11	2022/09/15
pH	-	7.0 - 10.5	8.1	8.1	7.74	7.74	8.0	7.18	8.2	7.80	8.1	7.60
Temperature	°C	15	9.2	9	***16.7***	***16.7***	9.8	***16.4***	10.1	***16.1***	9.7	***16.0***
Conductivity	µS/cm	-	192	192	192	196	369	369	291	285	414	411
Dissolved Oxygen	mg/L	-	4.89	5.03	2.7	2.7	7.8	5.86	6.64	4.59	3.86	3.93

Collection of samples and measurement provided by Saint John Laboratory Services Ltd.

Notes:

1. Guidelines for Canadian Drinking Water Quality (GCDWQ) (Health Canada, Sept. 2022).
2. Aesthetic Objective (AO) / Operational Guideline (OG).

DUP = Field Duplicate

"-" = None established/ not measured.

Results that exceed the AO/OG are bold and italic

Appendix C1-6: Field Data, Monitoring Wells

Sample Station	Units	GCDWQ[1,2]	MW38U	MW38U	MW38U	MW38U	MW38U	MW40S	MW40S	MW40U	MW40U	MW41L
Date:			2022/03/07	2022/04/11	2022/07/21	2022/09/15	2022/11/24	2022/04/25	2022/09/22	2022/04/25	2022/09/22	2022/04/25
pH	-	7.0 - 10.5	7.8	8.2	8.2	7.78	7.9	8.0	8.52	8.0	8.24	7.9
Temperature	°C	15	9.4	11.4	***19.2***	***16.1***	4.0	10.5	***16.9***	11.2	***17.9***	10.7
Conductivity	µS/cm	-	375	412	425	423	414	268	205	209	256	244
Dissolved Oxygen	mg/L	-	3.72	4.3	3.09	3.47	3.7	6.76	4.96	2.64	6.06	3.16

Collection of samples and measurement provided by Saint John Laboratory Services Ltd.

Notes:

1. Guidelines for Canadian Drinking Water Quality (GCDWQ) (Health Canada, Sept. 2022).
2. Aesthetic Objective (AO) / Operational Guideline (OG).

DUP = Field Duplicate

"-" = None established/ not measured.

Results that exceed the AO/OG are bold and italic

Appendix C1-6: Field Data, Monitoring Wells

Sample Station	Units	GCDWQ[1,2]	MW41L	MW41S	MW41S	MW41S	MW41S	MW41S	MW41U	MW41U	MW41U DUP	MW41U
Date:			2022/09/22	2022/03/07	2022/04/25	2022/07/21	2022/09/22	2022/11/24	2022/03/07	2022/04/25	2022/04/25	2022/07/21
pH	-	7.0 - 10.5	8.39	-	***5.4***	***5.8***	***6.5***	***6.2***	-	7.9	7.9	8.1
Temperature	°C	15	***18.2***	-	9.8	***20.3***	***17.3***	3.8	-	9.7	9.9	***18.4***
Conductivity	µS/cm	-	227	-	37	34	43	40	-	243	243	244
Dissolved Oxygen	mg/L	-	4.66	-	7.18	3.77	5.33	7.37	-	3.89	3.54	2.40

Collection of samples and measurement provided by Saint John Laboratory Services Ltd.

Notes:

1. Guidelines for Canadian Drinking Water Quality (GCDWQ) (Health Canada, Sept. 2022).
2. Aesthetic Objective (AO) / Operational Guideline (OG).

DUP = Field Duplicate

"-" = None established/ not measured.

Results that exceed the AO/OG are bold and italic

Appendix C1-6: Field Data, Monitoring Wells

Sample Station	**Units**	**GCDWQ[1,2]**	**MW41U DUP**	**MW41U**	**MW41U DUP**	**MW41U**	**MW42L**	**MW42L**	**MW42S**	**MW42S**	**MW42U**	**MW42U**
Date:			**2022/07/21**	**2022/09/22**	**2022/09/22**	**2022/11/24**	**2022/04/25**	**2022/09/22**	**2022/04/25**	**2022/09/22**	**2022/04/25**	**2022/09/22**
pH	**-**	7.0 - 10.5	8.1	7.95	7.95	7.6	8.0	8.16	7.9	7.01	8.0	7.43
Temperature	**°C**	15	***18.5***	***18.1***	***18.1***	4.0	9.9	***17.6***	8.6	***18.3***	9.5	***17.7***
Conductivity	**μS/cm**	-	244	234	234	230	235	230	253	258	241	224
Dissolved Oxygen	**mg/L**	-	2.51	5.38	5.38	3.34	3.71	4.53	5.53	4.1	4.13	5.07

Collection of samples and measurement provided by Saint John Laboratory Services Ltd.

Notes:

1. Guidelines for Canadian Drinking Water Quality (GCDWQ) (Health Canada, Sept. 2022).
2. Aesthetic Objective (AO) / Operational Guideline (OG).

DUP = Field Duplicate

"-" = None established/ not measured.

Results that exceed the AO/OG are bold and italic

Appendix C1-6: Field Data, Monitoring Wells

Sample Station	Units	GCDWQ[1,2]	MW43S	MW43S	MW43U	MW43U	MW44S	MW44S	MW44U	MW44U DUP	MW44U	MW44U DUP
Date:			2022/04/11	2022/09/15	2022/04/11	2022/09/15	2022/04/11	2022/09/15	2022/04/11	2022/04/11	2022/09/15	2022/09/15
pH	-	7.0 - 10.5	7.4	***6.72***	8.1	8.46	7.7	***6.41***	8.2	8.2	7.58	7.58
Temperature	°C	15	11.5	***15.5***	11.6	***16.7***	11.8	***16.9***	12	11.7	***16.7***	***16.7***
Conductivity	µS/cm	-	295	351	250	242	243	247	467	469	461	461
Dissolved Oxygen	mg/L	-	1.58	3.95	4.12	3.02	3.55	3.42	7.04	7.06	2.69	2.69

Collection of samples and measurement provided by Saint John Laboratory Services Ltd.

Notes:

1. Guidelines for Canadian Drinking Water Quality (GCDWQ) (Health Canada, Sept. 2022).
2. Aesthetic Objective (AO) / Operational Guideline (OG).

DUP = Field Duplicate

"-" = None established/ not measured.

Results that exceed the AO/OG are bold and italic

Appendix C1-6: Field Data, Monitoring Wells

Sample Station	Units	GCDWQ[1,2]	MW45L	MW45L	MW45U	MW45U	MW46L	MW46L	MW48L	MW48L	MW48S	MW48S
Date:			**2022/04/11**	**2022/09/15**	**2022/04/11**	**2022/09/15**	**2022/04/25**	**2022/09/22**	**2022/04/25**	**2022/09/15**	**2022/04/25**	**2022/09/15**
pH	**-**	7.0 - 10.5	7.9	7.97	7.9	7.98	7.9	7.98	7.9	8.64	7.8	8.50
Temperature	**°C**	15	12	***16.1***	11.7	***20.1***	8.9	***17.3***	10.2	***16.2***	9.3	***16.7***
Conductivity	**µS/cm**	-	227	248	399	251	698	697	238	587	187	212
Dissolved Oxygen	**mg/L**	-	6.54	4.39	7.43	5.37	5.29	6.02	2.87	3.69	4.17	3.73

Collection of samples and measurement provided by Saint John Laboratory Services Ltd.

Notes:

1. Guidelines for Canadian Drinking Water Quality (GCDWQ) (Health Canada, Sept. 2022).
2. Aesthetic Objective (AO) / Operational Guideline (OG).

DUP = Field Duplicate

"-" = None established/ not measured.

Results that exceed the AO/OG are bold and italic

Appendix C1-6: Field Data, Monitoring Wells

Sample Station	**Units**	**GCDWQ[1,2]**	**MW48U**	**MW48U**	**MW49L**	**MW49L**	**MW49S**	**MW49S**	**MW49U**	**MW49U**	**MW50L**	**MW50L**
Date:			**2022/04/25**	**2022/09/15**	**2022/04/25**	**2022/09/22**	**2022/04/25**	**2022/09/22**	**2022/04/25**	**2022/09/22**	**2022/04/11**	**2022/09/15**
pH	**-**	7.0 - 10.5	7.9	8.10	7.9	8.05	7.6	7.92	7.8	8.19	7.9	8.09
Temperature	**°C**	15	9.4	***16.4***	10	***17.9***	8.8	***18.1***	9.8	***17.7***	10.3	***16.3***
Conductivity	**µS/cm**	-	221	210	200	204	162	104	184	186	813	674
Dissolved Oxygen	**mg/L**	-	3.74	4.21	4.36	4.82	4.85	5.34	5.19	5.86	5	3.89

Collection of samples and measurement provided by Saint John Laboratory Services Ltd.

Notes:

1. Guidelines for Canadian Drinking Water Quality (GCDWQ) (Health Canada, Sept. 2022).
2. Aesthetic Objective (AO) / Operational Guideline (OG).

DUP = Field Duplicate

"-" = None established/ not measured.

Results that exceed the AO/OG are bold and italic

Appendix C1-6: Field Data, Monitoring Wells

Sample Station	Units	GCDWQ[1,2]	MW50S	MW50S	MW51D	MW51D	MW51D	MW51S1	MW51S1	MW51S1	MW51S2	MW51S2
Date:			2022/04/11	2022/09/15	2022/04/11	2022/07/21	2022/09/15	2022/04/11	2022/07/21	2022/09/15	2022/04/11	2022/07/21
pH	-	7.0 - 10.5	8.0	7.86	7.9	8.2	8.3	8.0	8.0	7.84	8.0	8.1
Temperature	°C	15	9.8	***15.8***	8.9	**17.9**	**15.9**	10.7	***18.3***	***16.2***	10.4	***18.2***
Conductivity	µS/cm	-	570	499	251	254	255	411	417	398	286	293
Dissolved Oxygen	mg/L	-	3.88	3.36	4.01	2.85	3.58	7.17	3.94	3.9	3.27	3.57

Collection of samples and measurement provided by Saint John Laboratory Services Ltd.

Notes:

1. Guidelines for Canadian Drinking Water Quality (GCDWQ) (Health Canada, Sept. 2022).
2. Aesthetic Objective (AO) / Operational Guideline (OG).

DUP = Field Duplicate

"-" = None established/ not measured.

Results that exceed the AO/OG are bold and italic

Appendix C1-6: Field Data, Monitoring Wells

Sample Station	Units	GCDWQ[1,2]	MW51S2	MW52D	MW52D	MW52D	MW52S	MW52S	MW52S	MW53D	MW53D	MW53D
Date:			**2022/09/15**	**2022/04/11**	**2022/07/21**	**2022/09/15**	**2022/04/11**	**2022/07/21**	**2022/09/15**	**2022/04/11**	**2022/07/21**	**2022/09/15**
pH	**-**	7.0 - 10.5	8.31	8.1	8.2	***6.93***	7.9	8.2	7.84	***6.2***	***5.7***	***6.79***
Temperature	**°C**	15	***16.4***	11	***19***	***15.9***	10.7	***19.1***	***15.7***	10.3	***18.7***	***16.6***
Conductivity	**µS/cm**	-	297	1093	1328	1253	313	279	354	24	28	65
Dissolved Oxygen	**mg/L**	-	2.89	3.56	3.32	2.96	5.53	3.60	3.83	8.78	6.54	6.52

Collection of samples and measurement provided by Saint John Laboratory Services Ltd.

Notes:

1. Guidelines for Canadian Drinking Water Quality (GCDWQ) (Health Canada, Sept. 2022).
2. Aesthetic Objective (AO) / Operational Guideline (OG).

DUP = Field Duplicate

"-" = None established/ not measured.

Results that exceed the AO/OG are bold and italic

Appendix C1-6: Field Data, Monitoring Wells

Sample Station	Units	GCDWQ[1,2]	MW54S	MW54S	MW54S	MW54U	MW54U DUP	MW54U	MW54U DUP	MW54U	MW54U DUP	MW55S
Date:			2022/04/11	2022/07/21	2022/09/15	2022/04/11	2022/04/11	2022/07/21	2022/07/21	2022/09/15	2022/09/15	2022/04/11
pH	-	7.0 - 10.5	7.8	7.9	7.01	7.8	7.8	7.9	7.9	7.89	7.89	8.1
Temperature	°C	15	11.6	***20.2***	***16.8***	11	10.8	***19.4***	***19.4***	***15.9***	***15.9***	11.4
Conductivity	µS/cm	-	296	335	313	341	341	339	340	316	316	261
Dissolved Oxygen	mg/L	-	3.35	2.50	6.48	2.45	2.4	2.47	2.55	1.48	1.48	2.16

Collection of samples and measurement provided by Saint John Laboratory Services Ltd.

Notes:

1. Guidelines for Canadian Drinking Water Quality (GCDWQ) (Health Canada, Sept. 2022).
2. Aesthetic Objective (AO) / Operational Guideline (OG).

DUP = Field Duplicate

"-" = None established/ not measured.

Results that exceed the AO/OG are bold and italic

Appendix C1-6: Field Data, Monitoring Wells

Sample Station	Units	GCDWQ[1,2]	MW55S	MW55S	MW56S	MW56S	MW56S	MW57S	MW57D
Date:			2022/07/21	2022/09/15	2022/04/11	2022/07/21	2022/09/15	2022/09/22	2022/09/22
pH	-	7.0 - 10.5	8.2	8.40	7.9	7.9	8.11	7.14	7.65
Temperature	°C	15	***20.1***	***16.4***	11.3	***17.6***	***16.3***	***17.6***	***16.9***
Conductivity	µS/cm	-	244	231	192	176	139	109	275
Dissolved Oxygen	mg/L	-	0.59	1.84	4.92	5.89	5.09	5.67	5.91

Collection of samples and measurement provided by Saint John Laboratory Services Ltd.

Notes:

1. Guidelines for Canadian Drinking Water Quality (GCDWQ) (Health Canada, Sept. 2022).
2. Aesthetic Objective (AO) / Operational Guideline (OG).

DUP = Field Duplicate

"-" = None established/ not measured.

Results that exceed the AO/OG are bold and italic

Appendix C1-7: Groundwater guideline criteria for Ammonia - Ecological Health

CCME reports the guideline criteria for Ammonia as follows:

as NH_3		pH							
		6	6.5	7	7.5	8	8.5	9	10
Temp (°C)	0	231	73	23.1	7.32	2.33	0.749	0.25	0.042
	5	153	48.3	15.3	4.84	1.54	0.502	0.172	0.034
	10	102	32.4	10.3	3.26	1.04	0.343	0.121	0.029
	15	69.7	22	6.98	2.22	0.715	0.239	0.089	0.026
	20	48	15.2	4.82	1.54	0.499	0.171	0.067	0.024
	25	33.5	10.6	3.37	1.08	0.354	0.125	0.053	0.022
	30	23.7	7.5	2.39	0.767	0.256	0.094	0.043	0.021

To convert to Ammonia as Nitrogen, multiply above by 0.8224

as N		pH							
		6	6.5	7	7.5	8	8.5	9	10
Temp (°C)	0	189.97	60.04	19.00	6.02	1.92	0.616	0.206	0.035
	5	125.83	39.72	12.58	3.98	1.27	0.413	0.141	0.028
	10	83.88	26.65	8.47	2.68	0.855	0.282	0.100	0.024
	15	57.32	18.09	5.74	1.83	0.588	0.197	0.073	0.021
	20	39.48	12.50	3.96	1.27	0.410	0.141	0.055	0.020
	25	27.55	8.72	2.77	0.888	0.291	0.103	0.044	0.018
	30	19.49	6.17	1.97	0.631	0.211	0.077	0.035	0.017

Appendix C2-1: General Chemistry, Underdrains

Sample Station:	**Units**	**MDL[1]**	**GCDWQ[2]**	**UD3**	**UD3**	**UD3**	**UD3**	**UD3**
Date:				**2022/03/07**	**2022/04/11**	**2022/07/21**	**2022/09/15**	**2022-11-24**
Alkalinity	mg/L	1	-	149	172	223	192	172
Ammonia	mg/L	0.50	-	<0.5	<0.5	<0.5	<0.5	<0.5
Calcium	mg/L	-	-	42.0	60.2	67.9	67.8	55.7
Chloride	mg/L	0.2	250	9.4	9.6	11.3	8.0	6.3
Conductivity	µS/cm	1	-	325	392	454	445	431
Copper	mg/L	0.001	1 / 2[3]	<0.001	<0.001	<0.001	<0.001	<0.001
Iron	mg/L	0.00	0.3	<0.002	<0.002	<0.002	0.003	<0.002
Magnesium	mg/L	-	-	6.4	8.9	9.0	7.3	8.7
Manganese	mg/L	0.002	0.02/0.12[3]	***0.261***	0.008	0.011	<0.002	0.016
Nitrate + Nitrite	mg/L	0.20	10	0.4	<0.2	<0.2	<0.2	<0.2
o-Phosphate	mg/L	0.05	-	<0.05	<0.05	<0.05	<0.05	<0.05
pH		-	7.0 - 10.5	7.7	8.1	8.1	7.1	7.2
Phenols	mg/L	0.002	-	<0.002	<0.002	<0.002	<0.002	<0.002
Potassium	mg/L	-	-	0.9	2.6	1.4	2.2	1.5
r-Silica	mg/L	-	-	10.0	11.0	15.9	12.5	10.8
Sodium	mg/L	-	200	9.6	11.5	12.5	13.3	13.3
Sulfate	mg/L	2	500	15	21	25	26	25
Total Organic Carbon	mg/L	1	-	3	<1	2	8	1
Turbidity	NTU	0.1	1	0.47	0.29	0.43	0.59	0.38
Zinc	mg/L	0.002	5	0.015	0.026	0.008	0.006	<0.002

Calculated Parameters								
Bicarbonate	mg/L	1	-	149	172	223	192	172
Carbonate	mg/L	1	-	<1	<1	<1	<1	<1
Hydroxide	mg/L	1	-	<1	<1	<1	<1	<1
Cation sum	meq/L	-	-	3.07	4.30	4.71	4.62	4.11
Anion sum	meq/L	-	-	3.36	3.90	5.02	4.32	3.88
% difference	mg/L	-	-	-4.45	4.90	-3.24	3.33	2.95
Theoretical Conductivity	µS/cm	-	-	322	420	489	457	406
Hardness	mg/L	-	-	131	187	207	199	175
Ion Sum	mg/L	-	-	233	286	350	316	283
Saturation pH		-	-	8.07	7.85	7.69	7.75	7.89
Langelier Index		-	-	-0.35	0.20	0.43	-0.62	-0.73

BOD_5	mg/L	1	-	<1	<1	1	<1	1
COD	mg/L	1	-	8	<1	7	23	3
Color	TCU	-	15	1	7	7	6	4
Kjeldahl Nitrogen	mg/L	0.50	-	<0.5	<0.5	0.5	<0.5	<0.5
Total Dissolved Solids	mg/L	1	500	-	-	-	-	-
Total Suspended Solids	mg/L	1	-	4	2	2	16	1

Collection of samples and analysis provided by
Saint John Laboratory Services Ltd.

Notes:

1. MDL = Method Detection Limit
2. Canadian Drinking Water Quality Guidelines (Health Canada, June 2019).
3. Aesthetic Objective/Maximum Allowable Concentration (MAC).

"-" = None established/ not measured.

Results that exceed the GCDWQ AO are bold and italic

Results that exceed the GCDWQ MAC are bold and shaded.

Appendix C2-1: General Chemistry, Underdrains

Sample Station:	Units	MDL[1]	GCDWQ[2]	UD4	UD4	UD4	UD4	UD4
Date:				**2022/03/07**	**2022/04/11**	**2022/07/21**	**2022/09/15**	**2022/11/24**
Alkalinity	mg/L	1	-	124	155	169	192	182
Ammonia	mg/L	0.50	-	<0.5	<0.5	<0.5	<0.5	<0.5
Calcium	mg/L	-	-	36.0	57.8	59.2	67.3	57.4
Chloride	mg/L	0.2	250	9.6	10.8	10.7	9.6	7.4
Conductivity	µS/cm	1	-	276	385	421	458	464
Copper	mg/L	0.001	1 / 2[3]	<0.001	0.002	<0.001	<0.001	<0.001
Iron	mg/L	0.00	0.3	<0.002	<0.002	<0.002	0.003	<0.002
Magnesium	mg/L	-	-	5.5	9.2	8.4	7.5	8.6
Manganese	mg/L	0.002	0.02/0.12[3]	***0.024***	0.012	0.003	<0.002	0.002
Nitrate + Nitrite	mg/L	0.20	10	0.5	<0.2	<0.2	<0.2	0.2
o-Phosphate	mg/L	0.05	-	<0.05	<0.05	<0.05	<0.05	<0.05
pH		-	7.0 - 10.5	7.7	8.1	8.1	7.4	7.4
Phenols	mg/L	0.002	-	<0.002	<0.002	<0.002	<0.002	<0.002
Potassium	mg/L	-	-	1.4	2.0	1.5	2.4	1.8
r-Silica	mg/L	-	-	8.7	17.1	12.2	15.5	7.3
Sodium	mg/L	-	200	8.8	12.1	12.3	14.0	13.9
Sulfate	mg/L	2	500	16	25	22	33	29
Total Organic Carbon	mg/L	1	-	3	<1	2	6	<1
Turbidity	NTU	0.1	1	0.78	0.26	0.4	0.57	0.22
Zinc	mg/L	0.002	5	<0.002	<0.002	<0.002	0.006	<0.002

Calculated Parameters								
Bicarbonate	mg/L	1	-	124	155	169	192	182
Carbonate	mg/L	1	-	<1	<1	<1	<1	<1
Hydroxide	mg/L	1	-	<1	<1	<1	<1	<1
Cation sum	meq/L	-	-	2.67	4.22	4.22	4.65	4.22
Anion sum	meq/L	-	-	2.93	3.93	3.94	4.61	4.04
% difference	mg/L	-	-	-4.74	3.51	3.46	0.33	2.22
Theoretical Conductivity	µS/cm	-	-	285	410	416	472	428
Hardness	mg/L	-	-	113	182	182	199	179
Ion Sum	mg/L	-	-	202	272	283	325	300
Saturation pH		-	-	8.22	7.92	7.87	7.76	7.85
Langelier Index		-	-	-0.48	0.14	0.18	-0.36	-0.45

BOD_5	mg/L	1	-	<1	<1	1	<1	<1
COD	mg/L	1	-	7	<1	4	17	<1
Color	TCU	-	15	3	5	4	3	4
Kjeldahl Nitrogen	mg/L	0.50	-	<0.5	<0.5	0.5	<0.5	<0.5
Total Dissolved Solids	mg/L	1	500	-	-	-	-	-
Total Suspended Solids	mg/L	1	-	1	1	6	17	2

Collection of samples and analysis provided by
Saint John Laboratory Services Ltd.

Notes:

1. MDL = Method Detection Limit
2. Canadian Drinking Water Quality Guidelines (Health Canada, June 2019).
3. Aesthetic Objective/Maximum Allowable Concentration (MAC).

"-" = None established/ not measured.

Results that exceed the GCDWQ AO are bold and italic

Results that exceed the GCDWQ MAC are bold and shaded.

Appendix C2-1: General Chemistry, Underdrains

Sample Station:	Units	MDL[1]	GCDWQ[2]	UD5	UD5	UD5	UD5	UD5
Date:				**2022/03/07**	**2022/04/11**	**2022/07/21**	**2022/09/15**	**2022/11/24**
Alkalinity	mg/L	1	-	179	125	143	181	155
Ammonia	mg/L	0.50	-	<0.5	<0.5	<0.5	<0.5	<0.5
Calcium	mg/L	-	-	52.0	45.9	54.2	74.5	54.5
Chloride	mg/L	0.2	250	14.4	10.5	11.6	11.3	8.5
Conductivity	µS/cm	1	-	420	324	386	454	443
Copper	mg/L	0.001	1 / 2[3]	<0.001	<0.001	0.003	<0.001	<0.001
Iron	mg/L	0.00	0.3	<0.002	<0.002	<0.002	0.002	<0.002
Magnesium	mg/L	-	-	8.0	8.4	7.9	7.2	8.3
Manganese	mg/L	0.002	0.02/0.12[3]	***0.029***	<0.002	0.005	<0.002	<0.002
Nitrate + Nitrite	mg/L	0.20	10	<0.2	<0.2	<0.2	<0.2	0.2
o-Phosphate	mg/L	0.05	-	<0.05	<0.05	<0.05	<0.05	<0.05
pH		-	7.0 - 10.5	7.6	8.1	8.1	7.0	7.3
Phenols	mg/L	0.002	-	<0.002	<0.002	<0.002	<0.002	<0.002
Potassium	mg/L	-	-	0.5	2.0	1.7	2.3	2.4
r-Silica	mg/L	-	-	13.1	9.9	11.2	14.0	9.5
Sodium	mg/L	-	200	15.5	9.5	10.5	15.6	12.8
Sulfate	mg/L	2	500	26	27	26	43	41
Total Organic Carbon	mg/L	1	-	3	<1	1	6	2
Turbidity	NTU	0.1	1	0.43	0.31	0.54	0.49	0.26
Zinc	mg/L	0.002	5	<0.002	<0.002	<0.002	0.01	<0.002

Calculated Parameters								
Bicarbonate	mg/L	1	-	179	125	143	181	155
Carbonate	mg/L	1	-	<1	<1	<1	<1	<1
Hydroxide	mg/L	1	-	<1	<1	<1	<1	<1
Cation sum	meq/L	-	-	3.94	3.45	3.85	5.05	4.02
Anion sum	meq/L	-	-	4.32	3.23	3.59	4.65	3.95
% difference	mg/L	-	-	-4.56	3.25	3.62	4.07	0.88
Theoretical Conductivity	µS/cm	-	-	419	346	385	508	419
Hardness	mg/L	-	-	163	149	168	216	170
Ion Sum	mg/L	-	-	295	228	255	335	283
Saturation pH		-	-	7.90	8.11	7.98	7.74	7.94
Langelier Index		-	-	-0.34	0.03	0.16	-0.74	-0.68

BOD_5	mg/L	1	-	<1	<1	<1	1	<1
COD	mg/L	1	-	8	<1	4	18	4
Color	TCU	-	15	<1	5	8	4	4
Kjeldahl Nitrogen	mg/L	0.50	-	<0.5	<0.5	<0.5	<0.5	<0.5
Total Dissolved Solids	mg/L	1	500	-	-	-	-	-
Total Suspended Solids	mg/L	1	-	<1	1	5	1	2

Collection of samples and analysis provided by
Saint John Laboratory Services Ltd.

Notes:

1. MDL = Method Detection Limit
2. Canadian Drinking Water Quality Guidelines (Health Canada, June 2019).
3. Aesthetic Objective/Maximum Allowable Concentration (MAC).

"-" = None established/ not measured.

Results that exceed the GCDWQ AO are bold and italic

Results that exceed the GCDWQ MAC are bold and shaded.

Appendix C2-1: General Chemistry, Underdrains

Sample Station:	Units	MDL[1]	GCDWQ[2]	UD6	UD6	UD6	UD6	UD6
Date:				**2022/03/07**	**2022/04/11**	**2022/07/21**	**2022/09/15**	**2022/11/24**
Alkalinity	mg/L	1	-	88	118	144	177	156
Ammonia	mg/L	0.50	-	<0.5	<0.5	<0.5	<0.5	<0.5
Calcium	mg/L	-	-	27.5	46.9	50.3	56.2	54.3
Chloride	mg/L	0.2	250	8.8	11.4	12.9	8.1	8.8
Conductivity	µS/cm	1	-	213	330	387	497	457
Copper	mg/L	0.001	1 / 2[3]	<0.001	<0.001	<0.001	<0.001	<0.001
Iron	mg/L	0.00	0.3	<0.002	<0.002	<0.002	0.002	<0.002
Magnesium	mg/L	-	-	4.1	8.8	8.0	7.6	8.5
Manganese	mg/L	0.002	0.02/0.12[3]	***0.170***	<0.002	0.003	<0.002	<0.002
Nitrate + Nitrite	mg/L	0.20	10	0.6	<0.2	<0.2	<0.2	0.2
o-Phosphate	mg/L	0.05	-	<0.05	<0.05	<0.05	<0.05	<0.05
pH		-	7.0 - 10.5	7.8	8.2	8.1	7.2	7.2
Phenols	mg/L	0.002	-	<0.002	<0.002	<0.002	<0.002	<0.002
Potassium	mg/L	-	-	0.5	2.7	2.0	2.7	2.3
r-Silica	mg/L	-	-	7.0	10.7	12.2	13.6	13.0
Sodium	mg/L	-	200	8.2	10.0	11.0	13.6	13.0
Sulfate	mg/L	2	500	13	31	16	28	44
Total Organic Carbon	mg/L	1	-	1	<1	3	6	1
Turbidity	NTU	0.1	1	**1.15**	0.28	0.28	0.5	0.18
Zinc	mg/L	0.002	5	0.004	<0.002	<0.002	0.01	<0.002

Calculated Parameters								
Bicarbonate	mg/L	1	-	88	118	144	177	156
Carbonate	mg/L	1	-	<1	<1	<1	<1	<1
Hydroxide	mg/L	1	-	<1	<1	<1	<1	<1
Cation sum	meq/L	-	-	2.09	3.57	3.70	4.09	4.03
Anion sum	meq/L	-	-	2.20	3.26	3.46	4.16	4.15
% difference	mg/L	-	-	-2.77	4.55	3.27	-0.82	-1.48
Theoretical Conductivity	µS/cm	-	-	219	357	363	418	425
Hardness	mg/L	-	-	86	153	159	172	171
Ion Sum	mg/L	-	-	151	229	244	293	287
Saturation pH		-	-	8.48	8.13	8.01	7.87	7.94
Langelier Index		-	-	-0.64	0.02	0.11	-0.68	-0.72

BOD_5	mg/L	1	-	<1	<1	<1	<1	<1
COD	mg/L	1	-	3	<1	8	18	3
Color	TCU	-	15	4	5	8	4	5
Kjeldahl Nitrogen	mg/L	0.50	-	<0.5	<0.5	<0.5	<0.5	<0.5
Total Dissolved Solids	mg/L	1	500	-	-	-	-	-
Total Suspended Solids	mg/L	1	-	1	1	<1	2	1

Collection of samples and analysis provided by Saint John Laboratory Services Ltd.

Notes:

1. MDL = Method Detection Limit
2. Canadian Drinking Water Quality Guidelines (Health Canada, June 2019).
3. Aesthetic Objective/Maximum Allowable Concentration (MAC).

"-" = None established/ not measured.

Results that exceed the GCDWQ AO are bold and italic

Results that exceed the GCDWQ MAC are bold and shaded.

Appendix C2-1: General Chemistry, Underdrains

Sample Station:	**Units**	**MDL[1]**	**GCDWQ[2]**	**Leach Surge Pond UD**	**Leach Surge Pond UD**	**Leach Surge Pond UD**	**Leach Surge Pond UD**	**Leach Surge Pond UD**
Date:				**2022/03/07**	**2022/04/11**	**2022/07/21**	**2022/09/15**	**2022/11/24**
Alkalinity	mg/L	1	-	123	153	168	185	178
Ammonia	mg/L	0.50	-	<0.5	<0.5	<0.5	<0.5	<0.5
Calcium	mg/L	-	-	42.2	54.6	56.6	70.3	52.1
Chloride	mg/L	0.2	250	10.0	10.5	27.5	9.1	7.4
Conductivity	µS/cm	1	-	285	384	460	422	430
Copper	mg/L	0.001	1 / 2[3]	<0.001	<0.001	<0.001	<0.001	<0.001
Iron	mg/L	0.00	0.3	<0.002	<0.002	<0.002	0.002	<0.002
Magnesium	mg/L	-	-	5.2	9.1	8.3	7.4	9.0
Manganese	mg/L	0.002	0.02/0.12[3]	***0.097***	<0.002	***0.034***	0.002	***0.102***
Nitrate + Nitrite	mg/L	0.20	10	0.5	<0.2	<0.2	<0.2	0.2
o-Phosphate	mg/L	0.05	-	<0.05	<0.05	<0.05	<0.05	<0.05
pH		-	7.0 - 10.5	7.7	8.0	8.2	7.2	7.2
Phenols	mg/L	0.002	-	<0.002	<0.002	<0.002	<0.002	<0.002
Potassium	mg/L	-	-	1.4	2.1	13.5	2.4	2.0
r-Silica	mg/L	-	-	9.2	11.6	12.7	13.1	12.8
Sodium	mg/L	-	200	8.5	11.7	12.3	13.7	15.0
Sulfate	mg/L	2	500	16	25	10	32	31
Total Organic Carbon	mg/L	1	-	<1	1	2	4	3
Turbidity	NTU	0.1	1	**1.12**	0.29	0.29	0.41	0.21
Zinc	mg/L	0.002	5	0.013	<0.002	<0.002	0.007	<0.002
Calculated Parameters								
Bicarbonate	mg/L	1	-	123	153	168	185	178
Carbonate	mg/L	1	-	<1	<1	<1	<1	<1
Hydroxide	mg/L	1	-	<1	<1	<1	<1	<1
Cation sum	meq/L	-	-	2.94	4.04	4.39	4.77	4.05
Anion sum	meq/L	-	-	2.95	3.72	4.16	4.40	4.20
% difference	mg/L	-	-	-0.04	4.09	2.67	4.13	-1.82
Theoretical Conductivity	µS/cm	-	-	301	398	447	473	417
Hardness	mg/L	-	-	127	174	175	206	167
Ion Sum	mg/L	-	-	207	266	296	320	295
Saturation pH		-	-	8.15	7.95	7.89	7.75	7.90
Langelier Index		-	-	-0.49	0.00	0.33	-0.52	-0.69
BOD_5	mg/L	1	-	<1	<1	<1	<1	<1
COD	mg/L	1	-	<1	2	6	12	7
Color	TCU	-	15	1	5	9	1	4
Kjeldahl Nitrogen	mg/L	0.50	-	0.6	0.9	0.5	0.8	<0.5
Total Dissolved Solids	mg/L	1	500	202	183	219	300	325
Total Suspended Solids	mg/L	1	-	1	1	5	3	1

Collection of samples and analysis provided by
Saint John Laboratory Services Ltd.

Notes:

1. MDL = Method Detection Limit
2. Canadian Drinking Water Quality Guidelines (Health Canada, June 2019).
3. Aesthetic Objective/Maximum Allowable Concentration (MAC).

"-" = None established/ not measured.

Results that exceed the GCDWQ AO are bold and italic

Results that exceed the GCDWQ MAC are bold and shaded.

Appendix C2-2: Trace Metals, Underdrains

Sample Station:	Units	MDL[1]	GCDWQ[2]	UD3	UD3	UD3	UD3	UD3
Date:				**2022/03/07**	**2022/04/11**	**2022/07/21**	**2022/09/15**	**2022/11/24**
Aluminium	µg/L	5	100	<5	10	41	7	<5
Antimony	µg/L	2	6	<1	<2	<2	<2	<1
Arsenic	µg/L	1	10	<1	<1	<1	1	<1
Barium	µg/L	10	1000	12	<10	13	<10	19
Beryllium	µg/L	1	-	<1	<1	<1	<1	<1
Bismuth	µg/L	1	-	<1	<1	<1	<1	<1
Boron	µg/L	100	5000	<100	<100	<100	<100	<100
Cadmium	µg/L	0.02	5	<0.02	<0.02	<0.02	<0.02	<0.02
Chromium	µg/L	1	50	<1	<1	<1	<1	<1
Cobalt	µg/L	2	-	<2	<2	<2	<2	<2
Copper	µg/L	1	1000 / 2000[4]	<1	<1	<1	<1	<1
Iron	µg/L	2	300	<2	<2	<2	3	<2
Lead	µg/L	1	5	<1	<1	<1	<1	<1
Manganese	µg/L	2	20 / 120[4]	***261***	8	11	<2	16
Mercury	µg/L	0.02	1	<0.2	<0.2	<0.2	<0.2	<0.2
Molybdenum	µg/L	5	-	<5	<5	<5	<5	<5
Nickel	µg/L	2	-	<2	<2	<2	<2	<2
Selenium	µg/L	1	50	<1	<1	<1	<1	<1
Silver	µg/L	0.1	-	<0.1	<0.1	<0.1	<0.1	<0.1
Strontium	µg/L	10	7000	88	19	89	119	131
Thallium[3]	µg/L	0.50	-	<0.5	<0.5	<0.5	<0.5	<0.2
Tin	µg/L	1	-	<1	<1	<1	<1	<1
Uranium[3]	µg/L	0.5	20	2.2	<0.5	3.2	3.0	4.0
Vanadium	µg/L	10	-	<10	<10	<10	<10	<10
Zinc	µg/L	2	5000	15	26	8	6	<2

Collection of samples and analysis provided by
Saint John Laboratory Services Ltd.

Notes:
1. MDL = Method Detection Limit
2. Canadian Drinking Water Quality Guidelines (Health Canada, Sept. 2022).
3. Analysis conducted by RPC in Fredericton, NB
4. Aesthetic Objective/Maximum Allowable Concentration (MAC).

"-" = None established/ not measured.

Results that exceed the GCDWQ AO are bold and italic	
Results that exceed the GCDWQ MAC are bold and shaded.	

Appendix C2-2: Trace Metals, Underdrains

Sample Station:		MDL[1]	GCDWQ[2]	UD4	UD4	UD4	UD4	UD4
Date:	**Units**			**2022/03/07**	**2022/04/11**	**2022/07/21**	**2022/09/15**	**2022/11/24**
Aluminium	µg/L	5	100	12	27	<5	<5	5
Antimony	µg/L	2	6	<1	<2	<2	<2	<1
Arsenic	µg/L	1	10	<1	<1	<1	1	<1
Barium	µg/L	10	1000	10	<10	14	15	21
Beryllium	µg/L	1	-	<1	<1	<1	<1	<1
Bismuth	µg/L	1	-	<1	<1	<1	<1	<1
Boron	µg/L	100	5000	<100	<100	<100	<100	<100
Cadmium	µg/L	0.02	5	<0.02	<0.02	<0.02	<0.02	<0.02
Chromium	µg/L	1	50	<1	<1	<1	<1	<1
Cobalt	µg/L	2	-	<2	<2	<2	<2	<2
Copper	µg/L	1	1000 / 2000[4]	<1	2	<1	<1	<1
Iron	µg/L	2	300	<2	<2	<2	3	<2
Lead	µg/L	1	5	<1	<1	<1	<1	<1
Manganese	µg/L	2	20 / 120[4]	***24***	12	3	<2	2
Mercury	µg/L	0.02	1	<0.2	<0.2	<0.2	<0.2	<0.2
Molybdenum	µg/L	5	-	<5	<5	<5	<5	<5
Nickel	µg/L	2	-	<2	<2	<2	<2	<2
Selenium	µg/L	1	50	<1	<1	<1	<1	<1
Silver	µg/L	0.1	-	<0.1	<0.1	<0.1	<0.1	<0.1
Strontium	µg/L	10	7000	87	<10	109	141	152
Thallium[3]	µg/L	0.50	-	<0.5	<0.5	<0.5	<0.5	<0.2
Tin	µg/L	1	-	<1	<1	<1	<1	<1
Uranium[3]	µg/L	0.5	20	2.7	<0.5	2.9	2.5	4.7
Vanadium	µg/L	10	-	<10	<10	<10	<10	<10
Zinc	µg/L	2	5000	<2	<2	<2	6	<2

Collection of samples and analysis provided by
Saint John Laboratory Services Ltd.

Notes:

1. MDL = Method Detection Limit
2. Canadian Drinking Water Quality Guidelines (Health Canada, Sept. 2022).
3. Analysis conducted by RPC in Fredericton, NB
4. Aesthetic Objective/Maximum Allowable Concentration (MAC).

"-" = None established/ not measured.

Results that exceed the GCDWQ AO are bold and italic	
Results that exceed the GCDWQ MAC are bold and shaded.	

Appendix C2-2: Trace Metals, Underdrains

Sample Station:		MDL[1]	GCDWQ[2]	UD5	UD5	UD5	UD5	UD5	UD6	UD6
Date:	Units			2022/03/07	2022/04/11	2022/07/21	2022/09/15	2022/11/24	2022/03/07	2022/04/11
Aluminium	µg/L	5	100	7	<5	<5	5	<5	25	<5
Antimony	µg/L	2	6	<1	<2	<2	<2	<1	<1	<2
Arsenic	µg/L	1	10	<1	<1	<1	1	<1	<1	<1
Barium	µg/L	10	1000	12	<10	20	13	31	<10	16
Beryllium	µg/L	1	-	<1	<1	<1	<1	<1	<1	<1
Bismuth	µg/L	1	-	<1	<1	<1	<1	<1	<1	<1
Boron	µg/L	100	5000	<100	<100	<100	<100	113	<100	<100
Cadmium	µg/L	0.02	5	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Chromium	µg/L	1	50	<1	<1	<1	<1	<1	<1	<1
Cobalt	µg/L	2	-	<2	<2	<2	<2	<2	<2	<2
Copper	µg/L	1	1000 / 2000[4]	<1	<1	3	<1	<1	<1	<1
Iron	µg/L	2	300	<2	<2	<2	2	<2	<2	<2
Lead	µg/L	1	5	<1	<1	<1	<1	<1	<1	<1
Manganese	µg/L	2	20 / 120[4]	***29***	<2	5	<2	<2	***170***	<2
Mercury	µg/L	0.02	1	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Molybdenum	µg/L	5	-	<5	<5	<5	<5	<5	<5	<5
Nickel	µg/L	2	-	<2	<2	<2	<2	<2	<2	<2
Selenium	µg/L	1	50	<1	<1	<1	<1	<1	<1	<1
Silver	µg/L	0.1	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Strontium	µg/L	10	7000	120	104	105	135	154	67	118
Thallium[3]	µg/L	0.50	-	<0.5	<0.5	<0.5	<0.5	<0.2	<0.5	<0.5
Tin	µg/L	1	-	<1	<1	<1	<1	<1	<1	<1
Uranium[3]	µg/L	0.5	20	1.4	0.7	2.2	2.9	4.3	0.6	0.8
Vanadium	µg/L	10	-	<10	<10	<10	<10	<10	<10	<10
Zinc	µg/L	2	5000	<2	<2	<2	10	<2	4	<2

Collection of samples and analysis provided by Saint John Laboratory Services Ltd.

Notes:

1. MDL = Method Detection Limit
2. Canadian Drinking Water Quality Guidelines (Health Canada, Sept. 2022).
3. Analysis conducted by RPC in Fredericton, NB
4. Aesthetic Objective/Maximum Allowable Concentration (MAC).

"-" = None established/ not measured.

Results that exceed the GCDWQ AO are bold and italic	
Results that exceed the GCDWQ MAC are bold and shaded.	

Appendix C2-2: Trace Metals, Underdrains

Sample Station:		**MDL[1]**	**GCDWQ[2]**	**UD6**	**UD6**	**UD6**	**Leach Surge Pond UD**	**Leach Surge Pond UD**	**Leach Surge Pond UD**	**Leach Surge Pond UD**	**Leach Surge Pond UD**
Date:	**Units**			**2022/07/21**	**2022/09/15**	**2022/11/24**	**2022/03/07**	**2022/04/11**	**2022/07/21**	**2022/09/15**	**2022/11/24**
Aluminium	µg/L	5	100	<5	26	<5	<5	5	<5	<5	14
Antimony	µg/L	2	6	<2	<2	<1	<1	<2	<2	<2	<1
Arsenic	µg/L	1	10	<1	1	<1	<1	<1	<1	1	<1
Barium	µg/L	10	1000	19	20	30	<10	14	26	18	22
Beryllium	µg/L	1	-	<1	<1	<1	<1	<1	<1	<1	<1
Bismuth	µg/L	1	-	<1	<1	<1	<1	<1	<1	<1	<1
Boron	µg/L	100	5000	<100	176	124	<100	<100	<100	101	<100
Cadmium	µg/L	0.02	5	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Chromium	µg/L	1	50	<1	<1	<1	<1	<1	<1	<1	<1
Cobalt	µg/L	2	-	<2	<2	<2	<2	<2	<2	<2	<2
Copper	µg/L	1	1000 / 2000[4]	<1	<1	<1	<1	<1	<1	<1	<1
Iron	µg/L	2	300	<2	2	<2	<2	<2	<2	2	<2
Lead	µg/L	1	5	<1	<1	<1	<1	<1	<1	<1	<1
Manganese	µg/L	2	20 / 120[4]	3	<2	<2	***97***	<2	***34***	2	***102***
Mercury	µg/L	0.02	1	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Molybdenum	µg/L	5	-	<5	<5	<5	<5	<5	<5	<5	<5
Nickel	µg/L	2	-	<2	<2	<2	<2	<2	<2	<2	<2
Selenium	µg/L	1	50	<1	<1	<1	<1	<1	<1	<1	<1
Silver	µg/L	0.1	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Strontium	µg/L	10	7000	102	155	149	83	126	111	139	157
Thallium[3]	µg/L	0.50	-	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<0.5	<0.2
Tin	µg/L	1	-	<1	<1	<1	<1	<1	<1	<1	<1
Uranium[3]	µg/L	0.5	20	1.0	1.5	4.5	1.1	0.7	2.2	2.0	2.8
Vanadium	µg/L	10	-	<10	<10	<10	<10	<10	<10	<10	<10
Zinc	µg/L	2	5000	<2	10	<2	13	<2	<2	7	<2

Collection of samples and analysis provided by
Saint John Laboratory Services Ltd.

Notes:
1. MDL = Method Detection Limit
2. Canadian Drinking Water Quality Guidelines (Health Canada, Sept. 2022).
3. Analysis conducted by RPC in Fredericton, NB
4. Aesthetic Objective/Maximum Allowable Concentration (MAC).

"-" = None established/ not measured.

Results that exceed the GCDWQ AO are bold and italic	
Results that exceed the GCDWQ MAC are bold and shaded.	

Appendix C2-3: Petroleum Hydrocarbons, Underdrains

Sample Station	Units	MDL[1]	RBCA[2]	UD3	UD3	UD3	UD3	UD3
Date:				2022/03/07	2022/04/11	2022/07/21	2022/09/15	2022/11/24
Benzene	µg/L	1	5	<1	<1	<1	<1	<1
Toluene	µg/L	1	24	<1	<1	<1	<1	<1
Ethylbenzene	µg/L	1	1.6	<1	<1	<1	<1	<1
Xylenes	µg/L	1	20	<1	<1	<1	<1	<1
C6 - <C10	µg/L	5	-	<5	<5	<5	<5	<5
>C10 - <C21	µg/L	10	-	<10	<10	<10	<10	<10
>C21 - <C32	µg/L	10	-	<10	<10	<10	<10	<10
Modified TPH	µg/L	10	3200	<10	<10	<10	<10	<10

Collection of samples and analysis provided by
Saint John Laboratory Services Ltd.

Notes:

1. MDL = Method Detection Limit
2. RBCA = Atlantic Risk Based Corrective Action Screening Levels (Tier I) for Groundwater at an Industrial site with potable water (July, 2022).

"-" = None established/ not measured.

Results that exceed the RBCA screening levels are bold and shaded.

Appendix C2-3: Petroleum Hydrocarbons, Underdrains

Sample Station	**Units**	**MDL[1]**	**RBCA[2]**	**UD4**	**UD4**	**UD4**	**UD4**	**UD4**
Date:				**2022/03/07**	**2022/04/11**	**2022/07/21**	**2022/09/15**	**2022/11/24**
Benzene	µg/L	1	5	<1	<1	<1	<1	<1
Toluene	µg/L	1	24	<1	<1	<1	<1	<1
Ethylbenzene	µg/L	1	1.6	<1	<1	<1	<1	<1
Xylenes	µg/L	1	20	<1	<1	<1	<1	<1
C6 - <C10	µg/L	5	-	<5	<5	<5	<5	<5
>C10 - <C21	µg/L	10	-	<10	<10	<10	<10	<10
>C21 - <C32	µg/L	10	-	<10	<10	<10	<10	<10
Modified TPH	µg/L	10	3200	<10	<10	<10	<10	<10

Collection of samples and analysis provided by
Saint John Laboratory Services Ltd.

Notes:
1. MDL = Method Detection Limit
2. RBCA = Atlantic Risk Based Corrective Action Screening Levels (Tier I) for Groundwater at an Industrial site with potable water (July, 2022).
"-" = None established/ not measured.

Results that exceed the RBCA screening levels are bold and shaded.

Appendix C2-3: Petroleum Hydrocarbons, Underdrains

Sample Station	**Units**	**MDL[1]**	**RBCA[2]**	**UD5**	**UD5**	**UD5**	**UD5**	**UD5**
Date:				**2022/03/07**	**2022/04/11**	**2022/07/21**	**2022/09/15**	**2022/11/24**
Benzene	µg/L	1	5	<1	<1	<1	<1	<1
Toluene	µg/L	1	24	<1	<1	<1	<1	<1
Ethylbenzene	µg/L	1	1.6	<1	<1	<1	<1	<1
Xylenes	µg/L	1	20	<1	<1	<1	<1	<1
C6 - <C10	µg/L	5	-	<5	<5	<5	<5	<5
>C10 - <C21	µg/L	10	-	<10	<10	<10	<10	<10
>C21 - <C32	µg/L	10	-	<10	<10	<10	<10	<10
Modified TPH	µg/L	10	3200	<10	<10	<10	<10	<10

Collection of samples and analysis provided by
Saint John Laboratory Services Ltd.

Notes:

1. MDL = Method Detection Limit
2. RBCA = Atlantic Risk Based Corrective Action Screening Levels (Tier I) for Groundwater at an Industrial site with potable water (July, 2022).

"-" = None established/ not measured.

Results that exceed the RBCA screening levels are bold and shaded.

Appendix C2-3: Petroleum Hydrocarbons, Underdrains

Sample Station	Units	MDL[1]	RBCA[2]	UD6	UD6	UD6	UD6	UD6
Date:				2022/03/07	2022/04/11	2022/07/21	2022/09/15	2022/11/24
Benzene	µg/L	1	5	<1	<1	<1	<1	<1
Toluene	µg/L	1	24	<1	<1	<1	<1	<1
Ethylbenzene	µg/L	1	1.6	<1	<1	<1	<1	<1
Xylenes	µg/L	1	20	<1	<1	<1	<1	<1
C6 - <C10	µg/L	5	-	<5	<5	<5	<5	<5
>C10 - <C21	µg/L	10	-	<10	<10	<10	<10	<10
>C21 - <C32	µg/L	10	-	<10	<10	<10	<10	<10
Modified TPH	µg/L	10	3200	<10	<10	<10	<10	<10

Collection of samples and analysis provided by
Saint John Laboratory Services Ltd.

Notes:

1. MDL = Method Detection Limit
2. RBCA = Atlantic Risk Based Corrective Action Screening Levels (Tier I) for Groundwater at an Industrial site with potable water (July, 2022).

"-" = None established/ not measured.

Results that exceed the RBCA screening levels are bold and shaded.

Appendix C2-3: Petroleum Hydrocarbons, Underdrains

Sample Station	**Units**	**MDL[1]**	**RBCA[2]**	**Leach Surge Pond UD**	**Leach Surge Pond UD**	**Leach Surge Pond UD**	**Leach Surge Pond UD**	**Leach Surge Pond UD**
Date:				**2022/03/07**	**2022/04/11**	**2022/07/21**	**2022/09/15**	**2022/11/24**
Benzene	µg/L	1	5	<1	<1	<1	<1	<1
Toluene	µg/L	1	24	<1	<1	<1	<1	<1
Ethylbenzene	µg/L	1	1.6	<1	<1	<1	<1	<1
Xylenes	µg/L	1	20	<1	<1	<1	<1	<1
C6 - <C10	µg/L	5	-	<5	<5	<5	<5	<5
>C10 - <C21	µg/L	10	-	<10	<10	<10	<10	<10
>C21 - <C32	µg/L	10	-	<10	<10	<10	<10	<10
Modified TPH	µg/L	10	3200	<10	<10	<10	<10	<10

Collection of samples and analysis provided by
Saint John Laboratory Services Ltd.

Notes:

1. MDL = Method Detection Limit
2. RBCA = Atlantic Risk Based Corrective Action Screening Levels (Tier I) for Groundwater at an Industrial site with potable water (July, 2022).

"-" = None established/ not measured.

Results that exceed the RBCA screening levels are bold and shaded.

Appendix C2-4: Field Data, Underdrains

Sample Station	**Units**	**CDWQG[1]**	**UD3**	**UD3**	**UD3**	**UD3**	**UD3**
Date:			**2022/03/07**	**2022/04/11**	**2022/07/21**	**2022/09/15**	**2022/11/24**
pH		7.0 - 10.5	7.7	8.1	8.1	7.1	7.2
Temperature	**°C**	15	11.8	11.6	**19.7**	**16.9**	5.2
Conductivity	**µS/cm**	-	325	392	454	445	431
Dissolved Oxygen	**mg/L**	-	9.7	9.09	4.02	5.53	5.84

Collection of samples and measurements provided by Saint John Laboratory Services Ltd.

Notes:

1.CDWQG = Guidelines for Canadian Drinking Water Quality (Health Canada, Sept. 2022).

"-" = None established/ not measured.

Results that exceed the CDWQG are bold and shaded.

Appendix C2-4: Field Data, Underdrains

Sample Station	**Units**	**CDWQG[1]**	**UD4**	**UD4**	**UD4**	**UD4**	**UD4**
Date:			**2022/03/07**	**2022/04/11**	**2022/07/21**	**2022/09/15**	**2022/11/24**
pH		7.0 - 10.5	7.7	8.06	8.05	7.4	7.4
Temperature	**°C**	15	11.3	11.8	**20.0**	**17.1**	5.7
Conductivity	**µS/cm**	-	276	385	421	458	464
Dissolved Oxygen	**mg/L**	-	9.51	8.07	7.37	6.41	9.14

Collection of samples and measurements provided by Saint John Laboratory Services Ltd.

Notes:

1.CDWQG = Guidelines for Canadian Drinking Water Quality (Health Canada, Sept. 2022).

"-" = None established/ not measured.

Results that exceed the CDWQG are bold and shaded.

Appendix C2-4: Field Data, Underdrains

Sample Station	**Units**	**CDWQG[1]**	**UD5**	**UD5**	**UD5**	**UD5**	**UD5**
Date:			**2022/03/07**	**2022/04/11**	**2022/07/21**	**2022/09/15**	**2022/11/24**
pH		7.0 - 10.5	7.6	8.14	8.14	7.0	7.3
Temperature	**°C**	15	13.3	11.1	**19.8**	**17.0**	4.9
Conductivity	**µS/cm**	-	420	324	386	454	443
Dissolved Oxygen	**mg/L**	-	9.3	8.97	7.27	5.89	5.64

Collection of samples and measurements provided by Saint John Laboratory Services Ltd.

Notes:

1.CDWQG = Guidelines for Canadian Drinking Water Quality (Health Canada, Sept. 2022).

"-" = None established/ not measured.

Results that exceed the CDWQG are bold and shaded.

Appendix C2-4: Field Data, Underdrains

Sample Station	**Units**	**CDWQG[1]**	**UD6**	**UD6**	**UD6**	**UD6**	**UD6**
Date:			**2022/03/07**	**2022/04/11**	**2022/07/21**	**2022/09/15**	**2022/11/24**
pH		7.0 - 10.5	7.8	8.15	8.12	7.2	7.2
Temperature	**°C**	15	11.5	10.8	**21.1**	**17.3**	5.3
Conductivity	**µS/cm**	-	213	330	387	497	457
Dissolved Oxygen	**mg/L**	-	9.77	8.88	5.92	7.04	5.6

Collection of samples and measurements provided by Saint John Laboratory Services Ltd.

Notes:

1.CDWQG = Guidelines for Canadian Drinking Water Quality (Health Canada, Sept. 2022).

"-" = None established/ not measured.

Results that exceed the CDWQG are bold and shaded.

Appendix C2-4: Field Data, Underdrains

Sample Station	**Units**	**CDWQG[1]**	**Leach Surge Pond UD**	**Leach Surge Pond UD**	**Leach Surge Pond UD**	**Leach Surge Pond UD**
Date:			**2022/03/07**	**2022/04/11**	**2022/07/21**	**2022/09/15**
pH		7.0 - 10.5	7.7	7.95	8.2	7.2
Temperature	**°C**	15	11.9	11.0	**20.2**	**17.4**
Conductivity	**µS/cm**	-	285	384	460	422
Dissolved Oxygen	**mg/L**	-	9.5	8.62	6.52	5.96

Collection of samples and measurements provided by Saint John Laboratory Services Ltd.

Notes:

1.CDWQG = Guidelines for Canadian Drinking Water Quality (Health Canada, Sept. 2022).

"-" = None established/ not measured.

Results that exceed the CDWQG are bold and shaded.

Appendix C2-4: Field Data, Underdrains

Sample Station	**Units**	**CDWQG[1]**	**Leach Surge Pond UD**
Date:			**2022/11/24**
pH		7.0 - 10.5	7.2
Temperature	**°C**	15	5.9
Conductivity	**µS/cm**	-	430
Dissolved Oxygen	**mg/L**	-	5.34

Collection of samples and measurements provided by Saint John Laboratory Services Ltd.

Notes:

1.CDWQG = Guidelines for Canadian Drinking Water Quality (Health Canada, Sept. 2022).

"-" = None established/ not measured.

Results that exceed the CDWQG are bold and shaded.

Appendix C3-4: Field Data, Surface Water

Sample Station:	Units	MDL	CCME FWAL[2]	SW1	SW1 DUP	SW1	SW1 DUP	SW2	SW2	SW3	SW3	SW4	SW4	SW5	SW5	SW6
Date:				2022/04/25	2022/04/25	2022/09/29	2022/09/29	2022/04/25	2022/09/29	2022/04/25	2022/09/15	2022/04/25	2022/09/29	2022/04/25	2022/09/29	2022/04/11
pH			6.5 - 9.0	7.3	7.3	7.72	7.72	7.9	7.98	7.6	8.00	6.8	7.89	7.4	7.84	7.2
Temperature	°C		-	13.2	12.9	17.2	17.2	10.7	18.3	10.8	17.8	11.8	18.4	11.3	17.8	12.4
Conductivity	µS/cm	1	-	196	196	128	128	632	619	283	413	101	121	200	188	128
Dissolved Oxygen	mg/L	1	-	10.46	10.45	8.63	8.63	11.11	8.78	10.89	7.88	9.67	9.06	10.90	8.76	9.83

Samples collected and analyzed by Saint John Laboratory Services Ltd.

Notes:

1. MDL = Method Detection Limit
2. CCME FWAL = CCME Canadian Water Quality Guidelines

DUP = Field Duplicate

"-" = None established/ not measured.

Results that exceed CCME FWAL are bold and shaded.

Appendix C3-4: Field Data, Surface Water

Sample Station:	Units	MDL	CCME FWAL[2]	SW6	SWR1	SWR1	SWR2	SWR2	Sed Pond	Sed Pond	Sed Pond	Sed Pond	Sed Pond
Date:				2022/09/15	2022/04/11	2022/09/29	2022/04/11	2022/09/21	2022/03/07	2022/04/11	2022/07/21	2022/09/15	2022/11/24
pH			6.5 - 9.0	7.94	6.8	8.04	6.5	8.23	8.3	6.7	8.2	7.55	7.3
Temperature	°C		-	17.6	11.6	16.7	6.3	18.9	7.8	12.3	22.2	17.8	2.8
Conductivity	µS/cm	1	-	173	457	197	39	272	198	107	64	95	52
Dissolved Oxygen	mg/L	1	-	7.13	7.81	8.95	11.71	11.42	11.65	9.94	7.05	6.36	7

Samples collected and analyzed by Saint John Laboratory Services Ltd.

Notes:

1. MDL = Method Detection Limit
2. CCME FWAL = CCME Canadian Water Quality Guidelines

DUP = Field Duplicate

"-" = None established/ not measured.

Results that exceed CCME FWAL are bold and shaded.

Appendix C5-1: General Chemistry, Potable Well

Sample Station	Units	GCDWQ[1]		Admin Building											
Date:		MAC[2]	AO/OG[3]	06-Nov-02	22-Oct-03	01-Oct-04	29-Sep-05	16-Oct-06	05-Oct-07	06-Oct-08	01-Oct-09	23-Sep-10	19-Sep-11	13-Sep-12	10-Oct-13
Alkalinity	mg/L	-	-	94	77	76	84	79	81	86	81	85	84	86	83
Antimony	mg/L	0.006	-	<0.0005	<0.0004	<0.001	<0.001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Arsenic	mg/L	0.01	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.002	0.004	0.001
Boron	mg/L	5	-	0.08	<0.1	<0.1	<0.1	0.15	0.2	0.19	<0.1	0.12	<0.1	<0.1	0.11
Ca/Mg Hardness	mg/L	-	-	19	54	50	55	55	52.2	61	59	54	59	133	50
Calcium	mg/L	-	-	6.5	19	17.2	19.3	19.3	17.6	19.5	20.8	18.5	20.1	46.2	17.1
Chloride	mg/L	-	≤ 250	5	5.5	5.6	6.5	5.5	4.9	5.4	4.9	6.5	7.2	5.6	6.4
Copper	mg/L	2	1	0.007	0.008	<0.001	<0.001	0.002	<0.001	0.005	<0.002	0.001	<0.001	0.005	0.017
Fluoride	mg/L	1.5	-	0.24	0.19	0.06	<0.1	<0.1	<0.1	<0.1	<0.1	0.2	0.2	0.1	0.1
Iron	mg/L	-	≤ 0.3	0.044	**0.39**	0.02	0.02	0.009	0.01	0.031	0.018	0.089	<0.002	0.018	0.036
Lead	mg/L	0.005	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Magnesium	mg/L	-	-	0.58	1.6	1.6	1.7	1.7	2	3.1	1.7	1.9	2.1	4.1	1.7
Manganese	mg/L	0.12	≤ 0.02	0.012	0.01	0.01	0.01	0.005	0.01	0.017	0.009	0.015	0.013	0.028	0.007
Nitrate	mg/L	45	-	<0.5	<0.05	<0.2	<0.5	<0.5	<0.5	<0.2	<0.2	<0.2	<0.5	<0.5	<0.2
pH	-	-	7.0-10.5	-	8.1	8.2	8.3	8.3	8	7.9	8	7.99	8.04	7.97	8
Potassium	mg/L	-	-	0.2	0.32	0.4	0.2	0.4	0.2	0.1	0.3	0.3	0.2	1.5	0.6
Sodium	mg/L	-	≤ 200	5.7	15.6	15.1	17	16.4	18.3	16.1	16.3	15.9	15	19.6	16.1
Sulphate	mg/L	-	≤ 500	0.5	<1	3.5	5.6	34.8	5	4.6	2.3	6	7	6	6
Thallium[4]	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Uranium[4]	mg/L	0.02	-	-	-	-	-	-	-	-	-	-	-	-	-
Zinc	mg/L	-	5	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.016	<0.002	0.002
Total Coliforms	cfu/100mL	0	-	0	0	0	0	0	0	0	0	0	4*	**15***	2*
E.Coli	cfu/100mL	0	-	-	-	0	0	0	0	0	0	0	0	0	0
Fecal Coliforms	cfu/100mL	-	-	0	0	-	-	-	-	-	-	-	-	-	-

Collection of samples and analysis provided by Saint John Labortory Services Ltd.

Notes:

1. Guidelines for Canadian Drinking Water Quality (GCDWQ) (Health Canada, Sept. 2022).
2. Maximum Allowable Concentration (MAC).
3. Aesthetic Objective (AO) / Operational Guideline (OG).
4. Analysis conducted by RPC in Fredericton, NB

"-" = None established/ not measured.

Results that exceed the AO/OG after 2019 are bold and italic

Results that exceed the MAC after 2019 are shaded.

Results that exceeded the GCDWQ guidelines prior to 2020 are bold and shaded.

Appendix C5-1: General Chemistry, Potable Well

Sample Station	**Units**	**GCDWQ[1]**		**Admin Building**								
Date:		**MAC[2]**	**AO/OG[3]**	**08-Sep-14**	**31-Aug-15**	**20-Sep-16**	**28-Sep-17**	**27-Sep-18**	**1-Oct-19**	**21-Sep-20**	**28-Sep-21**	**20-Oct-22**
Alkalinity	mg/L	-	-	83	84	85	90	76	81	80	83	78
Antimony	mg/L	0.006	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Arsenic	mg/L	0.01	-	<0.001	<0.001	<0.001	0.001	0.001	<0.001	<0.001	<0.001	0.001
Boron	mg/L	5	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.059
Ca/Mg Hardness	mg/L	-	-	48	59	53	61	54	67	52	69	86
Calcium	mg/L	-	-	16.1	20.8	21.4	21.2	19	23.4	18	24.7	31.7
Chloride	mg/L	-	≤ 250	6.2	5.8	5.9	6.1	7.4	7.1	7.7	7.5	8.1
Copper	mg/L	2	1	0.114	0.006	0.017	0.004	0.008	<0.001	<0.001	0.002	<0.001
Fluoride	mg/L	1.5	-	0.5	0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Iron	mg/L	-	≤ 0.3	0.029	0.02	0.005	0.006	0.007	0.034	0.015	0.008	0.005
Lead	mg/L	0.005	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Magnesium	mg/L	-	-	1.9	1.8	2.2	1.9	1.7	2.1	1.6	1.8	1.7
Manganese	mg/L	0.12	≤ 0.02	<0.002	0.006	0.014	0.012	0.004	0.008	0.015	0.007	0.007
Nitrate	mg/L	45	-	<0.2	0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
pH	-	-	7.0-10.5	7.84	8.03	7.98	8.1	8.1	7.95	7.88	7.98	7.97
Potassium	mg/L	-	-	0.1	0.4	0.4	0.5	0.3	0.9	0.1	0.6	0.2
Sodium	mg/L	-	≤ 200	17	14.6	16.5	16.8	16.6	16.1	16	17.1	16.4
Sulphate	mg/L	-	≤ 500	6	5	4	6	5	5	4	4	4
Thallium[4]	mg/L	-	-	-	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Uranium[4]	mg/L	0.02	-	-	-	0.0011	0.0013	0.0035	0.039	0.0029	0.001	0.002
Zinc	mg/L	-	5	0.007	0.002	0.005	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Total Coliforms	cfu/100mL	0	-	0	8*	2	**17**	0	5	5	209	0
E.Coli	cfu/100mL	0	-	0	0	0	0	0	0	1	0	0
Fecal Coliforms	cfu/100mL	-	-	-	-	-	-	-	-	-	-	-

Collection of samples and analysis provided by Saint John Labortory Services Ltd.

Notes:

1. Guidelines for Canadian Drinking Water Quality (GCDWQ) (Health Canada, Sept. 2022).
2. Maximum Allowable Concentration (MAC).
3. Aesthetic Objective (AO) / Operational Guideline (OG).
4. Analysis conducted by RPC in Fredericton, NB

"-" = None established/ not measured.

Results that exceed the AO/OG after 2019 are bold and italic

Results that exceed the MAC after 2019 are shaded.

Results that exceeded the GCDWQ guidelines prior to 2020 are bold and shaded.

Appendix C5-2: General Chemistry, Potable Well

Sample Station	**Units**	**GCDWQ[1]**		**Operations Building**											
Date:		**MAC[2]**	**AO/OG[3]**	**06-Nov-02**	**22-Oct-03**	**01-Oct-04**	**29-Sep-05**	**16-Oct-06**	**05-Oct-07**	**06-Oct-08**	**01-Oct-09**	**23-Sep-10**	**19-Sep-11**	**13-Sep-12**	**10-Oct-13**
Alkalinity	mg/L	-	-	102	84	83	85	83	79	82	82	83	82	84	81
Antimony	mg/L	0.006	-	<0.0005	<0.0004	<0.001	<0.001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Arsenic	mg/L	0.01	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.003	0.003	<0.001
Boron	mg/L	5	-	0.13	<0.1	0.15	<0.1	0.17	0.2	0.16	<0.1	<0.1	0.13	<0.1	<0.1
Ca/Mg Hardness	mg/L	-	-	14	35	34	34	36	34.7	38	37	30	35	66	27
Calcium	mg/L	-	-	5.1	13	12.4	12.6	12.9	12.4	11.9	13.9	10.9	12.5	20.8	9.7
Chloride	mg/L	-	≤ 250	3.7	3.2	3.8	5.2	4.4	3.3	3.2	3.1	3.8	4.1	3.3	3.5
Copper	mg/L	2	1	0.008	0.03	<0.001	<0.001	<0.001	0.005	0.005	0.005	0.001	<0.001	<0.001	0.002
Fluoride	mg/L	1.5	-	0.46	0.7	0.47	0.53	0.38	0.51	0.48	<0.1	0.5	0.7	0.6	0.5
Iron	mg/L	-	≤ 0.3	0.034	0.07	0.04	0.05	0.043	0.04	0.039	0.019	0.072	0.002	0.052	0.053
Lead	mg/L	0.005	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.002	<0.001	<0.001	<0.001
Magnesium	mg/L	-	-	0.26	0.7	0.7	0.7	0.8	0.9	2	0.5	0.7	1	3.3	0.7
Manganese	mg/L	0.12	≤ 0.02	0.012	0.013	0.014	0.01	0.009	0.015	0.008	0.003	0.011	0.007	0.029	0.01
Nitrate	mg/L	45	-	<0.5	<0.05	0.5	<0.5	<0.5	0.09	<0.2	<0.2	0.3	<0.5	<0.5	<0.2
pH	-	-	7.0-10.5	-	8.3	8.4	8.4	8.3	8.2	8.1	8.15	8.2	8.27	8.34	8.14
Potassium	mg/L	-	-	0.3	0.7	0.8	0.6	0.8	0.7	0.5	0.8	0.8	0.2	2.9	1
Sodium	mg/L	-	≤ 200	10.7	28.8	29	30.9	29.9	31.1	29.5	29.9	30	28.9	35.3	29.2
Sulphate	mg/L	-	≤ 500	20.5	<1	11.9	20.1	13.5	14.3	13.6	8.3	14	16	15	14
Thallium[4]	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Uranium[4]	mg/L	0.02	-	-	-	-	-	-	-	-	-	-	-	-	-
Zinc	mg/L	-	5	<0.002	<0.002	<0.002	< 0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.009	0.004	<0.002
Total Coliforms	cfu/100mL	0	-	0	0	0	0	0	0	0	0	**25**	0	0	**55***
E.Coli	cfu/100mL	0	-	0	0	0	0	0	0	0	0	0	0	0	0

Collection of samples and analysis provided by Saint John Labortory Services Ltd.

Notes:

1. Guidelines for Canadian Drinking Water Quality (GCDWQ) (Health Canada, Sept. 2022).
2. Maximum Allowable Concentration (MAC).
3. Aesthetic Objective (AO) / Operational Guideline (OG).
4. Analysis conducted by RPC in Fredericton, NB

"-" = None established/ not measured.

Results that exceed the AO/OG after 2019 are bold and italic

Results that exceed the MAC after 2019 are shaded.

Results that exceeded the GCDWQ guidelines prior to 2020 are bold and shaded.

Appendix C5-2: General Chemistry, Potable Well

Sample Station	Units	GCDWQ[1]		Operations Building								
Date:		MAC[2]	AO/OG[3]	08-Sep-14	31-Aug-15	20-Sep-16	28-Sep-17	27-Sep-18	1-Oct-19	21-Sep-20	28-Sep-21	20-Oct-22
Alkalinity	mg/L	-	-	84	86	86	90	84	84	82	87	83
Antimony	mg/L	0.006	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Arsenic	mg/L	0.01	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Boron	mg/L	5	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.040
Ca/Mg Hardness	mg/L	-	-	39	37	37	39	35	44	31	46	36
Calcium	mg/L	-	-	13.5	13.6	13.2	14.7	12.9	15.9	11.4	17.2	13.4
Chloride	mg/L	-	≤ 250	4.2	3.2	3.6	3.8	3.8	3.3	3.7	2.9	2.9
Copper	mg/L	2	1	<0.001	<0.001	0.007	<0.001	0.01	<0.001	<0.001	<0.001	<0.001
Fluoride	mg/L	1.5	-	0.6	0.6	0.4	0.5	0.5	0.4	0.4	0.4	0.2
Iron	mg/L	-	≤ 0.3	0.029	<0.002	0.041	0.031	0.04	<0.002	0.023	0.039	0.036
Lead	mg/L	0.005	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Magnesium	mg/L	-	-	1.2	0.7	1	0.5	0.7	1.1	0.6	0.8	0.6
Manganese	mg/L	0.12	≤ 0.02	0.016	0.004	0.016	0.014	0.013	0.009	0.011	0.009	0.010
Nitrate	mg/L	45	-	<0.2	0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
pH	-	-	7.0-10.5	8.15	8.21	8.27	8.25	8.1	8.18	7.95	8.09	8.07
Potassium	mg/L	-	-	0.5	0.8	0.8	1.3	0.6	1.3	0.6	1.0	0.2
Sodium	mg/L	-	≤ 200	29.3	27	29.7	31.1	27.8	30.6	29.6	31.2	28.6
Sulphate	mg/L	-	≤ 500	14	14	13	12	14	14	14	13	10
Thallium[4]	mg/L	-	-	-	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Uranium[4]	mg/L	0.02	-	-	-	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Zinc	mg/L	-	5	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Total Coliforms	cfu/100mL	0	-	0	0	2	5	0	6	0	0	0
E.Coli	cfu/100mL	0	-	0	0	0	0	0	0	0	0	0

Collection of samples and analysis provided by Saint John Labortory Services Ltd.

Notes:

1. Guidelines for Canadian Drinking Water Quality (GCDWQ) (Health Canada, Sept. 2022).
2. Maximum Allowable Concentration (MAC).
3. Aesthetic Objective (AO) / Operational Guideline (OG).
4. Analysis conducted by RPC in Fredericton, NB

"-" = None established/ not measured.

Results that exceed the AO/OG after 2019 are bold and italic

Results that exceed the MAC after 2019 are shaded.

Results that exceeded the GCDWQ guidelines prior to 2020 are bold and shaded.

Appendix C5-3: General Chemistry, Potable Well

Sample Station	Units	GCDWQ[1]		Haz Waste Building											
Date:		**MAC[2]**	**AO/OG[3]**	**01-Oct-03**	**01-Oct-04**	**29-Sep-05**	**16-Oct-06**	**05-Oct-07**	**06-Oct-08**	**01-Oct-09**	**23-Sep-10**	**19-Sep-11**	**13-Sep-12**	**10-Oct-13**	**08-Sep-14**
Alkalinity	mg/L	-	-	120	120	160	78	131	134	154	169	190	200	118	236
Antimony	mg/L	0.006	-	<0.001	<0.001	<0.001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Arsenic	mg/L	0.01	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.004	0.004	0.001	<0.001
Boron	mg/L	5	-	0.28	0.28	<0.1	0.56	0.3	0.35	0.28	0.28	0.28	0.19	<0.1	0.17
Ca/Mg Hardness	mg/L	-	-	75	75	128	118	84.8	90	107	121	148	173	63	174
Calcium	mg/L	-	-	26	26	43.9	20.4	29	29.6	37.1	40.9	49.4	54.4	21.2	56.4
Chloride	mg/L	-	≤ 250	15	15	22.4	14	11.3	12.6	12.9	19.6	17.8	16.1	10.3	17.6
Copper	mg/L	2	1	<0.001	<0.001	0.09	0.16	0.015	0.032	0.014	0.038	<0.001	0.031	0.117	0.019
Fluoride	mg/L	1.5	-	0.12	0.12	0.17	<0.1	0.17	0.14	<0.1	0.2	0.2	0.2	0.2	0.2
Iron	mg/L	-	≤ 0.3	0.004	0.004	0.03	0.025	0.009	0.054	0.044	0.136	0.007	0.246	0.02	0.085
Lead	mg/L	0.005	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	<0.001
Magnesium	mg/L	-	-	2.4	2.4	4.5	3.9	3	3.9	3.4	4.6	5.9	9.1	2.4	8.1
Manganese	mg/L	0.12	≤ 0.02	0.005	0.005	**0.1**	**0.64**	**0.7**	**0.49**	0.011	**2.01**	**0.392**	**0.355**	**0.23**	**1.739**
Nitrate	mg/L	45	-	1.6	1.6	4.8	<0.5	<0.5	<0.2	<0.2	<0.2	<0.5	<0.5	<0.2	<0.2
pH	-	-	7.0-10.5	7.9	7.9	7.7	7.5	7.5	7.15	7.1	7.36	7.08	7.12	7.31	6.95
Potassium	mg/L	-	-	0.9	0.9	0.9	1.1	0.9	0.68	1	1	0.1	2.7	1	1.1
Sodium	mg/L	-	≤ 200	31.8	31.8	36.5	29.9	31.9	28.9	20.6	28.5	26.7	31.8	27.7	23.9
Sulphate	mg/L	-	≤ 500	8.9	8.9	10.3	10.5	6.4	6.2	3.1	7	7	7	6	6
Thallium[4]	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Uranium[4]	mg/L	0.02	-	-	-	-	-	-	-	-	-	-	-	-	-
Zinc	mg/L	-	5	<0.002	<0.002	0.005	<0.002	0.01	0.03	0.006	0.014	0.025	0.014	0.006	0.008
Total Coliforms	cfu/100mL	0	-	4	4	0	0	0	0	0	0	0*	0	1*	0
E.Coli	cfu/100mL	0	-	0	0	0	0	0	0	0	0	0	0	0	0

Collection of samples and analysis provided by Saint John Labortory Services Ltd.

Notes:

1. Guidelines for Canadian Drinking Water Quality (GCDWQ) (Health Canada, Sept. 2022).
2. Maximum Allowable Concentration (MAC).
3. Aesthetic Objective (AO) / Operational Guideline (OG).
4. Analysis conducted by RPC in Fredericton, NB

"-" = None established/ not measured.

Results that exceed the AO/OG after 2019 are bold and italic

Results that exceed the MAC after 2019 are shaded.

Results that exceeded the GCDWQ guidelines prior to 2020 are bold and shaded.

Appendix C5-3: General Chemistry, Potable Well

Sample Station	Units	GCDWQ[1]		Haz Waste Building							
Date:		MAC[2]	AO/OG[3]	31-Aug-15	20-Sep-16	28-Sep-17	27-Sep-18	1-Oct-19	21-Sep-20	28-Sep-21	20-Oct-22
Alkalinity	mg/L	-	-	247	265	124	134	119	134	146	116
Antimony	mg/L	0.006	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Arsenic	mg/L	0.01	-	<0.001	<0.001	<0.001	<0.001	<0.001	0.002	<0.001	0.001
Boron	mg/L	5	-	0.104	<0.1	<0.1	<0.1	<0.1	0.106	0.147	0.141
Ca/Mg Hardness	mg/L	-	-	205	241	4	2	9	2	11	20
Calcium	mg/L	-	-	66.9	76.5	1.4	0.5	2.8	0.6	4.1	7.6
Chloride	mg/L	-	≤ 250	15	21.4	16.4	26.4	20.0	52.7	18.3	9.2
Copper	mg/L	2	1	0.023	0.035	0.021	0.081	0.022	0.095	<0.001	0.026
Fluoride	mg/L	1.5	-	0.2	0.1	0.2	0.2	0.2	0.2	0.2	0.1
Iron	mg/L	-	≤ 0.3	<0.002	0.069	0.007	0.008	<0.002	0.351	0.027	0.087
Lead	mg/L	0.005	-	<0.001	<0.001	<0.001	<0.001	<0.001	0.005	<0.001	<0.001
Magnesium	mg/L	-	-	9.2	12	0.2	0.1	0.4	0.1	0.2	0.2
Manganese	mg/L	0.12	≤ 0.02	**2.14**	**2.018**	<0.002	<0.002	<0.002	0.004	<0.002	0.004
Nitrate	mg/L	45	-	0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
pH	-	-	7.0-10.5	7.01	7.03	7.5	7.74	7.65	8.07	7.97	7.95
Potassium	mg/L	-	-	1.9	2.5	0.6	0.5	1.2	0.1	1.0	0.1
Sodium	mg/L	-	≤ 200	18.7	23.7	64.7	72.7	67.4	87	76.7	59.7
Sulphate	mg/L	-	≤ 500	5	4	5	7	5	4	4	5
Thallium[4]	mg/L	-	-	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Uranium[4]	mg/L	0.02	-	-	0.0017	0.0015	0.0005	0.0031	38	0.0039	0.0019
Zinc	mg/L	-	5	0.023	0.022	<0.002	<0.002	<0.002	0.01	<0.002	<0.002
Total Coliforms	cfu/100mL	0	-	0	0	0	0	0	0	1	0
E.Coli	cfu/100mL	0	-	0	0	0	0	0	0	0	0

Collection of samples and analysis provided by Saint John Labortory Services Ltd.

Notes:

1. Guidelines for Canadian Drinking Water Quality (GCDWQ) (Health Canada, Sept. 2022).
2. Maximum Allowable Concentration (MAC).
3. Aesthetic Objective (AO) / Operational Guideline (OG).
4. Analysis conducted by RPC in Fredericton, NB

"-" = None established/ not measured.

Results that exceed the AO/OG after 2019 are bold and italic

Results that exceed the MAC after 2019 are shaded.

Results that exceeded the GCDWQ guidelines prior to 2020 are bold and shaded.

Appendix C5-4: General Chemistry, Potable Well

Sample Station	Units	GCDWQ[1]		Scale House											
Date:		**MAC[2]**	**AO/OG[3]**	**16-Oct-06**	**05-Oct-07**	**06-Oct-08**	**01-Oct-09**	**23-Sep-10**	**19-Sep-11**	**13-Sep-12**	**10-Oct-13**	**08-Sep-14**	**31-Aug-15**	**20-Sep-16**	**28-Sep-17**
Alkalinity	mg/L	-	-	63	61	82	62	60	59	58	62	61	63	59	60
Antimony	mg/L	0.006	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Arsenic	mg/L	0.01	-	<0.001	<0.001	<0.001	**0.011**	**0.05**	**0.05**	**0.012**	**0.043**	**0.057**	**0.056**	**0.038**	**0.042**
Boron	mg/L	5	-	0.13	<0.1	0.16	<0.1	<0.1	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Ca/Mg Hardness	mg/L	-	-	50	50.8	38	51	45	50	70	36	43	52	52	55
Calcium	mg/L	-	-	15.7	15.7	11.9	16.6	13.9	15.7	21	12.2	12.9	16.7	16.4	17.8
Chloride	mg/L	-	≤ 250	5	4.1	3.2	3.7	4.6	5	3.9	4.2	5.2	4.1	3.8	4.1
Copper	mg/L	2	1	<0.001	<0.001	0.005	0.002	0.002	<0.001	0.003	0.002	0.002	<0.001	<0.001	<0.001
Fluoride	mg/L	1.5	-	0.16	0.28	0.48	<0.1	0.3	0.4	0.3	0.3	0.3	0.4	0.2	0.3
Iron	mg/L	-	≤ 0.3	0.017	0.008	0.039	0.01	0.029	<0.002	0.022	0.004	0.005	0.004	0.009	0.01
Lead	mg/L	0.005	-	<0.001	<0.001	<0.001	<0.001	0.008	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Magnesium	mg/L	-	-	2.5	2.8	2	2.3	2.5	2.7	4.3	1.3	2.5	2.6	2.6	2.6
Manganese	mg/L	0.12	≤ 0.02	0.002	0.002	0.008	0.006	0.004	0.005	0.002	0.002	0.007	0.003	0.003	0.003
Nitrate	mg/L	45	-	0.7	<0.5	<0.2	<0.2	<0.2	0.5	<0.5	<0.2	<0.2	0.2	<0.2	<0.2
pH	-	-	7.0-10.5	8.2	8.1	8.1	8.05	8.19	8.05	8.12	7.89	7.78	8.01	7.6	7.71
Potassium	mg/L	-	-	0.6	0.5	0.5	0.6	0.6	0.1	1.7	0.8	0.2	0.9	0.5	0.9
Sodium	mg/L	-	≤ 200	14.4	15.1	29.5	14.3	14.9	12.9	18.5	9.5	14.8	12.9	13.4	14.1
Sulphate	mg/L	-	≤ 500	5.8	14.7	13.6	8	15	16	15	15	15	15	13	14
Thallium[4]	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	<0.001	<0.001
Uranium[4]	mg/L	0.02	-	-	-	-	-	-	-	-	-	-	-	<0.0005	0.0017
Zinc	mg/L	-	5	<0.002	<0.002	<0.002	<0.002	0.003	0.016	<0.002	0.002	0.003	<0.002	<0.002	0.002
Total Coliforms	cfu/100mL	0	-	0	0	0	0	0	0	0	0	0	0	0	0
E.Coli	cfu/100mL	0	-	0	0	0	0	0	0	0	0	0	0	0	0

Collection of samples and analysis provided by
Saint John Labortory Services Ltd.

Notes:

1. Guidelines for Canadian Drinking Water Quality (GCDWQ) (Health Canada, Sept. 2022).
2. Maximum Allowable Concentration (MAC).
3. Aesthetic Objective (AO) / Operational Guideline (OG).
4. Analysis conducted by RPC in Fredericton, NB

"-" = None established/ not measured.

Results that exceed the AO/OG after 2019 are bold and italic

Results that exceed the MAC after 2019 are shaded.

Results that exceeded the GCDWQ guidelines prior to 2020 are bold and shaded.

Appendix C5-4: General Chemistry, Potable Well

Sample Station	Units	GCDWQ[1]		Scale House				
Date:		**MAC[2]**	**AO/OG[3]**	**27-Sep-18**	**1-Oct-19**	**21-Sep-20**	**28-Sep-21**	**20-Oct-22**
Alkalinity	mg/L	-	-	62	62	62	62	61
Antimony	mg/L	0.006	-	<0.002	<0.002	<0.002	<0.002	<0.002
Arsenic	mg/L	0.01	-	**0.049**	**0.026**	0.038	0.031	0.041
Boron	mg/L	5	-	<0.1	<0.1	<0.1	<0.1	0.020
Ca/Mg Hardness	mg/L	-	-	52	63	49	72	58
Calcium	mg/L	-	-	16.5	20.3	15.6	24.8	19.2
Chloride	mg/L	-	≤ 250	4.5	4.3	4.3	3.6	13.4
Copper	mg/L	2	1	<0.001	<0.001	<0.001	<0.001	<0.001
Fluoride	mg/L	1.5	-	0.3	0.2	0.2	0.2	0.1
Iron	mg/L	-	≤ 0.3	0.006	0.033	0.012	<0.002	0.008
Lead	mg/L	0.005	-	<0.001	<0.001	<0.001	<0.001	<0.001
Magnesium	mg/L	-	-	2.5	3.0	2.4	2.5	2.4
Manganese	mg/L	0.12	≤ 0.02	0.002	<0.002	<0.002	<0.002	0.002
Nitrate	mg/L	45	-	<0.2	<0.2	<0.2	<0.2	<0.2
pH	-	-	7.0-10.5	8	7.95	7.8	7.68	7.93
Potassium	mg/L	-	-	0.6	1.6	0.5	0.9	0.3
Sodium	mg/L	-	≤ 200	13.5	17.1	14.2	15.5	14.1
Sulphate	mg/L	-	≤ 500	16	15	14	13	11
Thallium[4]	mg/L	-	-	<0.001	<0.001	<0.001	<0.001	<0.001
Uranium[4]	mg/L	0.02	-	0.0018	0.0016	0.0009	0.0007	0.0022
Zinc	mg/L	-	5	<0.002	<0.002	<0.002	<0.002	<0.002
Total Coliforms	cfu/100mL	0	-	2	1	0	0	0
E.Coli	cfu/100mL	0	-	0	0	0	0	0

Collection of samples and analysis provided by
Saint John Labortory Services Ltd.

Notes:

1. Guidelines for Canadian Drinking Water Quality (GCDWQ) (Health Canada, Sept. 2022).
2. Maximum Allowable Concentration (MAC).
3. Aesthetic Objective (AO) / Operational Guideline (OG).
4. Analysis conducted by RPC in Fredericton, NB

"-" = None established/ not measured.

Results that exceed the AO/OG after 2019 are bold and italic

Results that exceed the MAC after 2019 are shaded.

Results that exceeded the GCDWQ guidelines prior to 2020 are bold and shaded.

Appendix C5-5: General Chemistry, Potable Well

Sample Station	Units	GCDWQ[1]		Compost Building											
Date:		**MAC[2]**	**AO/OG[3]**	**16-Oct-06**	**05-Oct-07**	**06-Oct-08**	**01-Oct-09**	**23-Sep-10**	**19-Sep-11**	**13-Sep-12**	**10-Oct-13**	**08-Sep-14**	**31-Aug-15**	**20-Sep-16**	**28-Sep-17**
Alkalinity	mg/L	-	-	65	65	64	62	64	62	63	64	63	66	65	66
Antimony	mg/L	0.006	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Arsenic	mg/L	0.01	-	<0.001	<0.001	<0.001	<0.001	0.002	0.002	0.003	0.001	<0.001	<0.001	0.001	0.001
Boron	mg/L	5	-	0.13	<0.1	0.16	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Ca/Mg Hardness	mg/L	-	-	66	70.3	61	63	57	64	81	53	54	104	66	68
Calcium	mg/L	-	-	23.4	24.5	19.6	22.4	19.7	22.2	26.3	18.5	18.5	38.3	22.8	24.1
Chloride	mg/L	-	≤ 250	5.4	3.7	4.4	4.4	4.9	5.4	4.1	4.5	4.5	4.2	3.7	4
Copper	mg/L	2	1	0.004	0.022	0.02	0.008	0.004	<0.001	0.014	0.005	0.016	<0.001	0.01	0.011
Fluoride	mg/L	1.5	-	<0.1	0.11	0.1	<0.1	0.2	0.2	0.2	0.1	<0.1	0.2	<0.1	0.1
Iron	mg/L	-	≤ 0.3	0.004	<0.002	0.004	0.02	0.002	<0.002	0.018	<0.002	0.007	<0.002	0.007	0.002
Lead	mg/L	0.005	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Magnesium	mg/L	-	-	1.9	2.2	2.9	1.7	1.8	2	3.7	1.7	1.9	2	2.2	1.8
Manganese	mg/L	0.12	≤ 0.02	<0.002	0.003	<0.002	0.011	0.003	0.006	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Nitrate	mg/L	45	-	<0.5	0.1	<0.2	<0.2	0.3	<0.5	<0.5	0.2	<0.2	0.3	<0.2	<0.2
pH	-	-	7.0-10.5	8.1	7.9	7.7	7.85	8.02	7.95	7.96	7.9	7.76	7.93	7.9	8
Potassium	mg/L	-	-	0.4	0.3	0.1	0.4	0.4	0.1	1	0.6	0.2	0.5	0.4	0.6
Sodium	mg/L	-	≤ 200	8.5	9.9	8.6	8.2	8.1	7.1	11.6	7.9	8.6	6.4	8.4	8.4
Sulphate	mg/L	-	≤ 500	15.4	10.7	11.8	7.3	14	16	14	14	14	14	12	13
Thallium[4]	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	<0.001	<0.001
Uranium[4]	mg/L	0.02	-	-	-	-	-	-	-	-	-	-	-	0.0009	0.0011
Zinc	mg/L	-	5	<0.002	0.003	0.003	<0.002	0.005	0.026	<0.002	0.006	0.01	<0.002	0.003	<0.002
Total Coliforms	cfu/100mL	0	-	0	0	0	3	0	0	1*	0	0	3*	2	2
E.Coli	cfu/100mL	0	-	0	0	0	0	0	0	0	0	0	0	0	0

Collection of samples and analysis provided by Saint John Labortory Services Ltd.

Notes:

1. Guidelines for Canadian Drinking Water Quality (GCDWQ)
2. Maximum Allowable Concentration (MAC).
3. Aesthetic Objective (AO) / Operational Guideline (OG).
4. Analysis conducted by RPC in Fredericton, NB

"-" = None established/ not measured.

Results that exceed the AO/OG after 2019 are bold and italic

Results that exceed the MAC after 2019 are shaded.

Results that exceeded the GCDWQ guidelines prior to 2020 are bold and shaded.

Appendix C5-5: General Chemistry, Potable Well

Sample Station	Units	GCDWQ[1]		Compost Building				
Date:		**MAC[2]**	**AO/OG[3]**	**27-Sep-18**	**1-Oct-19**	**21-Sep-20**	**28-Sep-21**	**20-Oct-22**
Alkalinity	mg/L	-	-	64	64	65	67	64
Antimony	mg/L	0.006	-	<0.002	<0.002	<0.002	<0.002	<0.002
Arsenic	mg/L	0.01	-	0.001	<0.001	0.001	<0.001	0.001
Boron	mg/L	5	-	<0.1	<0.1	<0.1	<0.1	0.013
Ca/Mg Hardness	mg/L	-	-	65	73	59	82	71
Calcium	mg/L	-	-	22.9	25.5	20.9	29.7	25.5
Chloride	mg/L	-	≤ 250	4.4	4.0	4.1	3.5	3.0
Copper	mg/L	2	1	0.004	<0.001	0.004	<0.001	<0.001
Fluoride	mg/L	1.5	-	<0.1	0.1	<0.1	<0.1	<0.1
Iron	mg/L	-	≤ 0.3	<0.002	0.025	<0.002	<0.002	<0.002
Lead	mg/L	0.005	-	<0.001	<0.001	<0.001	<0.001	<0.001
Magnesium	mg/L	-	-	1.9	2.2	1.7	1.9	1.7
Manganese	mg/L	0.12	≤ 0.02	<0.002	<0.002	<0.002	<0.002	<0.002
Nitrate	mg/L	45	-	<0.2	<0.2	<0.2	<0.2	<0.2
pH	-	-	7.0-10.5	7.85	7.85	7.8	7.83	7.88
Potassium	mg/L	-	-	0.4	0.4	0.1	0.8	0.2
Sodium	mg/L	-	≤ 200	8.2	8.5	7.8	10.4	8.0
Sulphate	mg/L	-	≤ 500	15	13	12	12	10
Thallium[4]	mg/L	-	-	<0.001	<0.001	<0.001	<0.001	<0.001
Uranium[4]	mg/L	0.02	-	0.0009	0.001	0.0006	0.0014	0.0012
Zinc	mg/L	-	5	<0.002	<0.002	0.004	<0.002	<0.002
Total Coliforms	cfu/100mL	0	-	25	0	0	3	0
E.Coli	cfu/100mL	0	-	0	0	0	0	0

Collection of samples and analysis provided by Saint John Labortory Services Ltd.

Notes:

1. Guidelines for Canadian Drinking Water Quality (GCDWQ)
2. Maximum Allowable Concentration (MAC).
3. Aesthetic Objective (AO) / Operational Guideline (OG).
4. Analysis conducted by RPC in Fredericton, NB

"-" = None established/ not measured.

Results that exceed the AO/OG after 2019 are bold and italic

Results that exceed the MAC after 2019 are shaded.

Results that exceeded the GCDWQ guidelines prior to 2020 are bold and shaded.

APPENDIX D

Groundwater Elevations

Appendix D: Water Elevations

Well ID	Ground Elevation (m)	Mid-elev. screen (m)	PVC elevation (1999)	Depth to Water (m)																			
				Oct-97	Dec-97	Jan-98	Feb-98	Mar-98	Mar-98	May-98	May-98	May-98	Jun-98	Aug-98	Aug-98	Oct-98	Nov-98	Dec-98	Jan-99	Feb-99	Oct-97	Dec-97	Jan-98
17 D	84.72	75.87	85.37						2.84					3.945			1.53						
17 S	84.64	81.49	85.53						2.432					2.704			2.33						
18	71.91	64.76	72.77						1.103					1.796			0.96						
22 S	65.04	51.39	65.77						1.068					1.343			0.77						
22 D	64.99	49.34	65.82						0.975					1.642			0.83						
31 S	78.52	75.58	79.08	0.385					0.793					1.715		0.385	0.731				-0.18		
31 U	78.52	70.14	79.08	1.44					0.914					1.689		1.44	0.817				0.88		
31 L	78.52	60.23	79.07	2.82										1.58		2.82	0.65				2.27		
32 U1	67.33	63.82	68.22	2.371					1.779							2.371	1.74				1.48		
32 L	67.33	60.47	68.21	2.3					1.909							2.3	1.619				1.43		
33 S	65.4	63.06	66.4	2.228	2.087	2.033	2.208	1.974	2.338	2.222		2.604	2.71	3.45	2.912	2.228	2.44	2.686	2.563	2.726	1.22	1.08	1.03
33 U	65.4	56.86	66.23	2.161	1.95	1.874	2.06	1.827	2.202	2.068		2.468	2.45	2.971	2.715	2.161	2.25	2.513	2.384	2.529	1.33	1.12	1.04
34 S	64.77	62	65.84	4.219	2.73	2.8	2.962	2.884	2.994	2.976		3.205	3.32	3.588	3.82	4.219	3.17	3.347	3.505	3.668	3.15	1.66	1.73
34 U	64.77	52.58	65.37	4.47	4.182	4.208	4.267	4.003	4.352	4.255		4.345	3.35	4.429	4.764	4.47	4.16	4.501	4.178	4.566	3.87	3.58	3.6
35 S1	63.89	57.8	64.59	2.818	2.425	2.45	2.488	2.438	2.54	2.447		2.624	2.72	2.949	2.862	2.818	2.68	2.865	2.911	3.073	2.12	1.72	1.75
35 S2	63.86	54.72	64.65	2.612	2.446	2.461	2.513	2.398	2.562	2.465		2.611		2.91	2.893	2.612	2.673	2.798	2.81	3.019	1.82	1.66	1.67
35 L	63.88	42.7	64.46	4.252	1.601	1.583	1.632	1.395	1.681	1.616		1.803	1.888	2.14	2.024	4.252	1.945	2.115	1.952	2.19	3.68	1.02	1.01
36 S	62.12	59.07	63.16	2.32					2.53					2.915		2.32	2.29				1.28		
36 U	62.12	49.92	62.37	2.067					1.186					1.655		2.067	1.14				1.82		
36 L	62.12	40.76	62.35	20.028					4.168					2.77		20.028	4.53				19.8		
37 S	61.8	56.46	62.84	2.102					2.388					2.822		2.102	2.11				1.06		
37 A	62.08	0	62.67																				
38 S	62.43	56.33	63.34	3.123	2.973	2.973	3.022	2.779	3.15	3.031			3.23	2.53	3.41	3.123	2.87	3.322	3.084	3.384	2.21	2.06	2.06
38 U	62.43	48.25	63.43	3.562	3.174	3.385	3.418	3.249	3.55	3.541			3.64	4.856	4.486	3.562	3.672	4.476	3.476	4.481	2.56	2.17	2.38
38 L	62.43	42.31	63.39	3.873	3.265	3.29	3.388	3.253	3.462	3.456			3.58	3.799	4.152	3.873	3.722	4.65	3.44	4.556	2.92	2.31	2.33
39 S	61.65	58.3	62.53	3.524					3.573					3.58		3.524	3.5				2.64		
39 A	60.78	0	61.36																				
40 S	60.69	54.6	61.48	3.38					2.398					2.396		3.38	3.5				2.59		
40 U	60.85	42.57	61.15	0.991									0.785	1.028		0.991	0.77				0.7		
41 S	58.53	57.01	59.56	1.62	1.508	1.485	1.535	1.437	1.543	1.505		1.647	1.58	1.779	1.68	1.65	1.44	1.714	1.48	1.659	0.62	0.48	0.45
41U	58.53	42.93	59.51	1.59	1.451	1.42	1.48	1.378	1.493	1.455		1.595	1.535	1.735	1.64	1.59	1.52	1.551		1.557	0.61	0.47	0.44
41L	58.53	39.48	59.49	1.378	1.222	1.19	1.225	1.121	1.276	1.197		1.378	1.315	1.58	2.7	1.378	1.15	1.273			0.42	0.26	0.23
42 S	60	58.02	61.1	1.711					1.294					2.29		1.711	3.05				0.61		
42 U	60	50.85	61.06	1.533										3.58		1.533	0.901				0.47		
42 L	60	42.15	61.02	1.259					0.285					1.144		1.259	0.38				0.24		
43 S	71.27	69.14	72	1.405					1.072					1.651		1.405	0.93				0.67		
43 U	71.27	63.2	71.53	2.938					0.649					1.023		2.938	0.48				2.68		
44 S	65.79	64.19	66.68	2.39					1.573					2.529		2.39	1.38				1.5		
44 U	65.79	59.7	66.14	6.4					1.305					2.225		6.4	1.18				6.05		
45 U	66.75	61.17	67.88	2.41					1.685					1.975		1.84	1.08				1.28		
45 L	66.75	48.14	67.88	1.84					1.251					2.55		22.41	1.55				0.71		
46 U	58.06	54.25	58.79	1.263					1.089					1.525		1.263	1				0.53		
46 L	58.06	47.55	58.73	1.174					0.887					1.376		1.174	0.75				0.5		
47 S	51.16	49.43	51.81	1.075					0.994		1.04			1.32		1.075	0.98				0.42		
47 U	51.16	44.4	51.81	1.092					1.008		1.044			1.33		1.092	0.985				0.44		
47 L	51.16	35.77	51.84	2.075							0.878			1.124		2.075	0.935				1.39		
48 S	35.17	33.8	36.09	0.853					0.65					0.945		0.853	0.68				-0.07		
48 U	35.09	30.52	36	0.737					0.021					0.871		0.737	0.6				-0.17		
48 L	35.02	22.53	35.88	0.444					1.025					0.519		0.444	0				-0.42		
49 S	46.5	43.68	47.41	1.556					1.385		1.385			1.666		1.556	1.353				0.65		
49 U	46.5	34.15	47.39	1.335					1.068		1.046			1.393		1.335	1.035				0.44		
49 L	46.5	31.12	47.47	0.762							0.262			0.718		0.762					-0.21		
50 S	56.02	54.35	56.99	1.07					0.817					1.145		1.07	0.66				0.1		
50 U	56.02	49.93	56.96	1.03					0.75					1.5		1.03	0.62				0.09		
50 L	56.02	42.01	56.9	0.945					0.625					1.105		0.945	0.55				0.07		
51 D	64.36	40.16	64.96																				
51 S1	64.37	56.75	65.17																				
51 S2	64.36	52.78	64.96																				
52 S	77.28	69.66	78.08																				
52 D	77.4	61.85	78.29																				
53 D	101.99	92.75	102.71																				
54 S																							
54 U																							

Appendix D: Water Elevations

Well ID	Ground Elevation (m)	Mid-elev. screen (m)	PVC elevation (1999)	Depth to Water (m)																			
				Feb-98	Mar-98	May-98	May-98	May-98	May-98	Jun-98	Aug-98	Aug-98	Oct-98	Oct-97	Dec-97	Jan-98	Feb-98	Mar-98	Mar-98	May-98	May-98	May-98	Jun-98
17 D	84.72	75.87	85.37			2.19					3.29								82.53				
17 S	84.64	81.49	85.53			1.54					1.81								83.14				
18	71.91	64.76	72.77			0.24					0.94								71.67				
22 S	65.04	51.39	65.77			0.34					0.61								64.7				
22 D	64.99	49.34	65.82			0.15					0.81								64.85				
31 S	78.52	75.58	79.08			0.23					1.15		-0.18	78.7					78.29				
31 U	78.52	70.14	79.08			0.35					1.13		0.88	77.64					78.17				
31 L	78.52	60.23	79.07								1.03		2.27	76.25									
32 U1	67.33	63.82	68.22			0.89					-0.89		1.48	65.85					66.44				
32 L	67.33	60.47	68.21			1.03					-0.88		1.43	65.91					66.3				
33 S	65.4	63.06	66.4	1.2	0.97	1.33	1.22		1.6	1.71	2.45	1.91	1.22	64.17	64.32	64.37	64.19	64.43	64.06	64.18		63.8	63.69
33 U	65.4	56.86	66.23	1.23	1	1.37	1.24		1.64	1.62	2.14	1.89	1.33	64.07	64.28	64.35	64.17	64.4	64.03	64.16		63.76	63.78
34 S	64.77	62	65.84	1.89	1.81	1.92	1.91		2.13	2.25	2.52	2.75	3.15	61.62	63.11	63.04	62.88	62.96	62.85	62.86		62.64	62.52
34 U	64.77	52.58	65.37	3.66	3.4	3.75	3.65		3.74	2.75	3.83	4.16	3.87	60.9	61.19	61.17	61.11	61.37	61.02	61.12		61.03	62.02
35 S1	63.89	57.8	64.59	1.79	1.74	1.84	1.75		1.92	2.02	2.25	2.16	2.12	61.77	62.17	62.14	62.1	62.15	62.05	62.14		61.97	61.87
35 S2	63.86	54.72	64.65	1.72	1.61	1.77	1.67		1.82		2.12	2.1	1.82	62.04	62.2	62.19	62.14	62.25	62.09	62.19		62.04	
35 L	63.88	42.7	64.46	1.06	0.82	1.1	1.04		1.23	1.31	1.56	1.45	3.68	60.2	62.86	62.87	62.83	63.06	62.78	62.84		62.65	62.57
36 S	62.12	59.07	63.16			1.49					1.87		1.28	60.84					60.63				
36 U	62.12	49.92	62.37			0.94					1.41		1.82	60.3					61.18				
36 L	62.12	40.76	62.35			3.94					2.54		19.8	42.32					58.18				
37 S	61.8	56.46	62.84			1.35					1.78		1.06	60.74					60.46				
37 A	62.08	0	62.67																				
38 S	62.43	56.33	63.34	2.11	1.86	2.23	2.11			2.31	1.61	2.49	2.21	60.22	60.37	60.37	60.32	60.56	60.19	60.31			60.11
38 U	62.43	48.25	63.43	2.41	2.247	2.54	2.53			2.63	3.85	3.48	2.56	59.87	60.26	60.05	60.02	60.19	59.88	59.89			57.79
38 L	62.43	42.31	63.39	2.43	2.3	2.5	2.5			2.62	2.84	3.19	2.92	59.51	60.12	60.1	60	60.13	59.92	59.93			59.81
39 S	61.65	58.3	62.53			2.69					2.7		2.64	59					58.95				
39 A	60.78	0	61.36																				
40 S	60.69	54.6	61.48			1.61					1.61		2.59	58.1					59.08				
40 U	60.85	42.57	61.15							0.49	0.73		0.7	60.15									60.36
41 S	58.53	57.01	59.56	0.5	0.41	0.51	0.47		0.62	0.55	0.75	0.65	0.62	57.91	58.05	58.08	58.03	58.12	58.02	58.06		57.91	57.98
41U	58.53	42.93	59.51	0.5	0.4	0.51	0.48		0.62	0.56	0.76	0.66	0.61	57.92	58.06	58.09	58.03	58.1	58.02	58.06		57.92	57.98
41L	58.53	39.48	59.49	0.26	0.16	0.32	0.24		0.42	0.35	0.62	1.74	0.42	58.11	58.27	58.3	58.27	58.37	58.21	58.29		58.11	58.18
42 S	60	58.02	61.1			0.19					1.19		0.61	59.39					59.81				
42 U	60	50.85	61.06								2.52		0.47	59.53									
42 L	60	42.15	61.02			-0.74					0.12		0.24	59.76					60.74				
43 S	71.27	69.14	72			0.34					0.92		0.67	70.6					70.93				
43 U	71.27	63.2	71.53			0.39					0.76		2.68	68.59					70.88				
44 S	65.79	64.19	66.68			0.68					1.64		1.5	64.29					65.11				
44 U	65.79	59.7	66.14			0.96					1.88		6.05	59.74					64.84				
45 U	66.75	61.17	67.88			0.56					0.85		0.71	65.47					66.2				
45 L	66.75	48.14	67.88			0.12					1.42		21.28	66.04					66.63				
46 U	58.06	54.25	58.79			0.36					0.8		0.53	57.53					57.7				
46 L	58.06	47.55	58.73			0.22					0.71		0.5	57.56					57.84				
47 S	51.16	49.43	51.81			0.34		0.39			0.67		0.42	50.74					50.82		50.77		
47 U	51.16	44.4	51.81			0.36		0.39			0.68		0.44	50.72					50.8		50.77		
47 L	51.16	35.77	51.84					0.2			0.44		1.39	49.77							50.96		
48 S	35.17	33.8	36.09			-0.27					0.02		-0.07	35.24					35.44				
48 U	35.09	30.52	36			-0.89					-0.04		-0.17	35.26					35.98				
48 L	35.02	22.53	35.88			0.17					-0.34		-0.42	35.44					34.86				
49 S	46.5	43.68	47.41			0.48		0.48			0.76		0.65	45.85					46.03		46.03		
49 U	46.5	34.15	47.39			0.18		0.16			0.5		0.44	46.06					46.32		46.34		
49 L	46.5	31.12	47.47					-0.71			-0.25		-0.21	46.71							47.21		
50 S	56.02	54.35	56.99			-0.15					0.18		0.1	55.92					56.17				
50 U	56.02	49.93	56.96			-0.19					0.56		0.09	55.93					56.21				
50 L	56.02	42.01	56.9			-0.25					0.23		0.07	55.96					56.28				
51 D	64.36	40.16	64.96																				
51 S1	64.37	56.75	65.17																				
51 S2	64.36	52.78	64.96																				
52 S	77.28	69.66	78.08																				
52 D	77.4	61.85	78.29																				
53 D	101.99	92.75	102.71																				
54 S																							
54 U																							

Appendix D: Water Elevations

Well ID	Ground Elevation (m)	Mid-elev. screen (m)	PVC elevation (1999)	Groundwater Elevation (m)																			
				Aug-98	Aug-98	Oct-98	Nov-98	Dec-98	Jan-99	Feb-99	Mar-99	Apr-99	May-99	Jun-99	Jul-99	Aug-99	Sep-99	Oct-99	Nov-99	Dec-99	Feb-00	Sep-00	Nov-00
17 D	84.72	75.87	85.37	81.43			83.84																
17 S	84.64	81.49	85.53	82.83			83.2									83.12			83.13				
18	71.91	64.76	72.77	70.97			71.81									71.68			71.68				
22 S	65.04	51.39	65.77	64.43			65									64.85			64.98				
22 D	64.99	49.34	65.82	64.18			64.99									64.9			64.84				
31 S	78.52	75.58	79.08	77.37		78.7	78.35					78.2				78.35			78.22			78.21	
31 U	78.52	70.14	79.08	77.39		77.64	78.26					78.14				78.16			78.19			78.13	
31 L	78.52	60.23	79.07	77.49		76.25	78.42					78.23				78.25			78.41			78.23	
32 U1	67.33	63.82	68.22	68.22		65.85	66.48					66.152				66.29			66.05				
32 L	67.33	60.47	68.21	68.21		65.91	66.59					66.248				66.35			66.24				
33 S	65.4	63.06	66.4	62.95	63.49	64.17	63.96	63.72	63.84	63.676	63.94	63.872	64	63.75	63.47	63.88	64.02	64	63.99	63.94			
33 U	65.4	56.86	66.23	63.26	63.51	64.07	63.98	63.72	63.84	63.699	64.02	63.878	63.98	63.74	63.52	63.85	64.05	64.02	63.99	63.97	64.71	65.35	66.23
34 S	64.77	62	65.84	62.25	62.02	61.62	62.67	62.49	62.34	62.17	62.33	62.8	62.59	62.43	62.21	62.24	62.51	62.77	62.81	63	62.89	62.29	63.02
34 U	64.77	52.58	65.37	60.94	60.61	60.9	61.21	60.87	61.2	60.81	60.82	61.133	60.97	60.52	60.54	60.72	61.01	61.22	61.15	61.16	61	60.92	61.17
35 S1	63.89	57.8	64.59	61.64	61.73	61.77	61.91	61.73	61.68	61.52	61.52	62.13	62.09	61.91	61.62	61.84	61.98	62.21	62.23	62.27	61.97	62	62.16
35 S2	63.86	54.72	64.65	61.74	61.76	62.04	61.98	61.85	61.84	61.63	61.8	62.16	62.15	61.98	61.64	61.93	62.03	62.2	63.32	62.32	62.02	61.76	62.23
35 L	63.88	42.7	64.46	62.32	62.43	60.2	62.51	62.34	62.51	62.27	62.41	62.667	62.56	62.29	62.14	62.29	62.5	62.71	62.65	62.71	62.63	62.56	62.46
36 S	62.12	59.07	63.16	60.25		60.84	60.87					60.49				60.86			60.71			62.29	
36 U	62.12	49.92	62.37	60.71		60.3	61.23					61.176				61.19			61.04			61.07	
36 L	62.12	40.76	62.35	59.58		42.32	57.82					57.867				53.89			53002			55.08	
37 S	61.8	56.46	62.84	60.02		60.74	60.73					60.444				60.69			60.78			60.61	
37 A	62.08	0	62.67																58.56				
38 S	62.43	56.33	63.34	60.81	59.93	60.22	60.47	60.02	60.26	59.96	60.42	60.16	60.44	59.93	59.77	60.47	60.59	60.52	60.51	60.45	59.14	60.39	
38 U	62.43	48.25	63.43	58.58	58.95	59.87	59.76	58.96	59.96	58.95	59.55	59.524	59	57.86	58.08	58.41	58.73	59.3	59.15	59.18		58.6	58.83
38 L	62.43	42.31	63.39	59.59	59.23	59.51	59.66	58.74	59.95	58.83	59.46	59.525	58.91	57.9	58.04	58.31	58.72	59.31	59.08	59.14		58.64	
39 S	61.65	58.3	62.53	58.95		59	59.03					58.956							62.53	62.53			
39 A	60.78	0	61.36																59.03				
40 S	60.69	54.6	61.48	59.08		58.1	57.98					59.119				59.14			59.15			59.1	
40 U	60.85	42.57	61.15	60.12		60.15	60.38					60.175				60.1			60.33				
41 S	58.53	57.01	59.56	57.78	57.88	57.91	58.12	57.85	58.08	57.9	58.08	57.99	58.1	57.84	57.94	58.04	58.05	58.08	58.05	58.01	58.04	58.6	58
41U	58.53	42.93	59.51	57.78	57.87	57.92	57.99	57.96		57.95	58.13	58.06	58.16	57.88	57.98	58.1	58.11	58.13	58.12	58.06	57.99	57.05	58.07
41L	58.53	39.48	59.49	57.91	56.79	58.11	58.34	58.22			58.39	58.28	58.38	58.06	58	58.34	58.35	58.37	58.34	58.33		58.3	
42 S	60	58.02	61.1	58.81		59.39	58.05					59.74				59.85			59.83			59.75	
42 U	60	50.85	61.06	57.48		59.53	60.16					59.95				60.08			60.19				
42 L	60	42.15	61.02	59.88		59.76	60.64					60.3				60.39			51.11				
43 S	71.27	69.14	72	70.35		70.6	71.07					70.7				71.02			70.86				
43 U	71.27	63.2	71.53	70.51		68.59	71.05					70.71				70.99			70.8			70.8	
44 S	65.79	64.19	66.68	64.15		64.29	65.3					65.15				65.12			65.15				
44 U	65.79	59.7	66.14	63.92		59.74	64.96					64.8				64.77			64.84				
45 U	66.75	61.17	67.88	65.91		66.04	66.8					66.64				66.68			66.7			66.58	
45 L	66.75	48.14	67.88	65.33		45.47	66.33					66.14				66.19			66.26			66.23	
46 U	58.06	54.25	58.79	57.27		57.53	57.79					57.66				57.69			57.67				
46 L	58.06	47.55	58.73	57.35		57.56	57.98					57.81				57.84			57.88				
47 S	51.16	49.43	51.81	50.49		50.74	50.83					50.64				51.01			50.71				
47 U	51.16	44.4	51.81	50.48		50.72	50.83					50.63				50.14			50.81				
47 L	51.16	35.77	51.84	50.72		49.77	50.91					50.69				49.99			50.84				
48 S	35.17	33.8	36.09	35.15		35.24	35.41					35.25				35.29			35.32				
48 U	35.09	30.52	36	35.13		35.26	35.4					35.29				35.259			35.31	35.35			
48 L	35.02	22.53	35.88	35.36		35.44						35.63				35.56			35.78				
49 S	46.5	43.68	47.41	45.74		45.85	46.06					45.95				46.02			46.06				
49 U	46.5	34.15	47.39	46		46.06	46.36					46.33				46.3			46.38				
49 L	46.5	31.12	47.47	46.75		46.71						47.02				47.18			47.25				
50 S	56.02	54.35	56.99	55.85		55.92	56.33					56.1				56.13			56.16			56.09	
50 U	56.02	49.93	56.96	55.46		55.93	56.34					56.14				56.17			56.39			56.11	
50 L	56.02	42.01	56.9	55.8		55.96	56.35					55.98				56.17			56.2			55.99	
51 D	64.36	40.16	64.96																				
51 S1	64.37	56.75	65.17																				
51 S2	64.36	52.78	64.96																				
52 S	77.28	69.66	78.08																				
52 D	77.4	61.85	78.29																				
53 D	101.99	92.75	102.71																				
54 S																							
54 U																							

Appendix D: Water Elevations

Well ID	Ground Elevation (m)	Mid-elev. screen (m)	PVC elevation (1999)	Groundwater Elevation (m)																			
				Feb-01	Apr-01	Jul-01	Sep-01	Feb-02	Apr-02	Sep-02	Dec-02	Feb-03	Apr-03	Jul-03	Sep-03	Dec-03	Apr-04	Jul-04	Sep-04	Nov-04	Feb-05	Apr-05	Jul-05
17 D	84.72	75.87	85.37																				
17 S	84.64	81.49	85.53																				
18	71.91	64.76	72.77																				
22 S	65.04	51.39	65.77																				
22 D	64.99	49.34	65.82																				
31 S	78.52	75.58	79.08		78.27	78.27	78.27		78.3	78.22			78.13		78.25		78.23		77.1			78.26	
31 U	78.52	70.14	79.08		78.17	78.17	78.17		78.18	78.13			78.05		78.12		78.13		77.9			78.08	
31 L	78.52	60.23	79.07		78.27	78.27	78.27		78.22	78.24			78.29		78.19		78.26		78.02			78.62	
32 U1	67.33	63.82	68.22												65.85								
32 L	67.33	60.47	68.21												65.98								
33 S	65.4	63.06	66.4												63.88				63.7	63.87	62.96	66.402	
33 U	65.4	56.86	66.23	63.88	63.99	63.76	63.23	64.41	64.09	64.11	63.93	63.7	64.73	63.79	63.83	63.97	64.01	63.89	63.73	63.1	62.26	63.908	63.74
34 S	64.77	62	65.84	63.16	63.19	60.91	62.31	63.62	63.28	63.2	63.3	62.94	63.14	62.94	62.93	63.04	63.24	62.87	63.04	61.47	61.07	63.34	62.65
34 U	64.77	52.58	65.37	60.89	61.16	61.97	60.57	60.87	60.77	60.84	60.82	59.65	64.02	60.74	60.94	60.09	60.62	61.01	60.67	62.37	61.91	61.473	61.3
35 S1	63.89	57.8	64.59	61.49	62.19	61.85	62.13	62.49	62.21	62.15	62.12	61.59	62.04	61.83	62.14	62.21	62.15	62.07	62.36	62.37	62.02	62.39	62.19
35 S2	63.86	54.72	64.65	61.75	62.33	61.92	61.95	62.3	62.26	60.65	62.4	60.45	62.29	61.93	62.11	62.26	62.23	62.18	61.89	62.65	62.62	62.46	62.18
35 L	63.88	42.7	64.46	61.96	62.47	62.16	61.46	62.56	62.45	62.51	62.36	61.86	62.44	61.96	62.38	62.47	62.37	62.59	62.56			62.647	62.5
36 S	62.12	59.07	63.16		60.52		60.56		60.92	60.71			60.64		60.64		60.79		60.62			60.82	
36 U	62.12	49.92	62.37		60.93		60.77		60.93	60.93			60.926		60.99		61.026		60.916			61.316	
36 L	62.12	40.76	62.35		60.05		60.32		61.04	60.86			60.897		60.91		61.107		61.047			61.247	
37 S	61.8	56.46	62.84		60.71		60.26		60.79	60.86			60.824		60.89		61.104		60.789			61.194	
37 A	62.08	0	62.67																				
38 S	62.43	56.33	63.34		60.51		60.25		60.89	60.83			60.633		60.77		60.913		60.843			63.343	
38 U	62.43	48.25	63.43	58.23	58.75	56.94	57.32	57.17	57.33	57.87	57.18	56.95	56.99	57.72	58.91		56.99	58.98	59.53	59.93	59.78	59.734	59.34
38 L	62.43	42.31	63.39				57.12		57.03	57.82			60.65		58.5		56.79		60.59			59.805	
39 S	61.65	58.3	62.53																				
39 A	60.78	0	61.36																				
40 S	60.69	54.6	61.48		59.09		59.02		56.98	59.04			58.279		59.04		59.049		58.879			59.039	
40 U	60.85	42.57	61.15				59.8								60.31		60.045		60.115			60.335	
41 S	58.53	57.01	59.56	57.9	58.16	57.67	57.91	58.04	57.96	57.86	58.26		57.73	57.9	57.68		57.91	57.64	56.67	57.79	57.87	57.885	58.69
41U	58.53	42.93	59.51	57.86	57.91	57.81	58.01		58.01	57.29	57.91	56.54	57.73	57.84	57.96	57.93	57.93	57.81	57.78	57.8	57.95	57.95	57.74
41L	58.53	39.48	59.49		58.24		55		58.1	58.02			57.99		58.15		58.11		57.9			58.14	
42 S	60	58.02	61.1		59.67		59.92		59.7	59.76			59.5		59.66		59.7		59.49			59.62	
42 U	60	50.85	61.06				59.79		59.91						59.93		59.94		59.7			61.06	
42 L	60	42.15	61.02				59.81		60.31						60.13		60.23		60.05			61.02	
43 S	71.27	69.14	72		70.95		70.9		70.9	70.8			70.9		70.92		70.9		70.72			70.95	
43 U	71.27	63.2	71.53		70.73		70.78		70.79	70.78			70.83		70.74		70.81		70.705			70.83	
44 S	65.79	64.19	66.68																				
44 U	65.79	59.7	66.14																				
45 U	66.75	61.17	67.88		65.74		65.53		65.77	65.88			65.76		65.81		65.87		65.68			65.88	
45 L	66.75	48.14	67.88		66.08		65.77		66.09	66.13			58.68		65.78		65.98		65.98			66.06	
46 U	58.06	54.25	58.79				57.48								57.72				57.45			58.79	
46 L	58.06	47.55	58.73				57.53								57.47				57.66			58.73	
47 S	51.16	49.43	51.81				50.51								50.52				50.24			51.81	
47 U	51.16	44.4	51.81				50.64								50.56				50.315			51.81	
47 L	51.16	35.77	51.84				50.72								50.65				50.46			51.84	
48 S	35.17	33.8	36.09												35.09				35.15			36.09	
48 U	35.09	30.52	36				35.08								35.06				35.165			36	
48 L	35.02	22.53	35.88				35.52								35.88				35.88			35.88	
49 S	46.5	43.68	47.41				45.87								45.99				46.26			47.41	
49 U	46.5	34.15	47.39				46.15								46.2				45.89			47.39	
49 L	46.5	31.12	47.47				46.92								46.97				46.875			47.47	
50 S	56.02	54.35	56.99		56.14		56.04		56.14	56.09			56.04		56.01				56.12	59.93		56.1	
50 U	56.02	49.93	56.96		56.21		56.04		56.16	56.08			55.98		56.03		56.06		55.98	62.08		56.16	
50 L	56.02	42.01	56.9		56.17		55.92		56.12	56.07			55.92		55.98		55.99		55.98	61.77		48.2	
51 D	64.36	40.16	64.96						61.36	59.94			63.61		59.76		59.88		59.78	76.2		59.96	
51 S1	64.37	56.75	65.17						62.37	62.42			62.43		62.37		62.32		62.27	75.56		62.37	
51 S2	64.36	52.78	64.96						62.01	62.18			62.1		61.95		62.09		61.91	99.01		62.15	
52 S	77.28	69.66	78.08						76.87	76.98			76.78		76.93		76.88		76.79			76.89	
52 D	77.4	61.85	78.29						76.72	76.92			76.84		76.9		76.84		76.875			76.94	
53 D	101.99	92.75	102.71						99.23	98.99			98.55		98.06		99.18		98.18			99.32	
54 S																							
54 U																							

Appendix D: Water Elevations

Well ID	Ground Elevation (m)	Mid-elev. screen (m)	PVC elevation (1999)	Groundwater Elevation (m)																			
				Sep-05	Nov-05	Mar-06	Apr-06	Jul-06	Sep-06	Nov-06	Feb-07	Apr-07	Jul-07	Sep-07	Nov-07	Feb-08	Apr-08	Jul-08	Sep-08	Feb-09	Apr-09	Jul-09	Sep-09
17 D	84.72	75.87	85.37																				
17 S	84.64	81.49	85.53																				
18	71.91	64.76	72.77																				
22 S	65.04	51.39	65.77																				
22 D	64.99	49.34	65.82																				
31 S	78.52	75.58	79.08	78.13	79.08		78.26		78.2			78.2		77.63			78.21		78.18		78.08		78.1
31 U	78.52	70.14	79.08	77.87	79.08		78.12		77.93			78.14		77.57			78.14		77.93		78.03		77.89
31 L	78.52	60.23	79.07	78.15	79.07		78.2		78.18			78.21		77.67			78.22		78.11		78.22		77.97
32 U1	67.33	63.82	68.22									65.88		65.58			66.02		65.872		65.937		65.942
32 L	67.33	60.47	68.21																				
33 S	65.4	63.06	66.4	63.78	66.4		63.92	63.92	63.74					63.76			63.83		62.887		63.902		63.502
33 U	65.4	56.86	66.23	63.81	64.04	63.72	64.15	63.93	63.83	63.88	63.88	63.99	63.8	63.83	62.9	63.83	64.15	63.878	63.628	63.868	63.888	63.938	63.818
34 S	64.77	62	65.84	62.97	63.42	63.09	63.31	63.37	63.2	63.28	62.39	63.05	62.65	63.1	63.44	63.04	63	63.19	63.11	63.23	63.24	63.48	62.8
34 U	64.77	52.58	65.37	61.43	61.66	61.44	61.51	61.77	61.61	61.76	61.32	61.58	61.46	61.38	61.77	61.45	61.52	61.513	62.603		61.523	61.723	61.663
35 S1	63.89	57.8	64.59	61.94	62.31	62.04	62.25	62.53	62.35	62.58	61.96	62.28	62.45	62.13	62.34	62.43	62.38		62.49		62.69		
35 S2	63.86	54.72	64.65	62.73	62.4	62.08	62.35	62.56	62.37	62.52	61.8	62.41	61.91	62.11			62.25	62.52	62.52	62.69	62.55		
35 L	63.88	42.7	64.46	62.51	62.75	62.57	62.67	62.88	62.64	62.79	62.46	62.65	62.69	63.31	62.59	62.71	62.81	62.767	62.697	62.747	62.747	62.927	62.677
36 S	62.12	59.07	63.16	60.66	63.16		62.08		60.9			60.89		60.96			61		61.06		60.91		60.87
36 U	62.12	49.92	62.37	60.67	62.37		61.2		61.17			61.03		61.01			61.11		61.036		61.256		61.036
36 L	62.12	40.76	62.35	61.02	62.35		61.27		60.78			61.31		60.8			61.28		59.057		61.347		61.047
37 S	61.8	56.46	62.84	60.91	62.84		61.15		61.04			61.18		61.17			61.17		61.054		61.044		60.954
37 A	62.08	0	62.67																				
38 S	62.43	56.33	63.34	59.88	63.34		61.04		60.82			61.03		61.06			61		60.773		60.793		60.733
38 U	62.43	48.25	63.43	59.67	59.91	59.95	60.06	60.03	59.96	60.07	59.65	60.01	59.53	59.98	60.12	59.89	60.02	59.934	59.909	60.234	59.984	59.964	60.054
38 L	62.43	42.31	63.39	59.7	63.39		59.94		59.88			59.94		60.04			60.43		59.837		60.095		59.905
39 S	61.65	58.3	62.53																				
39 A	60.78	0	61.36																				
40 S	60.69	54.6	61.48	58.97	61.48		58.98		59.05			59.12	57.73	59.03			59.16		59.029		58.919		59.009
40 U	60.85	42.57	61.15	60.04	61.15		61.15		60.31			60.34	57.59	60.2			61.07		60.16		60.345		60.055
41 S	58.53	57.01	59.56	57.86	57.93		57.86	57.86	.57.81	57.91		57.83		57.71	57.81	57.77	57.75	57.72	57.74		57.74	57.77	57.71
41U	58.53	42.93	59.51	57.77	57.76	57.81	57.91	58.01	57.84	57.93	57.47	57.87		57.82	57.89	58.04	58.03	57.83	57.795	58.03	57.92	57.97	57.95
41L	58.53	39.48	59.49	57.99	59.49		58.04		58.09			58.08		58.02			57.99		57.89		58.1		57.92
42 S	60	58.02	61.1	59.42	61.1		59.55		59.52			59.57		59.57			59.55		59.65		59.6	59.42	59.42
42 U	60	50.85	61.06	61.06	61.06				59.69			59.81		59.69			59.46		59.77		59.47		59.74
42 L	60	42.15	61.02	59.85	61.02				60.01			59.57		59.9			60.04		60.195		59.44		60.06
43 S	71.27	69.14	72	70.3	72		70.94		71.25			70.85		70.8			70.86		70.84		70.85		70.75
43 U	71.27	63.2	71.53	69.67	71.53		70.78		70.43			70.78		70.71			70.7		70.806		70.68		70.68
44 S	65.79	64.19	66.68									64.98		64.79			65.15		65.01		65.39		64.86
44 U	65.79	59.7	66.14									64.78		64.78			64.77		64.75		64.82		64.69
45 U	66.75	61.17	67.88	65.76	67.88		65.9		65.95			65.82		66.22			65.94		66.23		66.07		66.06
45 L	66.75	48.14	67.88	65.53	67.88		65.93		66.06			66.25		65.36			66		66.02		66.04		65.99
46 U	58.06	54.25	58.79	57.46	58.79				57.5			577.39		57.51			57.52		57.365		57.44		57.52
46 L	58.06	47.55	58.73	57.52	58.73				57.7			57.69		57.61			57.76		57.65		57.68		57.68
47 S	51.16	49.43	51.81	50.29	51.81				50.32			50.3		50.3			50.26		50.16		50.3		
47 U	51.16	44.4	51.81	50.5	51.81				50.56			50.58		50.57			50.58		50.465		50.66		
47 L	51.16	35.77	51.84	50.51	51.84				35.13			50.6		50.82			50.54		50.45		50.59		
48 S	35.17	33.8	36.09	34.91	36.09				35.01			35.07		35.14			35.2		35.12		35.185		35.19
48 U	35.09	30.52	36	34.82	36				35.56			35.19		35.06			35.2		35.075		35.13		35.3
48 L	35.02	22.53	35.88	35.88	35.88				46.01					35.46			35.88		35.58				35.68
49 S	46.5	43.68	47.41	45.8	47.41				46.21			45.97		45.92			45.89		45.8		46		45.89
49 U	46.5	34.15	47.39	46.06	47.39				46.96			46.28		46.21			46.33		46.25		46.29		46.29
49 L	46.5	31.12	47.47	46.98	47.47				56.01			47.14		47.07			47.16		46.87		47.05		47.04
50 S	56.02	54.35	56.99	56.04	56.99		56.09		55.94			56.03	59.8	55.99			56.09		55.87		55.99		55.93
50 U	56.02	49.93	56.96	56.03	56.96		56.06		55.88			56.01	61.85	56.01			56.01		55.56		56.11		56.01
50 L	56.02	42.01	56.9	55.7	56.9		56.04		59.91			55.83	62.15	55.92			56.1		55.94		55.96		55.98
51 D	64.36	40.16	64.96	59.59	64.96		59.88		62.2			59.9	76.85	59.73			59.91	61.76	59.82		59.83	59.78	59.61
51 S1	64.37	56.75	65.17	62	65.17		62.21		62.2			62.22	76.79	62			62.02	62.05	62.14		62.16	62.09	62.11
51 S2	64.36	52.78	64.96	61.38	64.96		62.07		62.06			62.11		61.84			61.96	61.95	62.005		62.04	62.14	61.97
52 S	77.28	69.66	78.08	76.89	78.08		73.01		76.99			76.93		76.97			76.88	76.97	76.965		77.03	76.96	76.85
52 D	77.4	61.85	78.29	76.81	78.29		77.13		77.02			76.9		77			76.99	76.87	76.96		77.01	77.22	76.75
53 D	101.99	92.75	102.71	96.86	102.71		98.99		97.08			98.52		96.64			98.36	98.84	99.31		99.01		
54 S																							
54 U																							

Appendix D: Water Elevations

Well ID	Ground Elevation (m)	Mid-elev. screen (m)	PVC elevation (1999)	Groundwater Elevation (m)																			
				Nov-09	Feb-10	Apr-10	Jul-10	Sep-10	Nov-10	Feb-11	Apr-11	Jul-11	Sep-11	Nov-11	Mar-12	Apr-12	Jul-12	Sep-12	Nov-12	Mar-13	Apr-13	Aug-13	Sep-13
17 D	84.72	75.87	85.37																				
17 S	84.64	81.49	85.53																				
18	71.91	64.76	72.77																				
22 S	65.04	51.39	65.77																				
22 D	64.99	49.34	65.82																				
31 S	78.52	75.58	79.08			78.15		77.77			78.33		77.86			78.24		78.23			78.25		78.05
31 U	78.52	70.14	79.08			78		77.73			78.15		77.87			78.07		78.13			78.15		77.98
31 L	78.52	60.23	79.07			78.07		77.79			78.27		77.88			78.12		78.18			78.21		78.05
32 U1	67.33	63.82	68.22			66.002		65.422			66.072		65.792			65.842		66.082			66.062		65.732
32 L	67.33	60.47	68.21																				
33 S	65.4	63.06	66.4			63.582		63.352			63.902		63.552			63.612		63.742			63.812		63.702
33 U	65.4	56.86	66.23	63.878	63.768	63.738	63.598	63.688	63.778	63.648	64.098	63.958	63.678	63.898	62.998	63.778	63.678	63.868	63.878	63.048	63.918	63.118	63.828
34 S	64.77	62	65.84	63.15	62.84	63.14	62.53	62.26	63.04	63.23	63.56	62.99	62.94	63.3	62.47	63.04	62.92	63.31	63.29	62.81	63.31	63.32	63.14
34 U	64.77	52.58	65.37		61.313	61.443	61.563	62.443	61.723		61.793	61.063	61.663	61.863	59.493	60.323	60.393	61.823	61.873	61.443	61.033	61.013	61.563
35 S1	63.89	57.8	64.59			61.075		62.19					62.59			62.42		62.51			62.5		62.48
35 S2	63.86	54.72	64.65				61.07	62.01	62.49	61.9	62.83	61.49	62	62.72	61.22	62.35	62.31	62.47	62.46	62.14	62.48	62.38	62.45
35 L	63.88	42.7	64.46	62.687	62.557	61.417	61.507	62.607	61.517	62.126	63.017	62.667	62.807	61.937	59.357	62.677	62.787	62.917	62.727	60.527	62.677	62.467	62.717
36 S	62.12	59.07	63.16			60.83		60.95			61.07		60.81			61.15		61.04			61.14		60.96
36 U	62.12	49.92	62.37			61.206		60.956			61.236		61.116			61.276		61.026			61.256		61.156
36 L	62.12	40.76	62.35			61.437		61.027			61.387		61.197			61.267		61.077			61.267		61.257
37 S	61.8	56.46	62.84			61.154		60.564			61.214		60.924			61.234		60.544			61.144		60.924
37 A	62.08	0	62.67																				
38 S	62.43	56.33	63.34			60.323		60.313			61.073		60.723			61.123		60.903			60.973		60.753
38 U	62.43	48.25	63.43	60.184	59.864	58.914	60.004	59.744	59.604	59.744	59.964	57.344	60.084	60.234	57.904	58.354	59.954	59.984	59.974	59.914	58.094	58.194	59.784
38 L	62.43	42.31	63.39			58.975		59.635			59.935		59.985			58.085		59.945			58.045		59.725
39 S	61.65	58.3	62.53																				
39 A	60.78	0	61.36																				
40 S	60.69	54.6	61.48			58.979		58.989			59.359		60.229			59.179		59.149			59.119		59.129
40 U	60.85	42.57	61.15			59.885		59.835			60.375		60.275			60.305		59.375			60.345		60.285
41 S	58.53	57.01	59.56	57.91	57.46	57.69	57.51	57.35	57.61	57.33	57.81	57.64	57.84	57.9		57.54	57.68	57.87			57.73	57.72	57.75
41U	58.53	42.93	59.51	57.88	57.61	57.8	57.57	57.68	57.7	57.57	57.92	58.04	57.73	57.76	57.6	57.93	57.41	58.01	57.97	57.97	57.84	57.87	57.84
41L	58.53	39.48	59.49			57.99		56.74			58.3		58.16			58.05		58.13		58.2	58.08		58.1
42 S	60	58.02	61.1			59.26		59.19			59.69		59.65			59.63		59.64			59.59		59.57
42 U	60	50.85	61.06			59.76		59.48			58.71		59.74			59.85		59.9			59.91		59.92
42 L	60	42.15	61.02			59.92		59.49			59.49		60.24			59.04		60.05			60.16		60.33
43 S	71.27	69.14	72			70.86		70.79			71.97		70.77			70.92		70.59			70.91		70.86
43 U	71.27	63.2	71.53			70.63		70.68			70.73		70.69			71.26		70.74			70.79		70.76
44 S	65.79	64.19	66.68			65.04		64.58			65.13		65.08			65.22		65.09			65.19		64.99
44 U	65.79	59.7	66.14			64.64		64.34			64.77		64.78			62.79		64.75			64.82		64.77
45 U	66.75	61.17	67.88			66.03		65.46			66.18		66.13			66.08		66.14			65.19		65.95
45 L	66.75	48.14	67.88			66.84		65.49			65.53		66.09			65.07		66.18			66.14		65.91
46 U	58.06	54.25	58.79			57.36		57.03			57.59		57.02			57.51		57.66			57.61		58.79
46 L	58.06	47.55	58.73			57.39		57.44			57.02		57.74			57.71		57.74			57.71		57.69
47 S	51.16	49.43	51.81																				50.34
47 U	51.16	44.4	51.81																				50.71
47 L	51.16	35.77	51.84																				50.79
48 S	35.17	33.8	36.09			35.04		34.33			35.22		34.9			35.11		35.11			35.06		35.11
48 U	35.09	30.52	36			35.09		34.75			35.27		35.21			35.16		35.09			35.1		35.16
48 L	35.02	22.53	35.88			35.56		35.17			35.88		35.88			34.84		35.88			35.62		35.08
49 S	46.5	43.68	47.41			45.82		45.77			47.08												
49 U	46.5	34.15	47.39			46.23		46.14			46.29												
49 L	46.5	31.12	47.47			46.93		46.74			47.39												
50 S	56.02	54.35	56.99			55.94		55.6			55.97												
50 U	56.02	49.93	56.96			56.16		55.74			56.01		56.1			56.06		56.05			56.08		56.05
50 L	56.02	42.01	56.9			55.93		55.72			55.83		56.02			55.62		55.95			56.05		56
51 D	64.36	40.16	64.96			59.68	59.43	59.61			60.135	59.88	59.81			59.73	59.75	59.74			59.71	61.76	61.91
51 S1	64.37	56.75	65.17			61.96	61.02	62.14			62.3	61.19	62.23			62.06	62.08	62.26			62.09	60.01	59.96
51 S2	64.36	52.78	64.96			61.96	60.98	61.83			62.26	62.22	62.16			62.2	62.02	62.2			62.06	61.86	62.1
52 S	77.28	69.66	78.08			76.98	76.82	76.89			76.97	75.91	77.02			75.8	75.69	76.88			76.91	76.84	76.76
52 D	77.4	61.85	78.29			76.8	76.78	76.34			76.98	76.93	75.78			76.46	76.8	76.83			76.9	76.87	76.79
53 D	101.99	92.75	102.71			97.96	96.5	96.01			100.17	98.24	97.62			99.82	97.49	99.06			99.17	98.92	97.71
54 S																							
54 U																							

Appendix D: Water Elevations

Well ID	Ground Elevation (m)	Mid-elev. screen (m)	PVC elevation (1999)	Groundwater Elevation (m)																			
				Nov-13	Mar-14	May-14	Jul-14	Sep-14	Oct-14	Mar-15	Apr-15	Jul-15	Sep-15	Oct-15	Feb-16	Apr-16	Jul-16	Sep-16	Oct-16	Feb-17	Apr-17	Jul-17	Sep-17
17 D	84.72	75.87	85.37																				
17 S	84.64	81.49	85.53																				
18	71.91	64.76	72.77																				
22 S	65.04	51.39	65.77																				
22 D	64.99	49.34	65.82																				
31 S	78.52	75.58	79.08			78.19		78.11			78.34		78.1			78.39		77.58			78.31		77.72
31 U	78.52	70.14	79.08			78.16		77.92			78.21		77.96			78.14		77.47			78.19		77.67
31 L	78.52	60.23	79.07			78.26		77.99			78.35		78.03			78.20		77.54			78.29		77.77
32 U1	67.33	63.82	68.22			65.982		65.852			66.212		65.932			66.09		65.65			66.112		65.692
32 L	67.33	60.47	68.21																				
33 S	65.4	63.06	66.4			63.912		62.622			64.112		63.622			63.93		63.14			63.712		63.742
33 U	65.4	56.86	66.23	63.718	61.718	63.998	63.918	60.978	63.918	62.878	61.248	62.828	63.768	61.278	63.25	63.86	63.02	63.47	63.87	63.42	63.89	62.828	63.548
34 S	64.77	62	65.84	63.18	63.08	63.35	63.34	62.94	63.39	62.63	63.55	63.1	63.1	63.39	63.64	63.50	63.12	62.71	63.20	61.88	63.15	62.77	63.3
34 U	64.77	52.58	65.37	61.763	59.833	61.613	61.263	61.683	61.773	61.093	61.943	61.773	61.903	61.723	61.79	61.83	61.64	61.52	61.38	61.12	61.16	61.523	61.463
35 S1	63.89	57.8	64.59			62.75		62.56			62.74		62.46			62.75		62.09			62.51		62.28
35 S2	63.86	54.72	64.65	62.61	61.61	62.69	62.6	62.53	62.68	61.62	62.69	62.56	62.45	62.62	62.68	62.71	61.81	62.18	62.39	61.75	62.43	62.32	62.36
35 L	63.88	42.7	64.46	62.967		62.947	62.767	62.907	62.957	62.577	62.957	62.937	62.727	62.837	62.82	62.89	61.04	62.23	62.66	61.74	62.70	61.737	62.487
36 S	62.12	59.07	63.16			61.12		60.33			61.23		60.74			60.97		60.81			61.13		61.04
36 U	62.12	49.92	62.37			61.256		61.146			61.396		60.976			61.29		61.03			61.336		61.166
36 L	62.12	40.76	62.35			61.417		61.057			61.307		61.117			61.36		59.92			60.967		60.667
37 S	61.8	56.46	62.84			61.164		59.854			61.254		60.684			61.11		60.66			61.174		60.834
37 A	62.08	0	62.67																				
38 S	62.43	56.33	63.34			61.043		60.673			61.193		60.703			61.00		60.54			60.993		59.663
38 U	62.43	48.25	63.43	60.104		59.754	58.954	59.954	59.984		60.254	60.124	60.044	59.834		60.17	58.73	59.79	60.02	58.58	60.07	59.914	59.774
38 L	62.43	42.31	63.39			59.675		59.935			60.115		60.215			60.12		59.76			60.055		59.685
39 S	61.65	58.3	62.53																				
39 A	60.78	0	61.36																				
40 S	60.69	54.6	61.48			59.249		57.999			59.249		59.099			59.27		59.29			59.219		59.139
40 U	60.85	42.57	61.15			60.445		60.345			60.285		60.175			60.41		60.38			60.475		60.255
41 S	58.53	57.01	59.56			57.86	57.75	57.68	57.74		57.91	57.69	57.62	57.87	57.64	57.87	57.46	57.48	57.81		57.79	57.84	57.94
41U	58.53	42.93	59.51			58.02	57.95	57.83	57.96		58.08	57.88	57.85	58.01	58.08	58.04	57.42	57.81	57.99		58.02	57.54	57.77
41L	58.53	39.48	59.49			58.18		58.06			58.22		58.09			58.17		56.30			58.13		58.11
42 S	60	58.02	61.1			59.69		59.5			59.8		59.38			59.71		58.98			59.69		59.33
42 U	60	50.85	61.06			60.08		58.61			60.1		59.68			60.06		59.25			59.93		59.52
42 L	60	42.15	61.02			60.49		60.19			60.45		60.12			60.35		59.59			60.26		59.54
43 S	71.27	69.14	72			70.88		70.77			70.2		70.65			70.85		70.83			70.93		70.81
43 U	71.27	63.2	71.53			70.77		70.7			70.82		70.6			70.71		70.59			70.77		70.66
44 S	65.79	64.19	66.68			65.19		64.98			65.26		65.01			65.18		64.16			65.18		65.04
44 U	65.79	59.7	66.14			64.91		64.64			64.92		64.81			64.88		64.4			64.81		64.53
45 U	66.75	61.17	67.88			66.19		65.89															66.18
45 L	66.75	48.14	67.88			66.24		64.95			66.27		65.96			66.21		65.24			66.21		65.78
46 U	58.06	54.25	58.79																				
46 L	58.06	47.55	58.73			57.8		57.58			57.86		57.64			57.76		57.44			57.83		57.58
47 S	51.16	49.43	51.81																				
47 U	51.16	44.4	51.81																				
47 L	51.16	35.77	51.84																				
48 S	35.17	33.8	36.09			35.15		35.08			35.15		35.06			34.28		35.00			35.11		35.01
48 U	35.09	30.52	36			35.21		35.13			35.22		35.12			34.97		34.96			35.18		35.03
48 L	35.02	22.53	35.88			35.74		35.76			35.88		35.47			35.88		34.11			35.88		35.66
49 S	46.5	43.68	47.41																				
49 U	46.5	34.15	47.39																				
49 L	46.5	31.12	47.47																				
50 S	56.02	54.35	56.99					55.54			55.81		55.39			55.15		55.46			55.89		55.76
50 U	56.02	49.93	56.96			56.11		55.95			56.27		55.95			56.04		55.71			56.96		
50 L	56.02	42.01	56.9			56.08		55.58			56.21		55.8			56.01		55.63			56		55.67
51 D	64.36	40.16	64.96			62.08	62.05	62.11			62.2	62.11	61.91			62.02	59.76	61.32			61.82	61.66	61.66
51 S1	64.37	56.75	65.17			60.09	60.08	59.96			60.12	60.01	59.95			60.10	60.00	59.87			59.98	59.93	59.87
51 S2	64.36	52.78	64.96			62.25	62.22	62.22			62.32	62.28	62.04			62.25	62.00	61.67			62.05	61.88	61.91
52 S	77.28	69.66	78.08			76.71	76.65	76.8			76.95	76.8	76.83			76.93	76.78	76.72			76.93	76.68	76.82
52 D	77.4	61.85	78.29			77.11	77.09	76.81			76.99	76.85	75.64			76.90	76.28	76.82			77.04	76.8	76.95
53 D	101.99	92.75	102.71			99.14	99.41	97.33			100.15	98.46	97.54			100.17	99.59	99.73			100.03	99.83	
54 S																							
54 U																							

Appendix D: Water Elevations

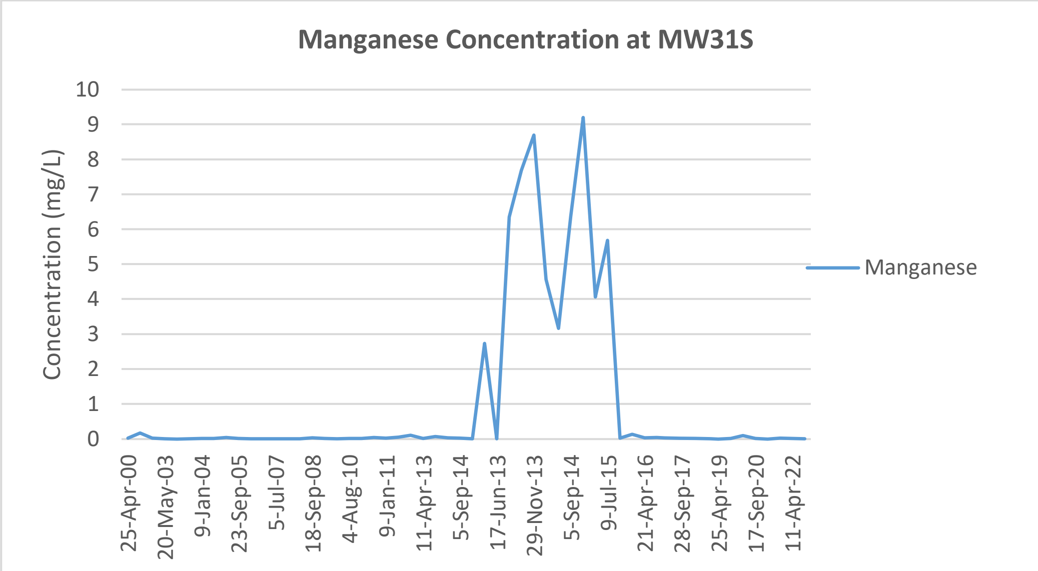
Well ID	Ground Elevation (m)	Mid-elev. screen (m)	PVC elevation (1999)	Groundwater Elevation (m)																	
				Nov-17	Feb-18	Apr-18	Jul-18	Sep-18	Nov-18	Feb-19	Apr-19	Jul-19	Sep-19	Nov-19	Feb-20	Apr-20	Jul-20	Sep-20	Oct-20	Feb-21	Apr-21
17 D	84.72	75.87	85.37																		
17 S	84.64	81.49	85.53																		
18	71.91	64.76	72.77																		
22 S	65.04	51.39	65.77																		
22 D	64.99	49.34	65.82																		
31 S	78.52	75.58	79.08			78.19		77.31			78.03		78.22			78.23		78.16			78.22
31 U	78.52	70.14	79.08			78.03		77.2			77.8		78.1			78.05		78.07			78.04
31 L	78.52	60.23	79.07			78.23		77.21			77.78		78.23			78.18		78.18			78.15
32 U1	67.33	63.82	68.22			66.042		65.252			66.172		66.082			66.082	65.852	65.772	66.042	66.202	66.082
32 L	67.33	60.47	68.21																		
33 S	65.4	63.06	66.4			64.092		63.872			63.962		64.092			63.982		63.732			64.052
33 U	65.4	56.86	66.23	63.758	63.498	63.838	63.498	63.398	64.058	63.518	63.638	63.728	63.918	63.818	63.738	63.798	63.628	63.518	61.948	63.698	63.848
34 S	64.77	62	65.84	63.64	63.4	63.79	63.19	63.01	63.79	63.24	63.92	63.5	63.78	63.89	64.44	63.45	63.27	63.23	63.75	63.47	63.56
34 U	64.77	52.58	65.37	61.713	61.483	61.723	61.483	61.373	61.773	61.623	61.753	61.633	61.763	61.813	61.633	61.513	61.523	61.223	61.743	62.693	61.733
35 S1	63.89	57.8	64.59			62.51		62.09			62.12		62.54			62.53		62.29			62.64
35 S2	63.86	54.72	64.65	62.43	62.44	62.55	62.29	62.09	61.44	61.48	62.05	62.43	62.55	62.56	61.37	62.5	62.39	62.29	62.54	62.48	62.55
35 L	63.88	42.7	64.46	62.657	62.677	62.687	62.537	62.397	62.777	62.617	62.347	62.657	62.697	62.667	62.637	62.657	62.587	61.277	62.717	62.637	62.787
36 S	62.12	59.07	63.16			61.31		60.81			60.52		61.16			61.17		60.94			61.2
36 U	62.12	49.92	62.37			61.496		60.906			61.266		61.266			61.266		61.006			61.276
36 L	62.12	40.76	62.35			61.357		60.987			61.297		60.987			61.387		61.007			61.387
37 S	61.8	56.46	62.84			61.204		60.474			61.154		60.984			61.144		60.614			60.994
37 A	62.08	0	62.67																		
38 S	62.43	56.33	63.34			61.093		60.433			60.703		61.003			60.923		60.503			60.493
38 U	62.43	48.25	63.43	60.144	59.964	60.114	59.964	59.584	60.054	60.054	60.174	59.974	59.984	60.004	59.934	60.014	59.834	59.774	59.804	60.034	60.024
38 L	62.43	42.31	63.39			60.035		59.545			60.075		60.045			59.805		59.705			60.005
39 S	61.65	58.3	62.53																		
39 A	60.78	0	61.36																		
40 S	60.69	54.6	61.48			59.159		59.049			59.239		59.059			59.099		59.069			60.839
40 U	60.85	42.57	61.15			60.385		60.095			60.535		60.315			60.385		60.255			58.895
41 S	58.53	57.01	59.56	58.11	58.17	58.16	57.92	57.82				57.94	57.78		57.93	58.03	57.89	57.85	57.93		58.12
41U	58.53	42.93	59.51	57.93	58.01	58	57.72	57.71	58.01	58.04	59.51	57.78	57.78	57.92	57.86	57.88	57.75	57.69	57.9	58.01	57.99
41L	58.53	39.48	59.49			58.13		57.93	58.38	57.75	58.37		58.14			58.11		57.96			58.25
42 S	60	58.02	61.1			59.67		58.97			59.69		59.47			59.95		59.12			59.65
42 U	60	50.85	61.06			60.05		59.43			60.08		59.92			59.9		59.48			59.99
42 L	60	42.15	61.02			60.48		59.7			60.46		60.23			60.2		59.67			60.27
43 S	71.27	69.14	72			71.1		70.68			71.08		71.09			71.03		70.88			70.99
43 U	71.27	63.2	71.53			70.86		70.45			70.69		70.82			70.82		70.68			69.82
44 S	65.79	64.19	66.68			65.38		64.57			65.38		65.34			65.34		65.01			65.36
44 U	65.79	59.7	66.14			64.82		64.08			64.87		64.75			64.77		64.54			64.82
45 U	66.75	61.17	67.88			66.7		65.93			66.18		66.5			66.68		66.13			66.63
45 L	66.75	48.14	67.88			66.39		65.38			66.42		66.11			66.25		65.72			66.3
46 U	58.06	54.25	58.79																		
46 L	58.06	47.55	58.73			57.81		57.41			57.92		57.7			57.74		57.41			57.27
47 S	51.16	49.43	51.81																		
47 U	51.16	44.4	51.81																		
47 L	51.16	35.77	51.84																		
48 S	35.17	33.8	36.09			35.01		34.9			35.05		34.9			34.99		34.93			35.01
48 U	35.09	30.52	36			35.11		35			35.19		35.09			34.84		34.96			35.11
48 L	35.02	22.53	35.88			35.88		35.88			35.88		35.74			35.06		35.1			35.43
49 S	46.5	43.68	47.41																		
49 U	46.5	34.15	47.39																		
49 L	46.5	31.12	47.47																		
50 S	56.02	54.35	56.99			55.95		55.6			56.14		55.89			55.92		55.72			55.93
50 U	56.02	49.93	56.96																		
50 L	56.02	42.01	56.9			55.73		55.55			56.15		55.82			55.92		55.7			55.91
51 D	64.36	40.16	64.96			61.85	61.65	61.44			61.78	61.76	61.78			61.77	61.74	61.65			61.84
51 S1	64.37	56.75	65.17			60.02	59.93	61.95			59.93	59.94	60.02			60.02	62.17	60.03			60.06
51 S2	64.36	52.78	64.96			62.05	61.86	59.63			62.04	62.03	61.04			61.98	59.82	61.81			62.07
52 S	77.28	69.66	78.08			77.02	76.76	76.62			77	76.94	77			76.94	76.78	76.86			76.92
52 D	77.4	61.85	78.29			77.19	76.92	76.8			77	77.03	77.12			77.17	77.03	77.11			77.06
53 D	101.99	92.75	102.71			100.01	97.72	96.26			98.04	97.98	98.18			98.59	96.95	98.5			98.79
54 S																					
54 U																					

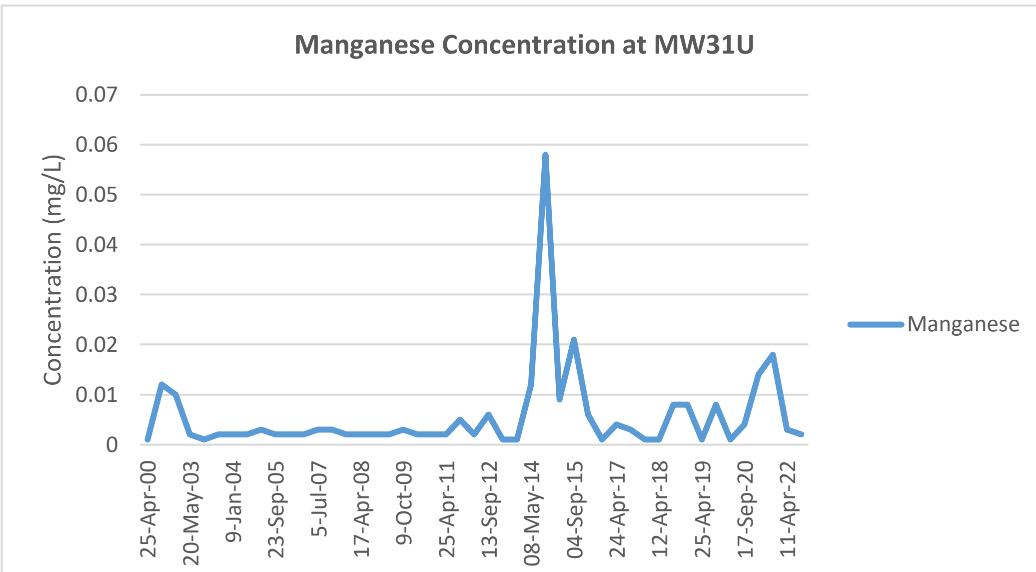
Appendix D: Water Elevations

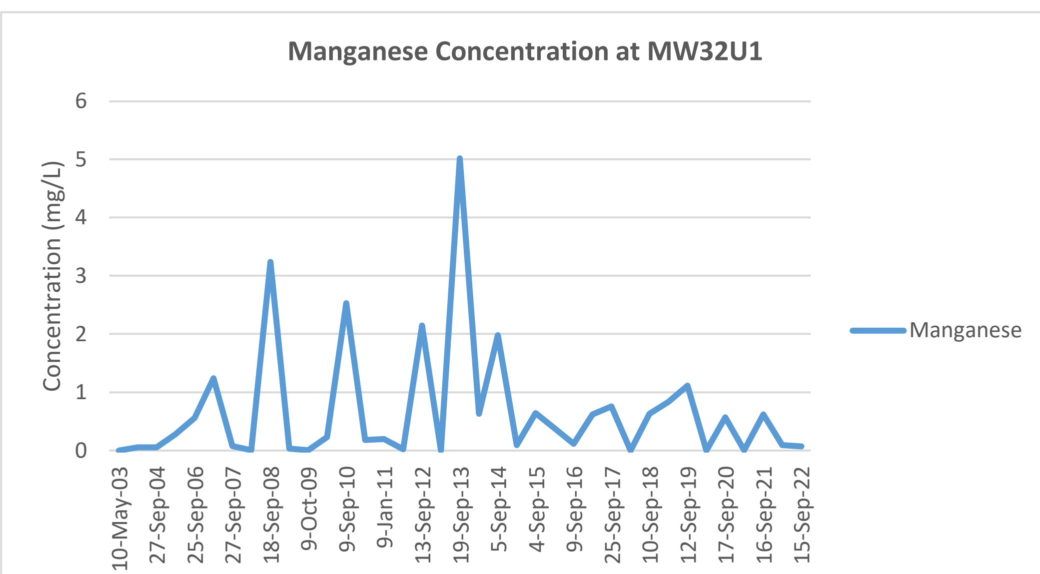
Well ID	Ground Elevation (m)	Mid-elev. screen (m)	PVC elevation (1999)	Groundwater Elevation (m)							
				Jul-21	Sep-21	Nov-21	Mar-22	Apr-22	Jul-22	Sep-22	Nov-22
17 D	84.72	75.87	85.37								
17 S	84.64	81.49	85.53								
18	71.91	64.76	72.77								
22 S	65.04	51.39	65.77								
22 D	64.99	49.34	65.82								
31 S	78.52	75.58	79.08		78.05			78.16		78.01	
31 U	78.52	70.14	79.08		77.92			78.35		77.91	
31 L	78.52	60.23	79.07		78.05			78.34		77.97	
32 U1	67.33	63.82	68.22	66.302	66.002	66.092		66.052		65.972	
32 L	67.33	60.47	68.21								
33 S	65.4	63.06	66.4		63.892			64.222		63.882	
33 U	65.4	56.86	66.23	64.048	63.688	61.558	63.808	63.978	63.888	63.678	63.868
34 S	64.77	62	65.84	63.87	62.40	63.61	63.63	63.85	64.64	63.38	63.64
34 U	64.77	52.58	65.37	61.713	61.613	61.593	61.693	61.733	61.533	61.633	61.743
35 S1	63.89	57.8	64.59		62.59			62.75		62.37	
35 S2	63.86	54.72	64.65	62.63	62.53	62.43	62.67	62.71	62.6	62.51	62.64
35 L	63.88	42.7	64.46	62.757	62.687	62.607	62.817	62.797	62.677	62.717	62.797
36 S	62.12	59.07	63.16		61.04			60.5		61	
36 U	62.12	49.92	62.37		61.236			61.336		61.186	
36 L	62.12	40.76	62.35		61.237			61.277		61.267	
37 S	61.8	56.46	62.84		60.884			61.124		60.864	
37 A	62.08	0	62.67								
38 S	62.43	56.33	63.34		60.773			61.103		60.783	
38 U	62.43	48.25	63.43	59.964	59.924	59.894	60.094	60.064	59.674	59.924	60.034
38 L	62.43	42.31	63.39		59.885			59.935		59.915	
39 S	61.65	58.3	62.53								
39 A	60.78	0	61.36								
40 S	60.69	54.6	61.48		60.149			59.279		59.229	
40 U	60.85	42.57	61.15		60.375			60.485		60.335	
41 S	58.53	57.01	59.56	58.1	57.91	58.11		58.04	57.66	58.05	57.89
41U	58.53	42.93	59.51	58.01	57.76	57.94		57.91	57.85	57.89	57.94
41L	58.53	39.48	59.49		58.15			58.26		58.23	
42 S	60	58.02	61.1		59.51			59.67		59.65	
42 U	60	50.85	61.06		59.92			59.99		60.02	
42 L	60	42.15	61.02		59.53			60.26		60.29	
43 S	71.27	69.14	72		71.05			71.1		71.05	
43 U	71.27	63.2	71.53		70.74			70.81		70.76	
44 S	65.79	64.19	66.68		65.26			65.47		65.3	
44 U	65.79	59.7	66.14		64.73			64.9		64.79	
45 U	66.75	61.17	67.88		66.55			66.72		66.47	
45 L	66.75	48.14	67.88		66.03			66.25		66.02	
46 U	58.06	54.25	58.79								
46 L	58.06	47.55	58.73		57.70			56.83		57.84	
47 S	51.16	49.43	51.81								
47 U	51.16	44.4	51.81								
47 L	51.16	35.77	51.84								
48 S	35.17	33.8	36.09		35.00			35.06		35	
48 U	35.09	30.52	36		35.13			35.14		35.12	
48 L	35.02	22.53	35.88		35.54			35.51		35.61	
49 S	46.5	43.68	47.41		45.94			46.18		46.03	
49 U	46.5	34.15	47.39		46.19			46.25		46.37	
49 L	46.5	31.12	47.47		46.99			47.28		47.22	
50 S	56.02	54.35	56.99		55.87			56		55.82	
50 U	56.02	49.93	56.96								
50 L	56.02	42.01	56.9		55.84			55.74		55.87	
51 D	64.36	40.16	64.96	61.94	61.74			61.91	61.79	61.85	
51 S1	64.37	56.75	65.17	60.19	60.13			60.1	59.57	60.02	
51 S2	64.36	52.78	64.96	62.1	61.97			62.13	61.98	61.99	
52 S	77.28	69.66	78.08	76.94	76.8			76.92	76.85	76.79	
52 D	77.4	61.85	78.29	77.11	76.97			77.07	76.99	76.9	
53 D	101.99	92.75	102.71	99.72	97.82			98.78	98.26	98.03	
54 S											
54 U											

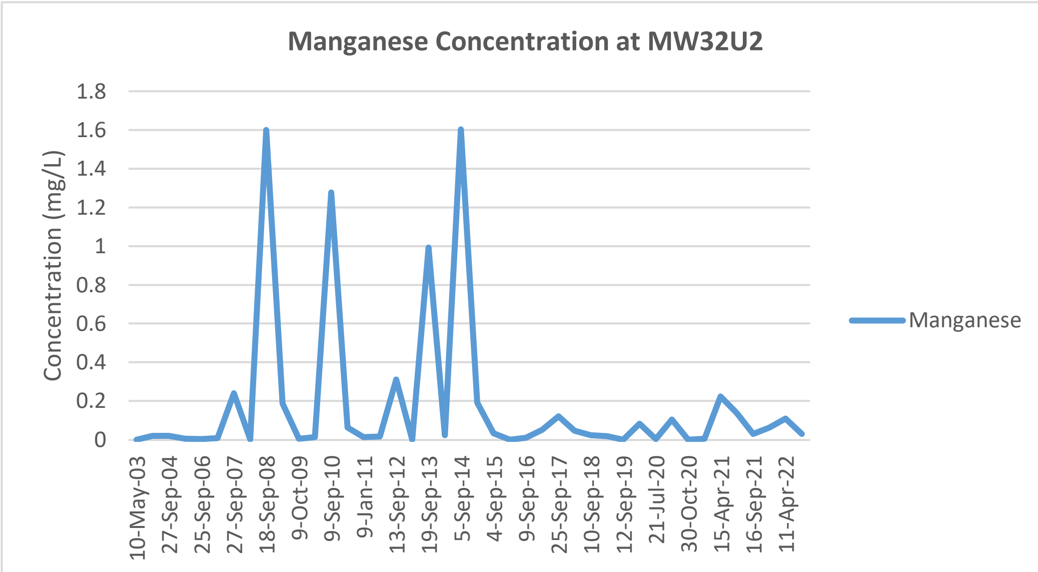
APPENDIX E

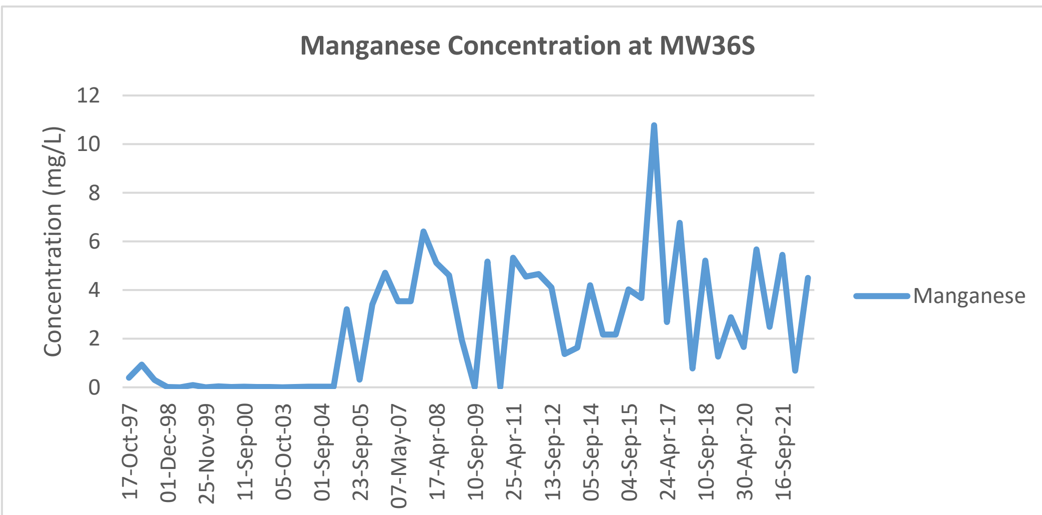
Selected Manganese Concentrations Trending Data

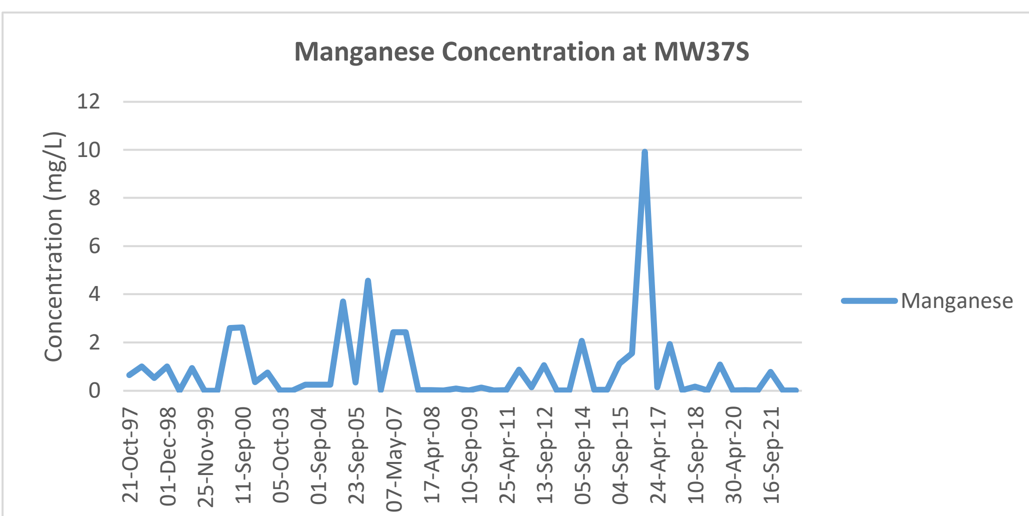

Manganese Concentration at MW31S
Concentration (mg/L)
10
9
8
7
6
5
4
3
2
1
0
25-Apr-00
20-May-03
9-Jan-04
23-Sep-05
5-Jul-07
18-Sep-08
4-Aug-10
9-Jan-11
11-Apr-13
5-Sep-14
17-Jun-13
29-Nov-13
5-Sep-14
9-Jul-15
21-Apr-16
28-Sep-17
25-Apr-19
17-Sep-20
11-Apr-22
Manganese

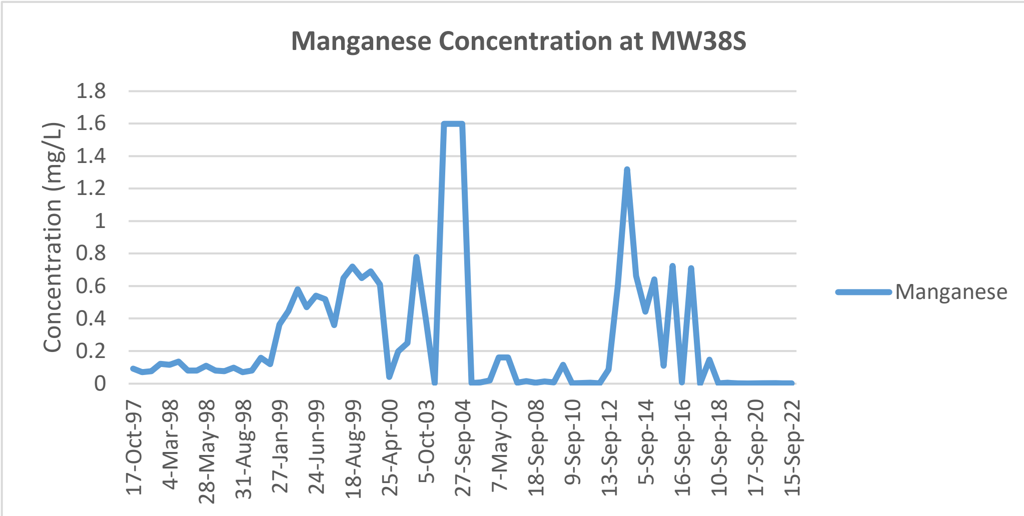

Manganese Concentration at MW31U
Concentration (mg/L)
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
25-Apr-00
20-May-03
9-Jan-04
23-Sep-05
5-Jul-07
17-Apr-08
9-Oct-09
25-Apr-11
13-Sep-12
08-May-14
04-Sep-15
24-Apr-17
12-Apr-18
25-Apr-19
17-Sep-20
11-Apr-22
Manganese

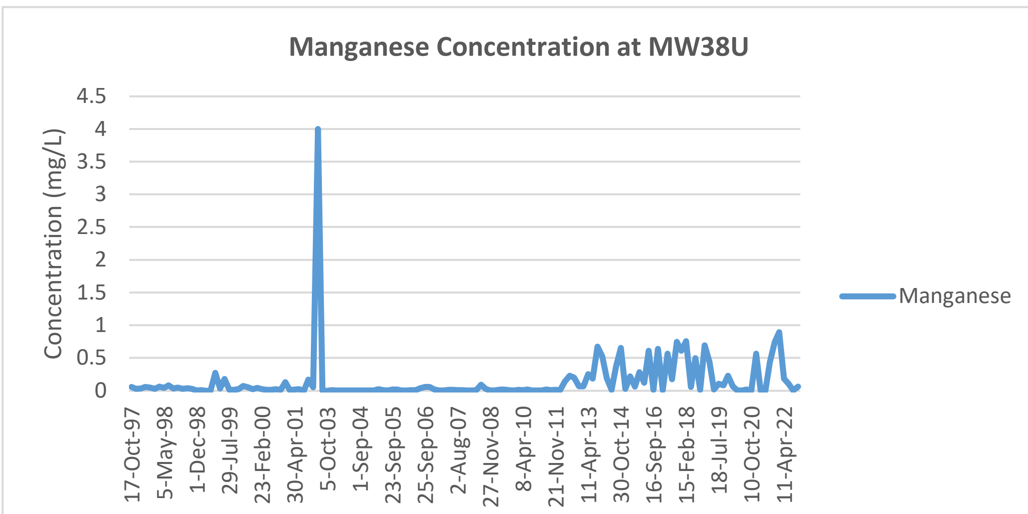

Manganese Concentration at MW32U1
Concentration (mg/L)
6
5
4
3
2
1
0
10-May-03
27-Sep-04
25-Sep-06
27-Sep-07
18-Sep-08
9-Oct-09
9-Sep-10
9-Jan-11
13-Sep-12
19-Sep-13
5-Sep-14
4-Sep-15
9-Sep-16
25-Sep-17
10-Sep-18
12-Sep-19
17-Sep-20
16-Sep-21
15-Sep-22
Manganese

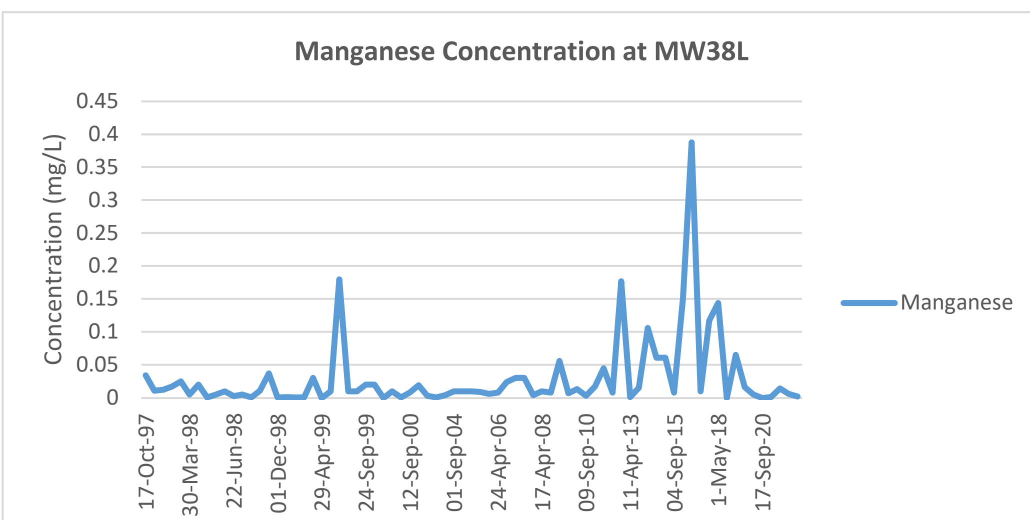

Manganese Concentration at MW32U2
Concentration (mg/L)
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
10-May-03
27-Sep-04
25-Sep-06
27-Sep-07
18-Sep-08
9-Oct-09
9-Sep-10
9-Jan-11
13-Sep-12
19-Sep-13
5-Sep-14
4-Sep-15
9-Sep-16
25-Sep-17
10-Sep-18
12-Sep-19
21-Jul-20
30-Oct-20
15-Apr-21
16-Sep-21
11-Apr-22
Manganese

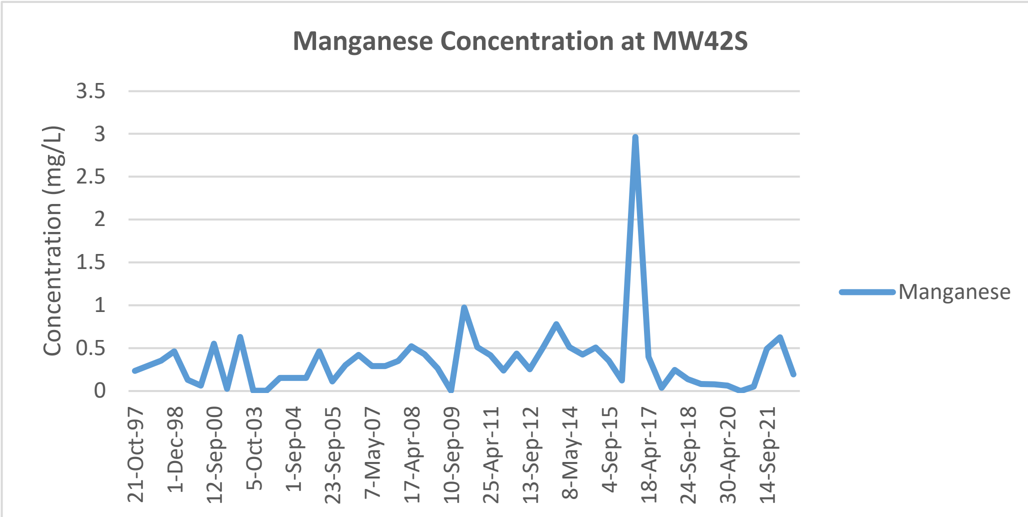

Manganese Concentration at MW36S
Concentration (mg/L)
12
10
8
6
4
2
0
17-Oct-97
01-Dec-98
25-Nov-99
11-Sep-00
05-Oct-03
01-Sep-04
23-Sep-05
07-May-07
17-Apr-08
10-Sep-09
25-Apr-11
13-Sep-12
05-Sep-14
04-Sep-15
24-Apr-17
10-Sep-18
30-Apr-20
16-Sep-21
Manganese

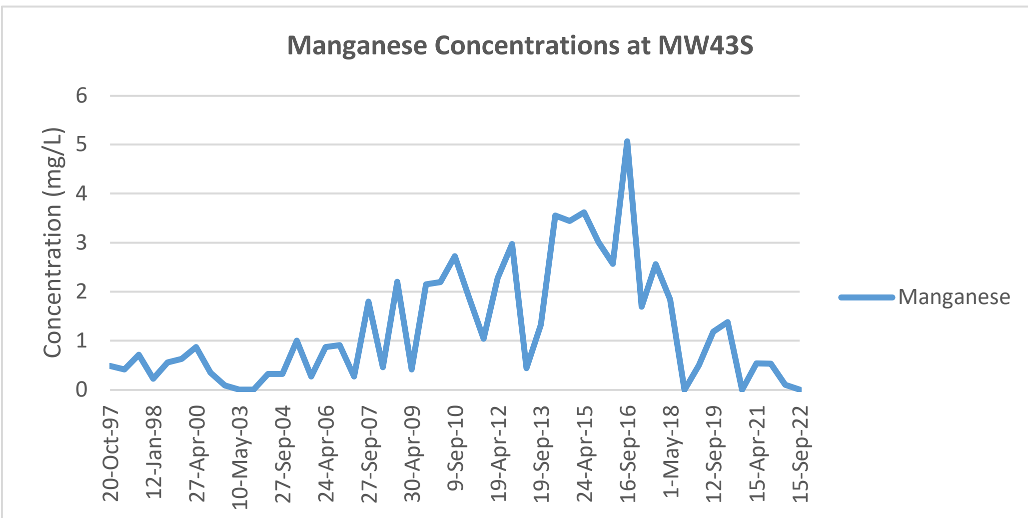

Manganese Concentration at MW37S
Concentration (mg/L)
12
10
8
6
4
2
0
21-Oct-97
01-Dec-98
25-Nov-99
11-Sep-00
05-Oct-03
01-Sep-04
23-Sep-05
07-May-07
17-Apr-08
10-Sep-09
25-Apr-11
13-Sep-12
05-Sep-14
04-Sep-15
24-Apr-17
10-Sep-18
30-Apr-20
16-Sep-21
Manganese

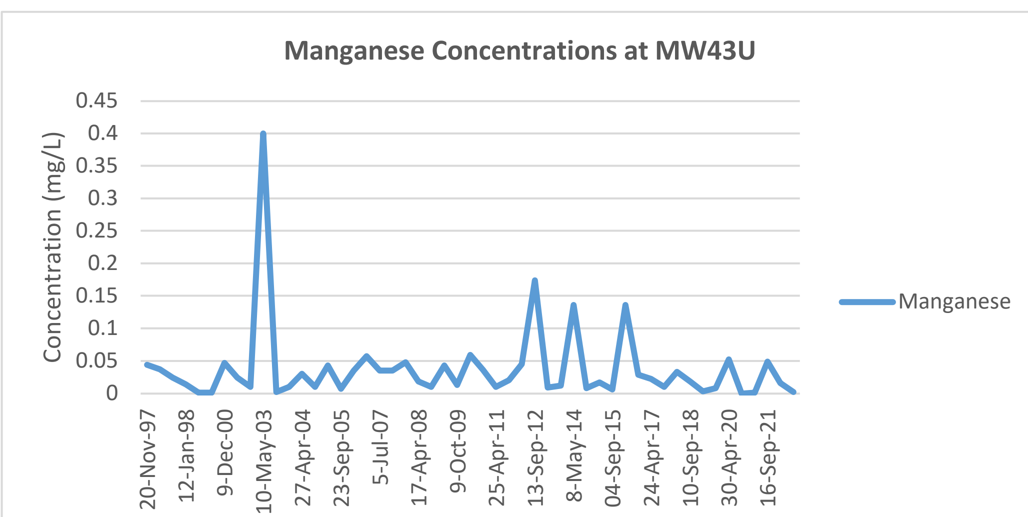

Manganese Concentration at MW38S
Concentration (mg/L)
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
17-Oct-97
4-Mar-98
28-May-98
31-Aug-98
27-Jan-99
24-Jun-99
18-Aug-99
25-Apr-00
5-Oct-03
27-Sep-04
7-May-07
18-Sep-08
9-Sep-10
13-Sep-12
5-Sep-14
16-Sep-16
10-Sep-18
17-Sep-20
15-Sep-22
Manganese

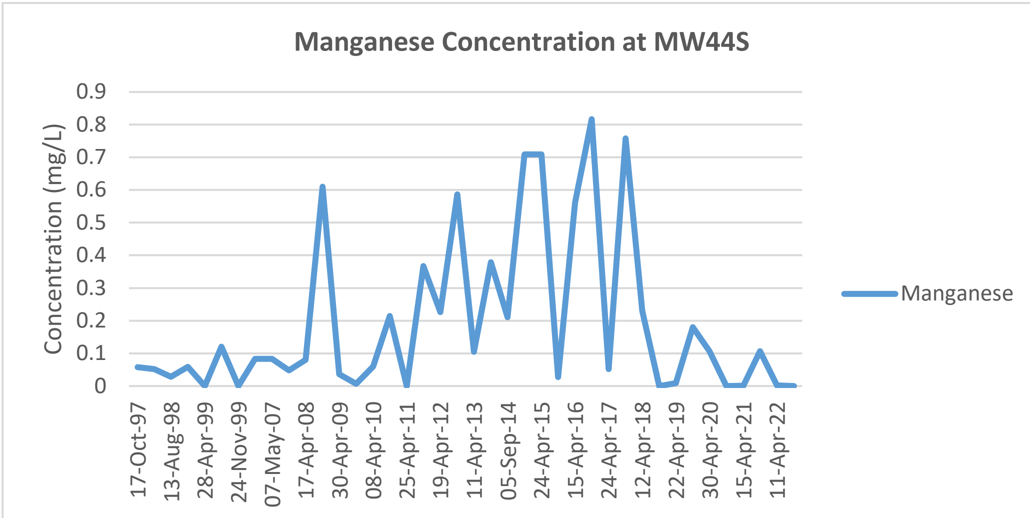

Manganese Concentration at MW38U
Concentration (mg/L)
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
17-Oct-97
5-May-98
1-Dec-98
29-Jul-99
23-Feb-00
30-Apr-01
5-Oct-03
1-Sep-04
23-Sep-05
25-Sep-06
2-Aug-07
27-Nov-08
8-Apr-10
21-Nov-11
11-Apr-13
30-Oct-14
16-Sep-16
15-Feb-18
18-Jul-19
10-Oct-20
11-Apr-22
Manganese

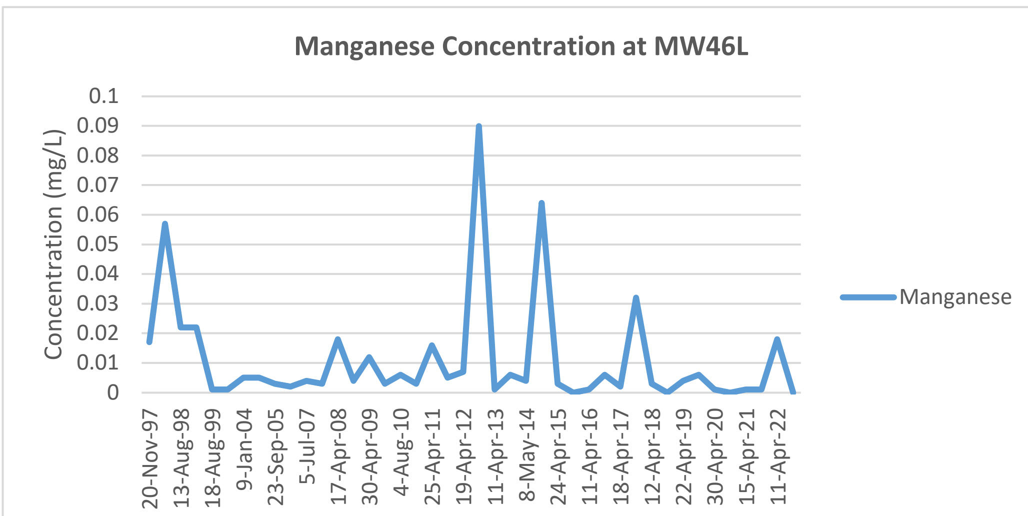

Manganese Concentration at MW38L
Concentration (mg/L)
0.45
0.4
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
17-Oct-97
30-Mar-98
22-Jun-98
01-Dec-98
29-Apr-99
24-Sep-99
12-Sep-00
01-Sep-04
24-Apr-06
17-Apr-08
09-Sep-10
11-Apr-13
04-Sep-15
1-May-18
17-Sep-20
Manganese

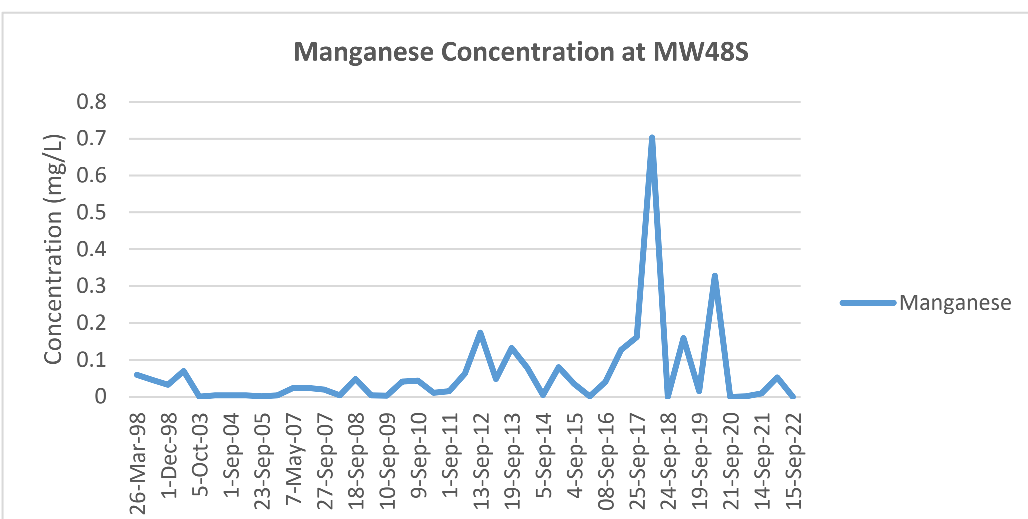

Manganese Concentration at MW42S
Concentration (mg/L)
3.5
3
2.5
2
1.5
1
0.5
0
21-Oct-97
1-Dec-98
12-Sep-00
5-Oct-03
1-Sep-04
23-Sep-05
7-May-07
17-Apr-08
10-Sep-09
25-Apr-11
13-Sep-12
8-May-14
4-Sep-15
18-Apr-17
24-Sep-18
30-Apr-20
14-Sep-21
Manganese

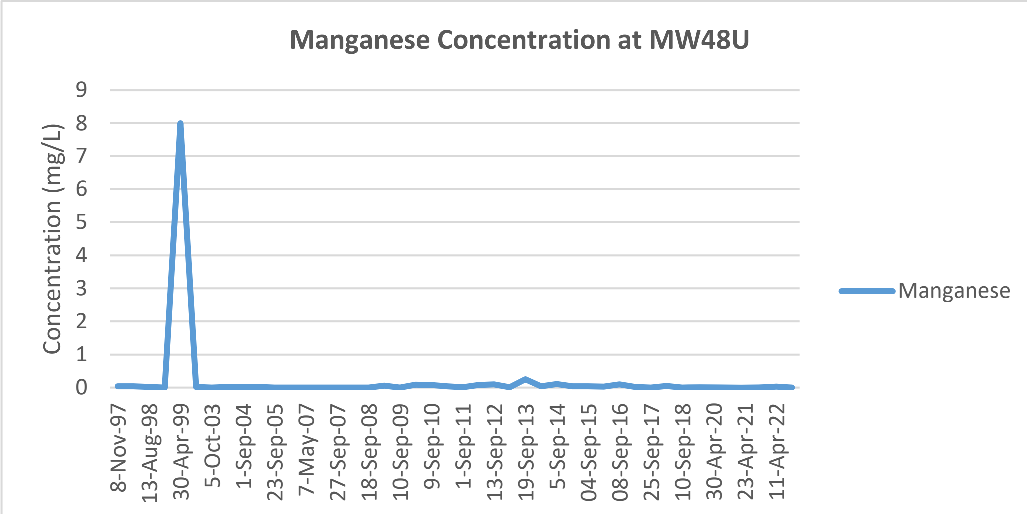

Manganese Concentrations at MW43S
Concentration (mg/L)
6
5
4
3
2
1
0
20-Oct-97
12-Jan-98
27-Apr-00
10-May-03
27-Sep-04
24-Apr-06
27-Sep-07
30-Apr-09
9-Sep-10
19-Apr-12
19-Sep-13
24-Apr-15
16-Sep-16
1-May-18
12-Sep-19
15-Apr-21
15-Sep-22
Manganese

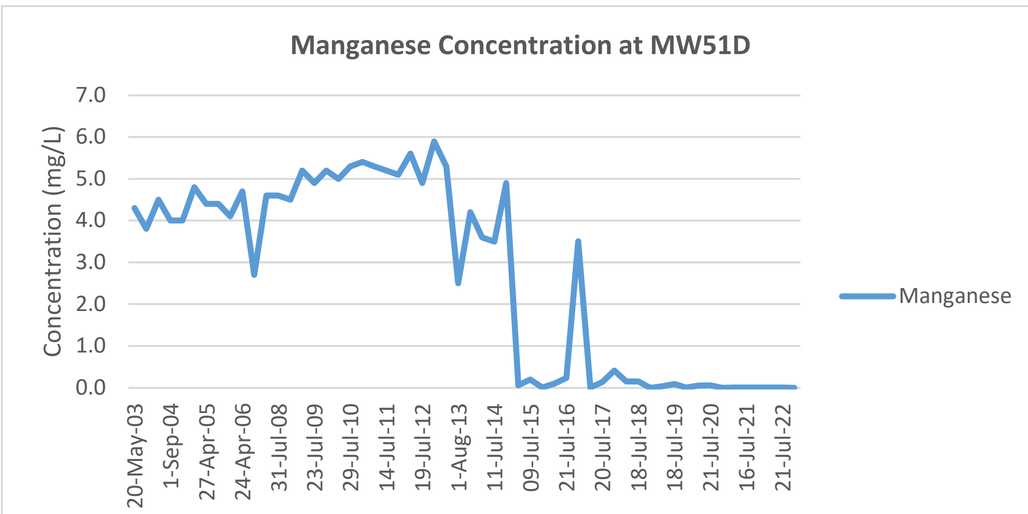

Manganese Concentrations at MW43U
Concentration (mg/L)
0.45
0.4
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
20-Nov-97
12-Jan-98
9-Dec-00
10-May-03
27-Apr-04
23-Sep-05
5-Jul-07
17-Apr-08
9-Oct-09
25-Apr-11
13-Sep-12
8-May-14
04-Sep-15
24-Apr-17
10-Sep-18
30-Apr-20
16-Sep-21
Manganese

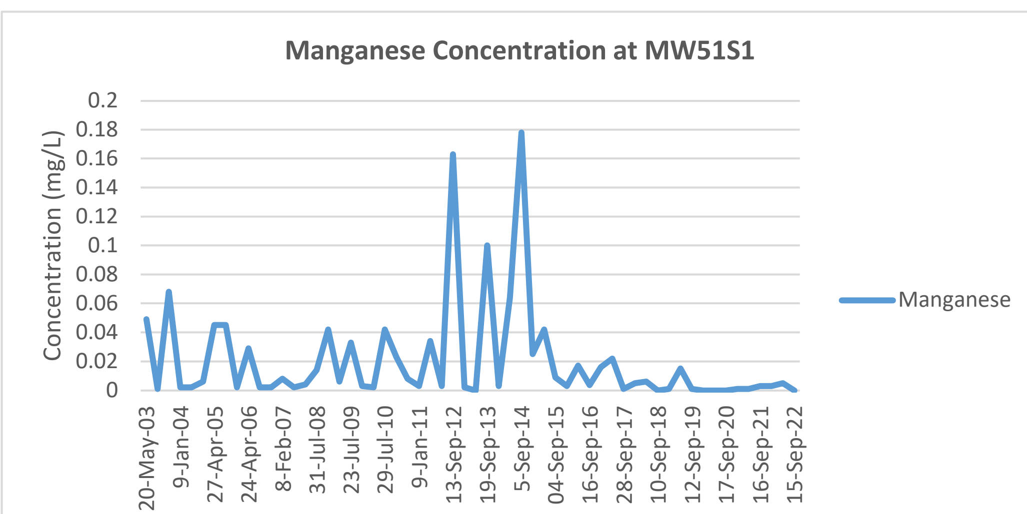

Manganese Concentration at MW44S
Concentration (mg/L)
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
17-Oct-97
13-Aug-98
28-Apr-99
24-Nov-99
07-May-07
17-Apr-08
30-Apr-09
08-Apr-10
25-Apr-11
19-Apr-12
11-Apr-13
05-Sep-14
24-Apr-15
15-Apr-16
24-Apr-17
12-Apr-18
22-Apr-19
30-Apr-20
15-Apr-21
11-Apr-22
Manganese

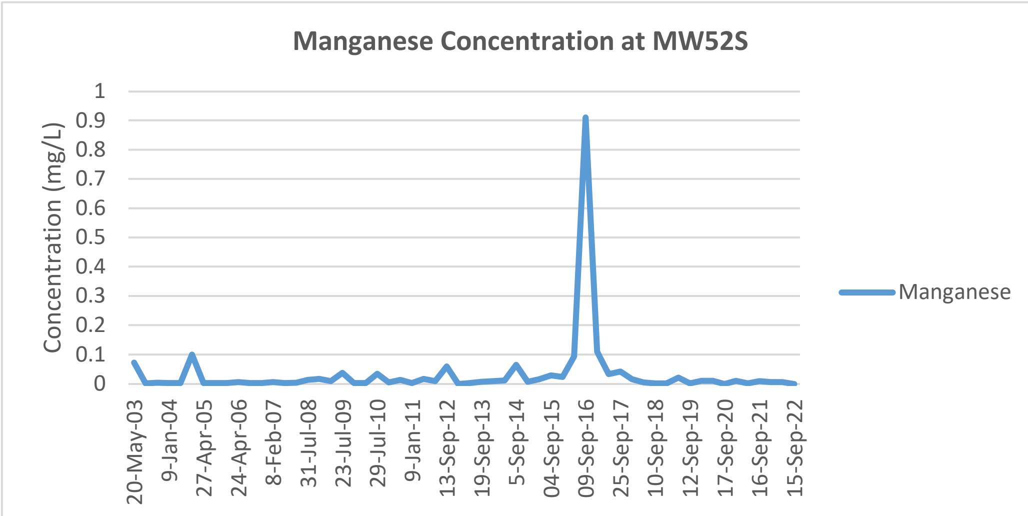

Manganese Concentration at MW46L
Concentration (mg/L)
0.1
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
20-Nov-97
13-Aug-98
18-Aug-99
9-Jan-04
23-Sep-05
5-Jul-07
17-Apr-08
30-Apr-09
4-Aug-10
25-Apr-11
19-Apr-12
11-Apr-13
8-May-14
24-Apr-15
11-Apr-16
18-Apr-17
12-Apr-18
22-Apr-19
30-Apr-20
15-Apr-21
11-Apr-22
Manganese

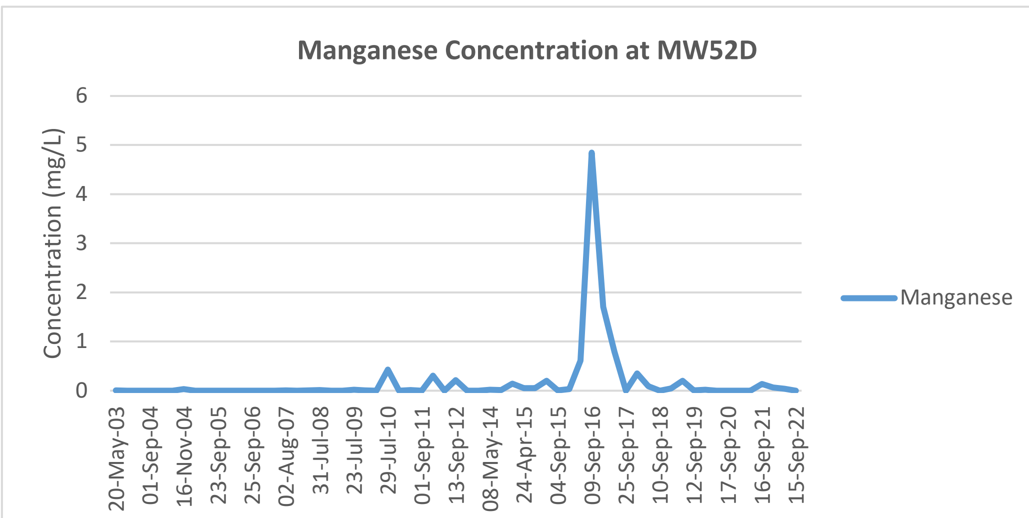

Manganese Concentration at MW48S
Concentration (mg/L)
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
26-Mar-98
1-Dec-98
5-Oct-03
1-Sep-04
23-Sep-05
7-May-07
27-Sep-07
18-Sep-08
10-Sep-09
9-Sep-10
1-Sep-11
13-Sep-12
19-Sep-13
5-Sep-14
4-Sep-15
08-Sep-16
25-Sep-17
24-Sep-18
19-Sep-19
21-Sep-20
14-Sep-21
15-Sep-22
Manganese

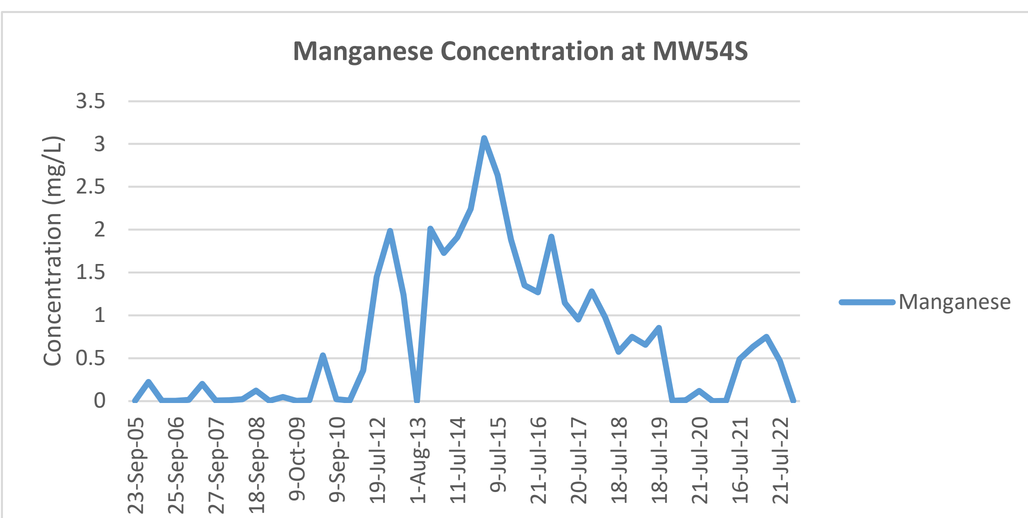

Manganese Concentration at MW48U
Concentration (mg/L)
9
8
7
6
5
4
3
2
1
0
8-Nov-97
13-Aug-98
30-Apr-99
5-Oct-03
1-Sep-04
23-Sep-05
7-May-07
27-Sep-07
18-Sep-08
10-Sep-09
9-Sep-10
1-Sep-11
13-Sep-12
19-Sep-13
5-Sep-14
04-Sep-15
08-Sep-16
25-Sep-17
10-Sep-18
30-Apr-20
23-Apr-21
11-Apr-22
Manganese

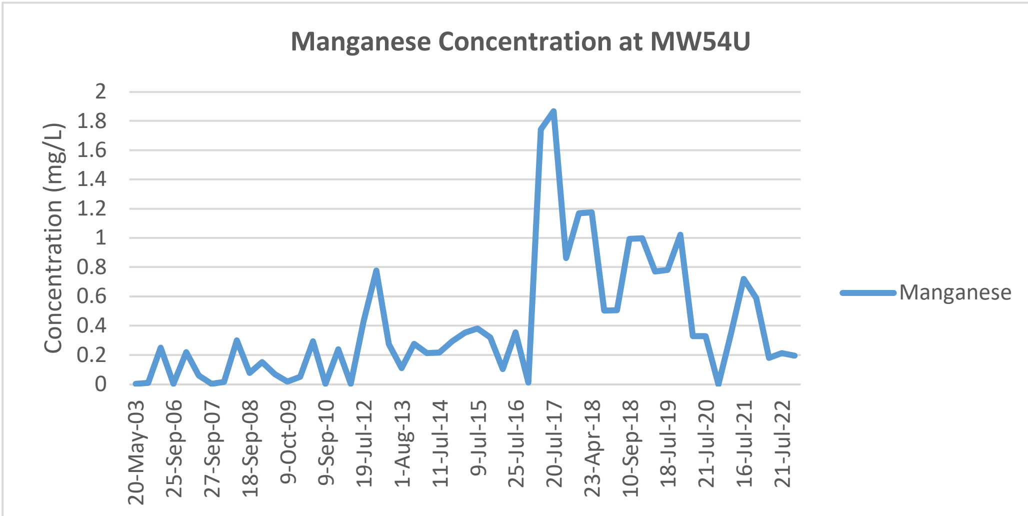

Manganese Concentration at MW51D
Concentration (mg/L)
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
20-May-03
1-Sep-04
27-Apr-05
24-Apr-06
31-Jul-08
23-Jul-09
29-Jul-10
14-Jul-11
19-Jul-12
1-Aug-13
11-Jul-14
09-Jul-15
21-Jul-16
20-Jul-17
18-Jul-18
18-Jul-19
21-Jul-20
16-Jul-21
21-Jul-22
Manganese

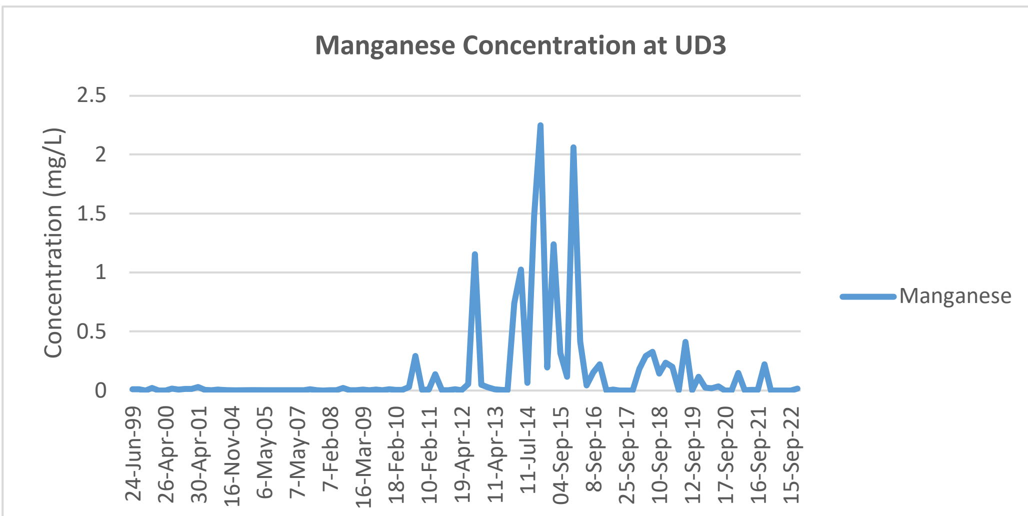

Manganese Concentration at MW51S1
Concentration (mg/L)
0.2
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
20-May-03
9-Jan-04
27-Apr-05
24-Apr-06
8-Feb-07
31-Jul-08
23-Jul-09
29-Jul-10
9-Jan-11
13-Sep-12
19-Sep-13
5-Sep-14
04-Sep-15
16-Sep-16
28-Sep-17
10-Sep-18
12-Sep-19
17-Sep-20
16-Sep-21
15-Sep-22
Manganese

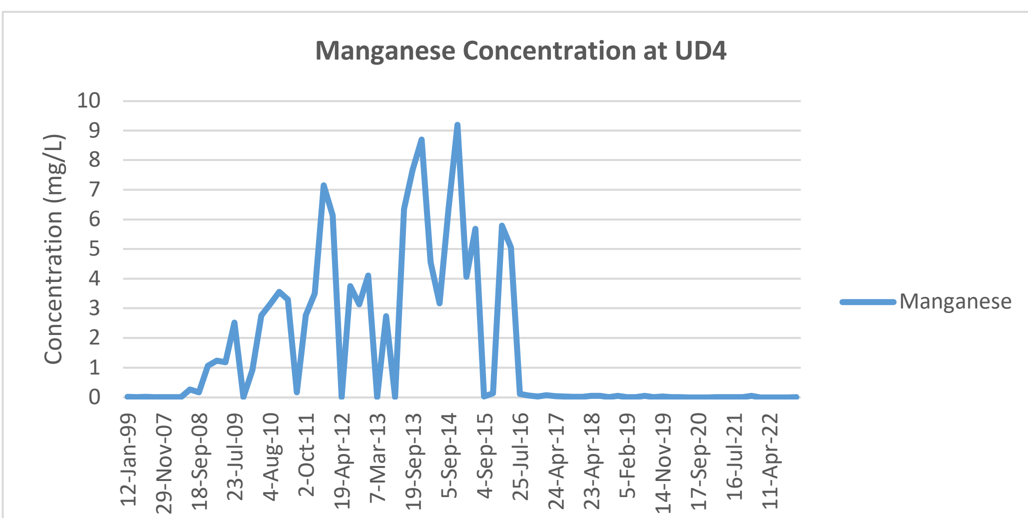

Manganese Concentration at MW52S
Concentration (mg/L)
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
20-May-03
9-Jan-04
27-Apr-05
24-Apr-06
8-Feb-07
31-Jul-08
23-Jul-09
29-Jul-10
9-Jan-11
13-Sep-12
19-Sep-13
5-Sep-14
04-Sep-15
09-Sep-16
25-Sep-17
10-Sep-18
12-Sep-19
17-Sep-20
16-Sep-21
15-Sep-22
Manganese

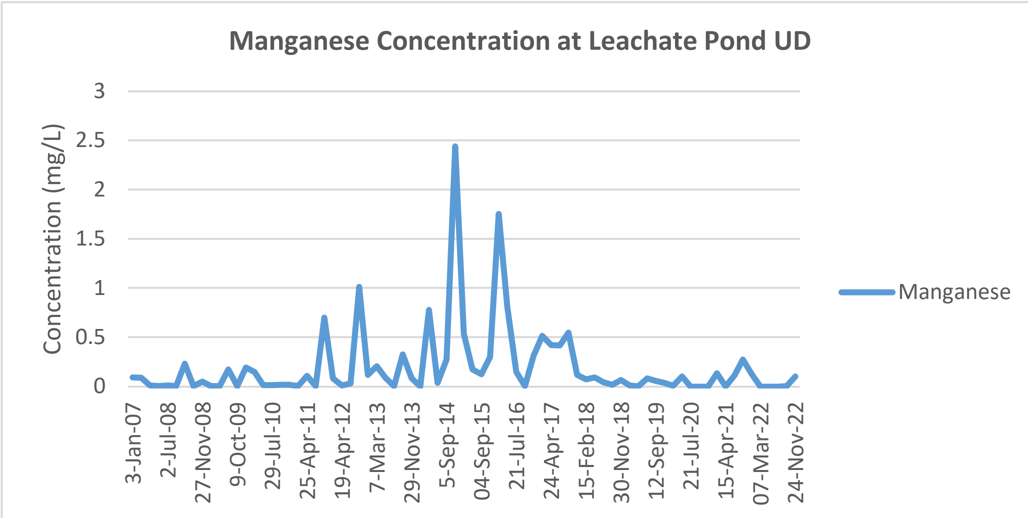

Manganese Concentration at MW52D
Concentration (mg/L)
6
5
4
3
2
1
0
20-May-03
01-Sep-04
16-Nov-04
23-Sep-05
25-Sep-06
02-Aug-07
31-Jul-08
23-Jul-09
29-Jul-10
01-Sep-11
13-Sep-12
08-May-14
24-Apr-15
04-Sep-15
09-Sep-16
25-Sep-17
10-Sep-18
12-Sep-19
17-Sep-20
16-Sep-21
15-Sep-22
Manganese


Manganese Concentration at MW54S
Concentration (mg/L)
3.5
3
2.5
2
1.5
1
0.5
0
23-Sep-05
25-Sep-06
27-Sep-07
18-Sep-08
9-Oct-09
9-Sep-10
19-Jul-12
1-Aug-13
11-Jul-14
9-Jul-15
21-Jul-16
20-Jul-17
18-Jul-18
18-Jul-19
21-Jul-20
16-Jul-21
21-Jul-22
Manganese


Manganese Concentration at MW54U
Concentration (mg/L)
2
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
20-May-03
25-Sep-06
27-Sep-07
18-Sep-08
9-Oct-09
9-Sep-10
19-Jul-12
1-Aug-13
11-Jul-14
9-Jul-15
25-Jul-16
20-Jul-17
23-Apr-18
10-Sep-18
18-Jul-19
21-Jul-20
16-Jul-21
21-Jul-22
Manganese

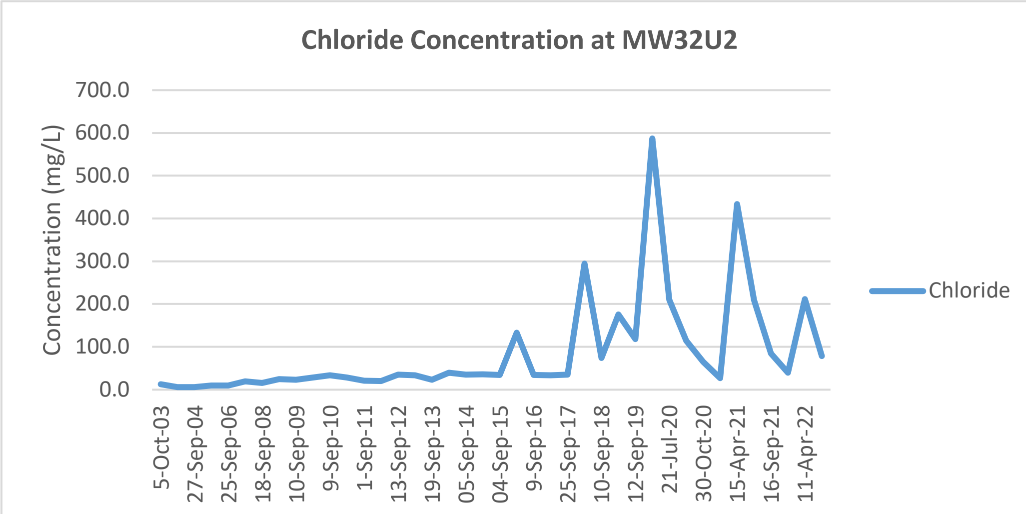

Manganese Concentration at UD3
Concentration (mg/L)
2.5
2
1.5
1
0.5
0
24-Jun-99
26-Apr-00
30-Apr-01
16-Nov-04
6-May-05
7-May-07
7-Feb-08
16-Mar-09
18-Feb-10
10-Feb-11
19-Apr-12
11-Apr-13
11-Jul-14
04-Sep-15
8-Sep-16
25-Sep-17
10-Sep-18
12-Sep-19
17-Sep-20
16-Sep-21
15-Sep-22
Manganese

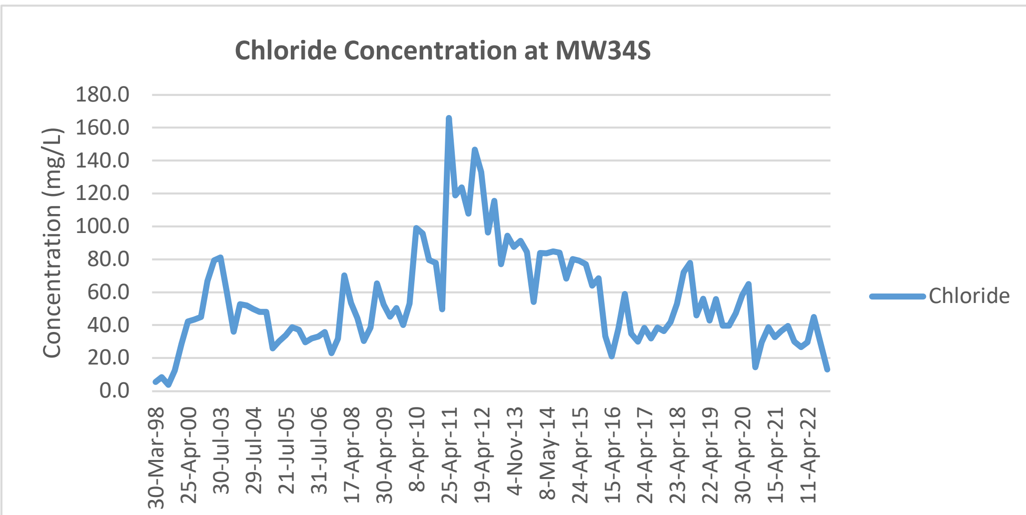

Manganese Concentration at UD4
Concentration (mg/L)
10
9
8
7
6
5
4
3
2
1
0
12-Jan-99
29-Nov-07
18-Sep-08
23-Jul-09
4-Aug-10
2-Oct-11
19-Apr-12
7-Mar-13
19-Sep-13
5-Sep-14
4-Sep-15
25-Jul-16
24-Apr-17
23-Apr-18
5-Feb-19
14-Nov-19
17-Sep-20
16-Jul-21
11-Apr-22
Manganese

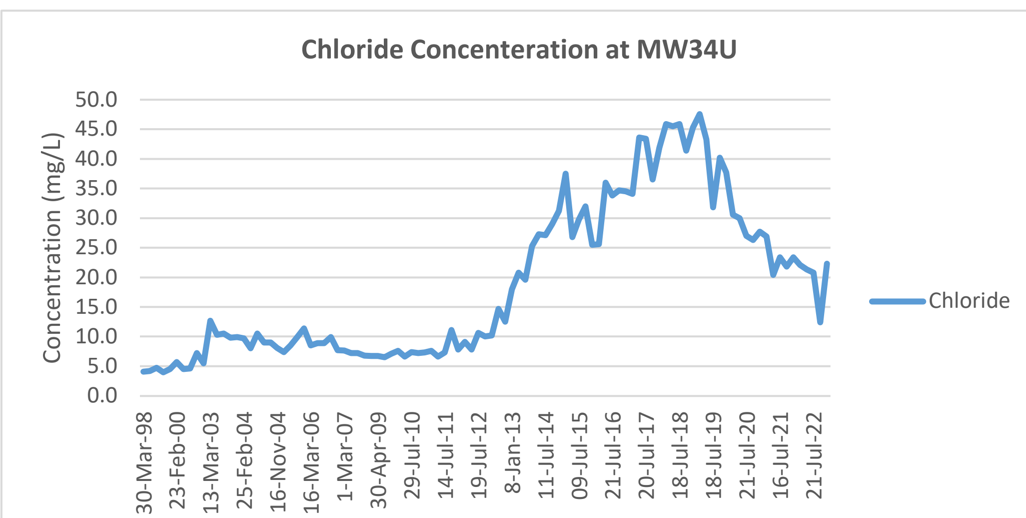

Manganese Concentration at Leachate Pond UD
Concentration (mg/L)
3
2.5
2
1.5
1
0.5
0
3-Jan-07
2-Jul-08
27-Nov-08
9-Oct-09
29-Jul-10
25-Apr-11
19-Apr-12
7-Mar-13
29-Nov-13
5-Sep-14
04-Sep-15
21-Jul-16
24-Apr-17
15-Feb-18
30-Nov-18
12-Sep-19
21-Jul-20
15-Apr-21
07-Mar-22
24-Nov-22
Manganese

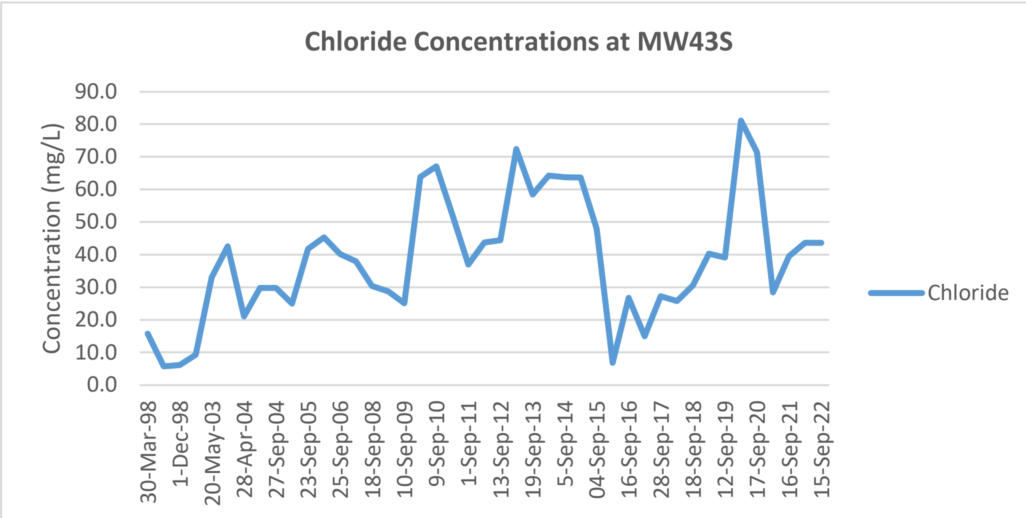
APPENDIX F

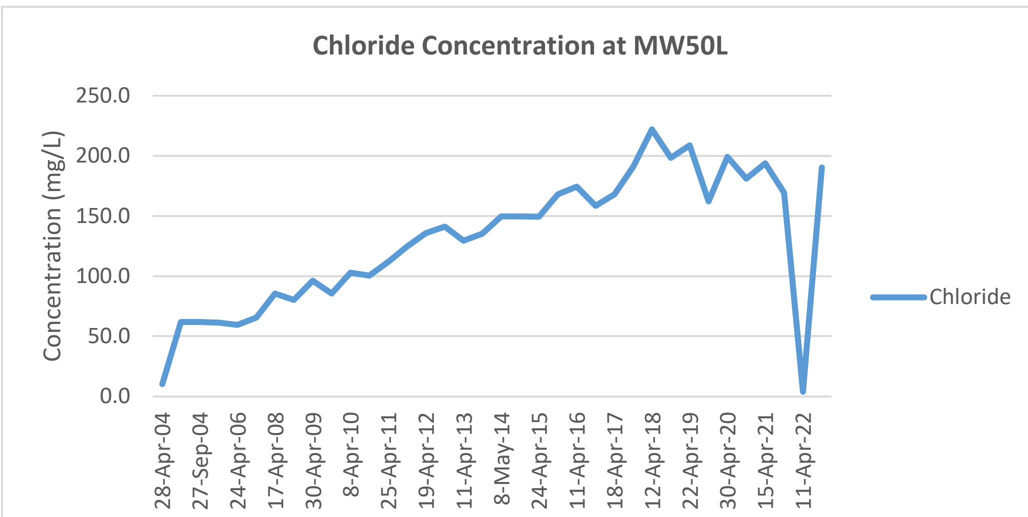
Selected Chloride Concentrations Trending Data

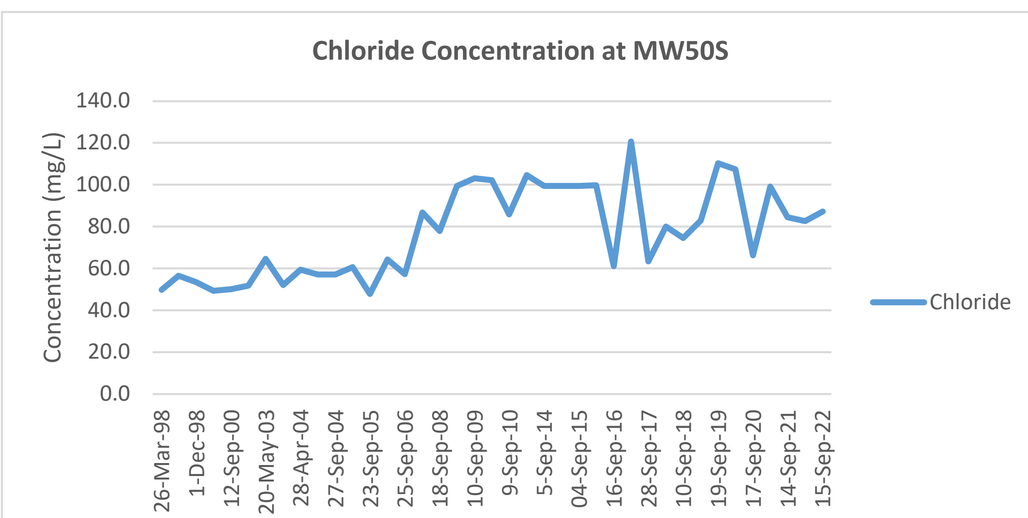

Chloride Concentration at MW32U2
Concentration (mg/L)
700.0
600.0
500.0
400.0
300.0
200.0
100.0
0.0
5-Oct-03
27-Sep-04
25-Sep-06
18-Sep-08
10-Sep-09
9-Sep-10
1-Sep-11
13-Sep-12
19-Sep-13
05-Sep-14
04-Sep-15
9-Sep-16
25-Sep-17
10-Sep-18
12-Sep-19
21-Jul-20
30-Oct-20
15-Apr-21
16-Sep-21
11-Apr-22
Chloride

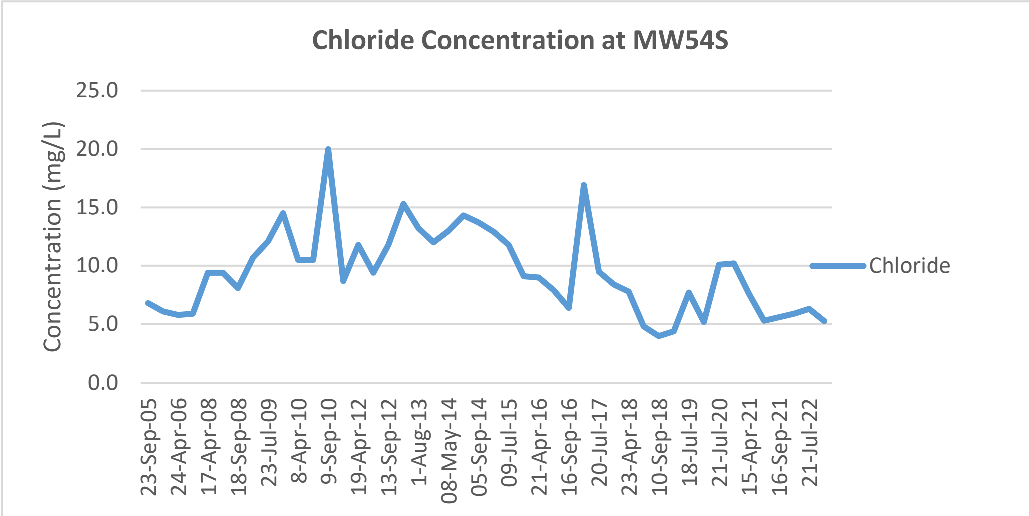

Chloride Concentration at MW34S
Concentration (mg/L)
180.0
160.0
140.0
120.0
100.0
80.0
60.0
40.0
20.0
0.0
30-Mar-98
25-Apr-00
30-Jul-03
29-Jul-04
21-Jul-05
31-Jul-06
17-Apr-08
30-Apr-09
8-Apr-10
25-Apr-11
19-Apr-12
4-Nov-13
8-May-14
24-Apr-15
15-Apr-16
24-Apr-17
23-Apr-18
22-Apr-19
30-Apr-20
15-Apr-21
11-Apr-22
Chloride


Chloride Concenteration at MW34U
Concentration (mg/L)
50.0
45.0
40.0
35.0
30.0
25.0
20.0
15.0
10.0
5.0
0.0
30-Mar-98
23-Feb-00
13-Mar-03
25-Feb-04
16-Nov-04
16-Mar-06
1-Mar-07
30-Apr-09
29-Jul-10
14-Jul-11
19-Jul-12
8-Jan-13
11-Jul-14
09-Jul-15
21-Jul-16
20-Jul-17
18-Jul-18
18-Jul-19
21-Jul-20
16-Jul-21
21-Jul-22
Chloride


Chloride Concentrations at MW43S
Concentration (mg/L)
90.0
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0.0
30-Mar-98
1-Dec-98
20-May-03
28-Apr-04
27-Sep-04
23-Sep-05
25-Sep-06
18-Sep-08
10-Sep-09
9-Sep-10
1-Sep-11
13-Sep-12
19-Sep-13
5-Sep-14
04-Sep-15
16-Sep-16
28-Sep-17
18-Sep-18
12-Sep-19
17-Sep-20
16-Sep-21
15-Sep-22
Chloride

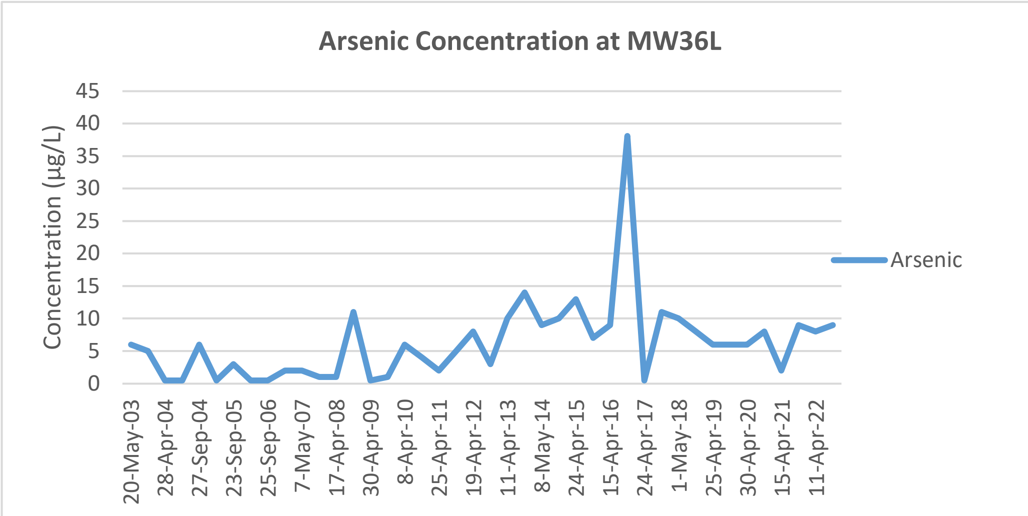

Chloride Concentration at MW50L
Concentration (mg/L)
250.0
200.0
150.0
100.0
50.0
0.0
28-Apr-04
27-Sep-04
24-Apr-06
17-Apr-08
30-Apr-09
8-Apr-10
25-Apr-11
19-Apr-12
11-Apr-13
8-May-14
24-Apr-15
11-Apr-16
18-Apr-17
12-Apr-18
22-Apr-19
30-Apr-20
15-Apr-21
11-Apr-22
Chloride

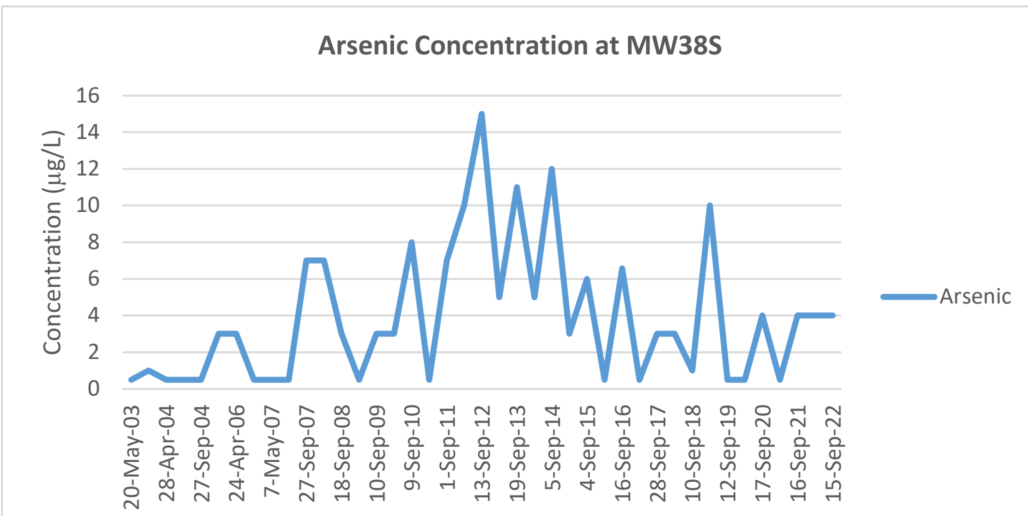

Chloride Concentration at MW50S
Concentration (mg/L)
140.0
120.0
100.0
80.0
60.0
40.0
20.0
0.0
26-Mar-98
1-Dec-98
12-Sep-00
20-May-03
28-Apr-04
27-Sep-04
23-Sep-05
25-Sep-06
18-Sep-08
10-Sep-09
9-Sep-10
5-Sep-14
04-Sep-15
16-Sep-16
28-Sep-17
10-Sep-18
19-Sep-19
17-Sep-20
14-Sep-21
15-Sep-22
Chloride

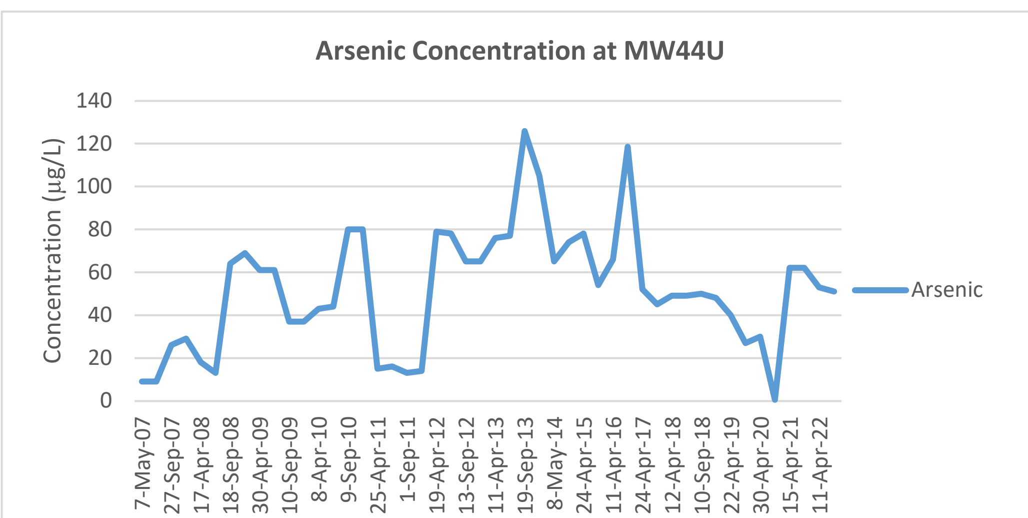

Chloride Concentration at MW54S
Concentration (mg/L)
25.0
20.0
15.0
10.0
5.0
0.0
23-Sep-05
24-Apr-06
17-Apr-08
18-Sep-08
23-Jul-09
8-Apr-10
9-Sep-10
19-Apr-12
13-Sep-12
1-Aug-13
08-May-14
05-Sep-14
09-Jul-15
21-Apr-16
16-Sep-16
20-Jul-17
23-Apr-18
10-Sep-18
18-Jul-19
21-Jul-20
15-Apr-21
16-Sep-21
21-Jul-22
Chloride

APPENDIX G

Selected Arsenic Concentrations Trending Data


Arsenic Concentration at MW36L
Concentration (µg/L)
45
40
35
30
25
20
15
10
5
0
20-May-03
28-Apr-04
27-Sep-04
23-Sep-05
25-Sep-06
7-May-07
17-Apr-08
30-Apr-09
8-Apr-10
25-Apr-11
19-Apr-12
11-Apr-13
8-May-14
24-Apr-15
15-Apr-16
24-Apr-17
1-May-18
25-Apr-19
30-Apr-20
15-Apr-21
11-Apr-22
Arsenic


Arsenic Concentration at MW38S
Concentration (µg/L)
16
14
12
10
8
6
4
2
0
20-May-03
28-Apr-04
27-Sep-04
24-Apr-06
7-May-07
27-Sep-07
18-Sep-08
10-Sep-09
9-Sep-10
1-Sep-11
13-Sep-12
19-Sep-13
5-Sep-14
4-Sep-15
16-Sep-16
28-Sep-17
10-Sep-18
12-Sep-19
17-Sep-20
16-Sep-21
15-Sep-22
Arsenic


Arsenic Concentration at MW44U
Concentration (µg/L)
140
120
100
80
60
40
20
0
7-May-07
27-Sep-07
17-Apr-08
18-Sep-08
30-Apr-09
10-Sep-09
8-Apr-10
9-Sep-10
25-Apr-11
1-Sep-11
19-Apr-12
13-Sep-12
11-Apr-13
19-Sep-13
8-May-14
24-Apr-15
11-Apr-16
24-Apr-17
12-Apr-18
10-Sep-18
22-Apr-19
30-Apr-20
15-Apr-21
11-Apr-22
Arsenic

APPENDIX H

Sedimentation Pond Discharge Data

2022 Sedimentation Ponds Discharge Data

F.R.S.C.

Date	Total Suspended Solids at Mid-point of Discharge mg/L	Comments
07-Jan-22	2	
08-Feb-22	5	
17-Feb-22	7	
28-Feb-22	4	
01-Mar-22	7	
03-Mar-22	3	
07-Mar-22	1	
08-Mar-22	1	
23-Mar-22	2	
12-May-22	1	
17-Aug-22	1	
24-Aug-22	3	
26-Oct-22	4	
15-Nov-22	5	
11-Dec-22	5	
Maximum	Allowed TSS Value	25 mg/l

APPENDIX I

2022 Meteorological Data

Government of Canada Gouvernement du Canada

Home > Environment and natural resources > Weather, Climate and Hazard > Past weather and climate > Historical Data

Daily Data Report for January 2022

SAINT JOHN A
NEW BRUNSWICK
Current Station Operator: NAVCAN

Latitude:	45°18'58.000" N
Longitude:	65°53'24.000" W
Elevation:	108.80 m
Climate ID:	8104901
WMO ID:	71609
TC ID:	YSJ

DAY	Max Temp °C	Min Temp °C	Mean Temp °C	Heat Deg Days	Cool Deg Days	Total Rain mm	Total Snow cm	Total Precip mm	Snow on Grnd cm	Dir of Max Gust 10's deg	Spd of Max Gust km/h
01	5.8	0.2	3.0	15.0	0.0	1.9	0.0	1.9	6	M	M
02	5.3	-6.0	-0.4	18.4	0.0	2.1	T	2.1	T	34	42
03	-5.9	-14.0	-10.0	28.0	0.0	0.0	T	T	2	35	49
04	-4.6	-16.9	-10.8	28.8	0.0	0.0	0.0	0.0	2	36	45
05	9.0	-5.6	1.7	16.3	0.0	24.3	0.0	24.3	2	19	70
06	8.6	-2.3	3.2	14.8	0.0	3.7	0.0	3.7		21	39
07	-0.8	-6.9	-3.9	21.9	0.0	0.0	35.6	35.6	5E	2	154
08	-6.7	-19.9	-13.3	31.3	0.0	0.0	T	T	35	31	57
09	5.5	-17.2	-5.9	23.9	0.0	11.4	T	11.4	25E	21	78
10	2.4	-16.0	-6.8	24.8	0.0	0.0	0.0	0.0	10	32	63
11	-16.0	-23.1	-19.6	37.6	0.0	0.0	0.0	0.0	9	33	46
12	0.2	-24.2	-12.0	30.0	0.0	4.0	13.4	13.4	6	21	65
13	0.8	-8.0	-3.6	21.6	0.0	0.0	0.0	0.0	21	13	33
14	1.1	-13.7	-6.3	24.3	0.0	2.2	4.1	5.1	18	36	87
15	-13.7	-19.3	-16.5	34.5	0.0	0.0	5.4	5.4	18	34	92
16	-9.8	-21.9	-15.9	33.9	0.0	0.0	0.0	0.0	18	32	63
17	5.9	-21.0	-7.6	25.6	0.0	21.0	T	21.0	18	11	84
18	M	M	M	M	M	0.2	T	0.2	12	30	65
19	4.0	-18.2	-7.1	25.1	0.0	2.6	2.5	5.1	11	31	52
20	3.1	-15.5	-6.2	24.2	0.0	0.0	1.2	1.0	10	34	44
21	-13.6	-21.8	-17.7	35.7	0.0	0.0	0.0	0.0	11	35	40
22	-8.0	-24.1	-16.1	34.1	0.0	0.0	T	T	11E	M	M
23	-2.6	-16.8	-9.7	27.7	0.0	0.0	T	T	11	M	M

DAY	Max Temp °C	Min Temp °C	Mean Temp °C	Heat Deg Days	Cool Deg Days	Total Rain mm	Total Snow cm	Total Precip mm	Snow on Grnd cm	Dir of Max Gust 10's deg	Spd of Max Gust km/h
24	-5.5	-17.1	-11.3	29.3	0.0	T	0.0	T	11	M	M
25	2.1	-17.5	-7.7	25.7	0.0	4.6	4.0	8.1	12	32	38
26	-8.7	-22.3	-15.5	33.5	0.0	0.0	0.0	0.0	20	34	39
27	-3.1	-29.8	-16.5	34.5	0.0	0.0	T	T	18	20	52
28	-2.1	-9.6	-5.9	23.9	0.0	0.0	7.4	4.6	20	18	44
29	M	M	M	M	M	6.0	20.2	26.2	19	2	99
30	-5.2	-22.5	-13.9	31.9	0.0	0.0	6.0	6.0	38	33	64
31	-6.0	-25.4	-15.7	33.7	0.0	0.0	0.0	0.0	29	30	32
Sum				790.0^	0.0^	84.0	99.8	175.1			
Avg	-2.0^	-16.4^	-9.2^								
Xtrm	9.0^	-29.8^				24.3	35.6	35.6		2^	154^

Summary, average and extreme values are based on the data above.

Legend

- A = Accumulated
- C = Precipitation occurred, amount uncertain
- E = Estimated
- F = Accumulated and estimated
- L = Precipitation may or may not have occurred
- M = Missing
- N = Temperature missing but known to be > 0
- S = More than one occurrence
- T = Trace
- Y = Temperature missing but known to be < 0
- [empty] = Indicates an unobserved value
- ^ = The value displayed is based on incomplete data
- † = Data that is not subject to review by the National Climate Archives

Date modified:

2022-12-01

Daily Data Report for February 2022

SAINT JOHN A
NEW BRUNSWICK
Current Station Operator: NAVCAN

Latitude:	45°18'58.000" N
Longitude:	65°53'24.000" W
Elevation:	108.80 m
Climate ID:	8104901
WMO ID:	71609
TC ID:	YSJ

DAY	Max Temp °C	Min Temp °C	Mean Temp °C	Heat Deg Days	Cool Deg Days	Total Rain mm	Total Snow cm	Total Precip mm	Snow on Grnd cm	Dir of Max Gust 10's deg	Spd of Max Gust km/h
01	M	M	M	M	M	0.0	0.0	0.0	25	M	M
02	4.8	-21.0	-8.1	26.1	0.0	2.9	0.0	2.9	24	17	51
03	5.9	-2.3	1.8	16.2	0.0	M	M	16.2	18	18	54
04	-2.4	-8.3	-5.4	23.4	0.0	M	M	16.6	16	4	56
05	-7.9	-16.3	-12.1	30.1	0.0	4.0	4.2	4.0	30	30	53
06	-6.4	-20.0	-13.2	31.2	0.0	0.0	0.0	0.0	26	33	45
07	1.0	-6.3	-2.7	20.7	0.0	0.0	0.0	M	10	18	44
08	4.3	0.1	2.2	15.8	0.0	M	M	M	6	6	49
09	0.8	-7.0	-3.1	21.1	0.0	3.6	T	3.6	12	28	35
10	3.6	-5.1	-0.8	18.8	0.0	4.7	0.0	4.7	20	20	44
11	4.8	-0.4	2.2	15.8	0.0	0.0	0.0	0.0	16	20	34
12	6.5	0.9	3.7	14.3	0.0	0.0	0.0	0.0	13	21	50
13	0.9	-10.8	-5.0	23.0	0.0	0.0	0.8	0.8	11	34	45
14	-10.7	-16.3	-13.5	31.5	0.0	0.2	3.0	0.4	15	1	49
15	-10.4	-18.6	-14.5	32.5	0.0	0.0	0.0	0.0	20	32	45
16	4.1	-24.0	-10.0	28.0	0.0	0.0	T	T	20	19	81
17	7.3	3.9	5.6	12.4	0.0	3.1	0.0	3.1	12	20	77
18	9.6	-9.7	-0.1	18.1	0.0	33.2	0.0	33.2	6	21	95
19	-1.6	-13.7	-7.7	25.7	0.0	0.2	3.0	3.2	1	20	45
20	M	M	M	M	M	0.0	T	T	6	M	M
21	M	M	M	M	M	0.0	0.0	0.0	4	M	M
22	4.9	-5.0	-0.1	18.1	0.0	7.9	0.0	7.9		11	59
23	8.2	-8.8	-0.3	18.3	0.0	21.1	0.0	21.1		20	90

DAY	Max Temp °C	Min Temp °C	Mean Temp °C	Heat Deg Days	Cool Deg Days	Total Rain mm	Total Snow cm	Total Precip mm	Snow on Grnd cm	Dir of Max Gust 10's deg	Spd of Max Gust km/h
24	-6.1	-12.6	-9.4	27.4	0.0	0.0	0.0	0.0		31	51
25	-11.3	-17.3	-14.3	32.3	0.0	7.0	1.0	8.0	1E	35	39
26	-7.5	-20.8	-14.2	32.2	0.0	0.0	0.0	0.0	10	32	35
27	-1.1	-12.5	-6.8	24.8	0.0	0.0	1.0	1.0	8	32	68
28	-9.8	-14.8	-12.3	30.3	0.0	0.0	T	T	9	32	59
Sum				588.1^	0.0^	87.9^	13.0^	126.7^			
Avg	-0.3^	-10.7^	-5.5^								
Xtrm	9.6^	-24.0^				33.2^	4.2^	33.2^		21^	95^
Summary, average and extreme values are based on the data above.											

Legend

- A = Accumulated
- C = Precipitation occurred, amount uncertain
- E = Estimated
- F = Accumulated and estimated
- L = Precipitation may or may not have occurred
- M = Missing
- N = Temperature missing but known to be > 0
- S = More than one occurrence
- T = Trace
- Y = Temperature missing but known to be < 0
- [empty] = Indicates an unobserved value
- ^ = The value displayed is based on incomplete data
- † = Data that is not subject to review by the National Climate Archives

Date modified:

2022-12-01

Government of Canada / Gouvernement du Canada

Daily Data Report for March 2022

SAINT JOHN A
NEW BRUNSWICK
Current Station Operator: NAVCAN

Latitude:	45°18'58.000" N
Longitude:	65°53'24.000" W
Elevation:	108.80 m
Climate ID:	8104901
WMO ID:	71609
TC ID:	YSJ

DAY	Max Temp °C	Min Temp °C	Mean Temp °C	Heat Deg Days	Cool Deg Days	Total Rain mm	Total Snow cm	Total Precip mm	Snow on Grnd cm	Dir of Max Gust 10's deg	Spd of Max Gust km/h
01	-1.9	-21.6	-11.8	29.8	0.0	0.0	0.2	0.2	8	17	44
02	1.7	-10.0	-4.2	22.2	0.0	0.3	5.0	5.1	8E	19	52
03	-3.5	-16.8	-10.2	28.2	0.0	M	M	1.4	8	32	57
04	-8.1	-19.5	-13.8	31.8	0.0	0.0	0.0	0.0	8	31	46
05	0.7	-13.7	-6.5	24.5	0.0	0.0	0.0	0.0	8	31	42
06	5.5	-7.9	-1.2	19.2	0.0	6.7	2.0	8.7	8	15	45
07	6.4	2.1	4.3	13.7	0.0	11.5	0.0	11.5	7	16	39
08	5.9	-6.6	-0.4	18.4	0.0	5.0	T	5.0	T	29	75
09	-1.3	-8.4	-4.9	22.9	0.0	0.6	0.0	0.6	T	23	41
10	5.9	-2.5	1.7	16.3	0.0	0.0	0.0	0.0	1	23	42
11	6.9	-5.7	0.6	17.4	0.0	0.0	0.0	0.0		20	33
12	10.2	-1.7	4.3	13.7	0.0	25.7	T	25.7		21	64
13	-1.7	-7.6	-4.7	22.7	0.0	M	M	T	T	32	88
14	3.0	-10.2	-3.6	21.6	0.0	0.0	0.0	0.0		21	42
15	7.1	-2.5	2.3	15.7	0.0	T	0.0	T		34	38
16	4.7	-2.6	1.1	16.9	0.0	0.0	T	T	T	22	43
17	6.4	2.5	4.5	13.5	0.0	0.0	0.0	0.0		20	56
18	16.1	2.7	9.4	8.6	0.0	T	0.0	T		32	40
19	3.0	0.0	1.5	16.5	0.0	2.8	T	2.8		10	69
20	11.1	1.3	6.2	11.8	0.0	3.2	0.0	3.2		10	59
21	5.7	-1.0	2.4	15.6	0.0	1.3	T	1.3	T	34	60
22	2.5	-2.8	-0.2	18.2	0.0	0.0	T	T		32	65
23	8.4	-4.9	1.8	16.2	0.0	0.0	0.0	0.0		35	41

DAY	Max Temp °C	Min Temp °C	Mean Temp °C	Heat Deg Days	Cool Deg Days	Total Rain mm	Total Snow cm	Total Precip mm	Snow on Grnd cm	Dir of Max Gust 10's deg	Spd of Max Gust km/h
24	4.4	-6.4	-1.0	19.0	0.0	0.8	T	0.8		10	46
25	5.8	-2.7	1.6	16.4	0.0	5.7	0.0	5.7		10	62
26	9.9	-1.5	4.2	13.8	0.0	4.0	4.0	8.0	2E	21	35
27	7.8	0.0	3.9	14.1	0.0	8.4	0.0	8.4	3	20	38
28	3.1	-5.2	-1.1	19.1	0.0	0.5	4.3	4.8	2E	31	40
29	1.3	-6.2	-2.5	20.5	0.0	0.0	0.5	0.5	3	31	64
30	6.2	-7.1	-0.5	18.5	0.0	0.0	0.0	0.0	T	31	50
31	M	M	M	M	M	2.5	T	2.5	T	20	41
Sum				556.8^	0.0^	79.0^	16.0^	96.2			
Avg	4.4^	-5.6^	-0.6^								
Xtrm	16.1^	-21.6^				25.7^	5.0^	25.7		32	88
Summary, average and extreme values are based on the data above.											

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- S = More than one occurrence
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Date modified:

2022-12-01

Government of Canada Gouvernement du Canada

Daily Data Report for April 2022

SAINT JOHN A
NEW BRUNSWICK
Current Station Operator: NAVCAN

Latitude:	45°18'58.000" N
Longitude:	65°53'24.000" W
Elevation:	108.80 m
Climate ID:	8104901
WMO ID:	71609
TC ID:	YSJ

DAY	Max Temp °C	Min Temp °C	Mean Temp °C	Heat Deg Days	Cool Deg Days	Total Rain mm	Total Snow cm	Total Precip mm	Snow on Grnd cm	Dir of Max Gust 10's deg	Spd of Max Gust km/h
01	10.6	2.9	6.8	11.2	0.0	10.3	0.0	10.3		20	57
02	5.9	0.4	3.2	14.8	0.0	1.0	0.0	1.0		32	66
03	9.0	-2.2	3.4	14.6	0.0	0.0	0.0	0.0		31	41
04	4.7	-4.7	0.0	18.0	0.0	M	M	T	T	35	72
05	11.1	-5.0	3.1	14.9	0.0	0.0	0.0	0.0		29	44
06	12.1	-7.2	2.5	15.5	0.0	0.0	0.0	0.0		M	M
07	10.7	-6.2	2.3	15.7	0.0	0.0	0.0	0.0		8	43
08	7.0	0.6	3.8	14.2	0.0	4.7	0.0	4.7		12	72
09	14.9	4.1	9.5	8.5	0.0	T	0.0	T		M	M
10	9.3	0.9	5.1	12.9	0.0	2.4	0.0	2.4		35	45
11	14.7	-3.0	5.9	12.1	0.0	0.0	0.0	0.0		34	60
12	9.8	-3.8	3.0	15.0	0.0	0.2	0.0	0.2		33	59
13	14.5	-2.3	6.1	11.9	0.0	0.0	0.0	0.0		30	57
14	9.0	4.3	6.7	11.3	0.0	3.5	0.0	3.5		11	32
15	8.3	1.3	4.8	13.2	0.0	3.1	0.0	3.1		10	36
16	10.2	0.0	5.1	12.9	0.0	2.7	0.0	2.7		22	54
17	8.8	1.0	4.9	13.1	0.0	12.3	0.0	12.3		32	49
18	11.9	-2.6	4.7	13.3	0.0	0.0	0.0	0.0		32	49
19	9.3	1.8	5.6	12.4	0.0	73.5	0.0	73.5		10	84
20	10.5	2.6	6.6	11.4	0.0	T	0.0	T		23	58
21	9.9	-1.2	4.4	13.6	0.0	T	0.0	T		22	45
22	13.6	2.8	8.2	9.8	0.0	2.7	0.0	2.7		31	53
23	10.2	-1.6	4.3	13.7	0.0	0.0	0.0	0.0		30	58

DAY	Max Temp °C	Min Temp °C	Mean Temp °C	Heat Deg Days	Cool Deg Days	Total Rain mm	Total Snow cm	Total Precip mm	Snow on Grnd cm	Dir of Max Gust 10's deg	Spd of Max Gust km/h
24	12.4	-1.6	5.4	12.6	0.0	0.0	0.0	0.0		2	52
25	12.4	3.1	7.8	10.2	0.0	0.0	0.0	0.0		1	45
26	9.7	2.5	6.1	11.9	0.0	0.4	0.0	0.4		20	39
27	9.0	5.4	7.2	10.8	0.0	16.1	0.0	16.1		M	M
28	6.6	0.8	3.7	14.3	0.0	7.2	0.0	7.2		34	61
29	5.4	0.7	3.1	14.9	0.0	2.0	T	2.0		1	63
30	6.1	0.7	3.4	14.6	0.0	3.4	T	3.4		36	54
Sum				393.3	0.0	145.5^	T	145.5			
Avg	9.9	-0.2	4.9								
Xtrm	14.9	-7.2				73.5^	0.0^	73.5		10^	84^
Summary, average and extreme values are based on the data above.											

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Government of Canada Gouvernement du Canada

Daily Data Report for May 2022

SAINT JOHN A
NEW BRUNSWICK
Current Station Operator: NAVCAN

Latitude:	45°18'58.000" N
Longitude:	65°53'24.000" W
Elevation:	108.80 m
Climate ID:	8104901
WMO ID:	71609
TC ID:	YSJ

DAY	Max Temp °C	Min Temp °C	Mean Temp °C	Heat Deg Days	Cool Deg Days	Total Rain mm	Total Snow cm	Total Precip mm	Snow on Grnd cm	Dir of Max Gust 10's deg	Spd of Max Gust km/h
01	9.0	0.8	4.9	13.1	0.0	T	0.0	T		35	42
02	14.1	0.1	7.1	10.9	0.0	0.0	0.0	0.0		21	32
03	16.6	-1.8	7.4	10.6	0.0	0.0	0.0	0.0		M	M
04	8.1	1.2	4.7	13.3	0.0	4.2	0.0	4.2		M	M
05	15.4	2.8	9.1	8.9	0.0	1.4	0.0	1.4		33	46
06	12.9	-1.1	5.9	12.1	0.0	0.0	0.0	0.0		32	48
07	11.2	-3.3	4.0	14.0	0.0	0.0	0.0	0.0		6	42
08	13.0	-4.2	4.4	13.6	0.0	0.0	0.0	0.0		14	36
09	18.6	-2.3	8.2	9.8	0.0	0.0	0.0	0.0		8	45
10	19.1	1.2	10.2	7.8	0.0	0.0	0.0	0.0		12	40
11	22.6	3.0	12.8	5.2	0.0	0.0	0.0	0.0		10	31
12	27.3	4.1	15.7	2.3	0.0	0.0	0.0	0.0		3	31
13	18.9	5.1	12.0	6.0	0.0	T	0.0	T		20	41
14	25.6	8.9	17.3	0.7	0.0	2.0	0.0	2.0		10	46
15	15.4	9.2	12.3	5.7	0.0	4.4	0.0	4.4		10	46
16	15.9	9.4	12.7	5.3	0.0	0.6	0.0	0.6		12	33
17	15.7	5.1	10.4	7.6	0.0	18.5	0.0	18.5		21	51
18	15.7	5.3	10.5	7.5	0.0	0.0	0.0	0.0		30	58
19	17.5	-0.2	8.7	9.3	0.0	3.0	0.0	3.0		11	32
20	16.8	6.5	11.7	6.3	0.0	0.0	0.0	0.0		19	32
21	M	M	M	M	M	1.7	0.0	1.7		19	42
22	20.6	10.9	15.8	2.2	0.0	0.4	0.0	0.4		21	42
23	18.5	6.9	12.7	5.3	0.0	0.9	0.0	0.9		35	45

DAY	Max Temp °C	Min Temp °C	Mean Temp °C	Heat Deg Days	Cool Deg Days	Total Rain mm	Total Snow cm	Total Precip mm	Snow on Grnd cm	Dir of Max Gust 10's deg	Spd of Max Gust km/h
24	17.4	2.1	9.8	8.2	0.0	0.0	0.0	0.0		15	39
25	18.0	-0.7	8.7	9.3	0.0	0.0	0.0	0.0		20	35
26	15.2	5.7	10.5	7.5	0.0	2.4	0.0	2.4		20	44
27	12.9	9.8	11.4	6.6	0.0	1.7	0.0	1.7		21	48
28	13.9	11.1	12.5	5.5	0.0	3.1	0.0	3.1		21	51
29	22.7	5.7	14.2	3.8	0.0	0.0	0.0	0.0		21	43
30	24.8	9.0	16.9	1.1	0.0	1.8	0.0	1.8		22	37
31	18.5	0.1	9.3	8.7	0.0	2.8	0.0	2.8		2	45
Sum				228.2^	0.0^	48.9	0.0	48.9			
Avg	17.1^	3.7^	10.4^								
Xtrm	27.3^	-4.2^				18.5	0.0	18.5		30^	58^

Summary, average and extreme values are based on the data above.

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Government of Canada Gouvernement du Canada

Daily Data Report for June 2022

SAINT JOHN A
NEW BRUNSWICK
Current Station Operator: NAVCAN

Latitude:	45°18'58.000" N
Longitude:	65°53'24.000" W
Elevation:	108.80 m
Climate ID:	8104901
WMO ID:	71609
TC ID:	YSJ

DAY	Max Temp °C	Min Temp °C	Mean Temp °C	Heat Deg Days	Cool Deg Days	Total Rain mm	Total Snow cm	Total Precip mm	Snow on Grnd cm	Dir of Max Gust 10's deg	Spd of Max Gust km/h
01	19.9	0.2	10.1	7.9	0.0	0.0	0.0	0.0		34	45
02	21.7	1.5	11.6	6.4	0.0	0.0	0.0	0.0		33	43
03	19.4	5.6	12.5	5.5	0.0	0.2	0.0	0.2		13	36
04	18.5	8.5	13.5	4.5	0.0	0.0	0.0	0.0		M	M
05	16.5	6.2	11.4	6.6	0.0	3.9	0.0	3.9		M	M
06	17.1	4.4	10.8	7.2	0.0	0.0	0.0	0.0		M	M
07	22.2	3.4	12.8	5.2	0.0	0.0	0.0	0.0		21	31
08	17.2	11.1	14.2	3.8	0.0	32.3	0.0	32.3		16	38
09	17.4	11.8	14.6	3.4	0.0	7.0	0.0	7.0		13	38
10	19.8	9.1	14.5	3.5	0.0	T	0.0	T		20	45
11	23.2	8.1	15.7	2.3	0.0	0.0	0.0	0.0		21	53
12	25.2	8.4	16.8	1.2	0.0	0.0	0.0	0.0		21	40
13	M	M	M	M	M	M	M	M		13	33
14	16.7	12.3	14.5	3.5	0.0	2.6	0.0	2.6		36	51
15	24.3	6.6	15.5	2.5	0.0	0.0	0.0	0.0		4	46
16	21.8	4.9	13.4	4.6	0.0	0.0	0.0	0.0		20	48
17	13.9	11.5	12.7	5.3	0.0	8.6	0.0	8.6		20	62
18	20.7	7.1	13.9	4.1	0.0	T	0.0	T		21	31
19	15.6	7.2	11.4	6.6	0.0	0.2	0.0	0.2		M	M
20	14.8	10.0	12.4	5.6	0.0	1.6	0.0	1.6		1	35
21	16.3	7.9	12.1	5.9	0.0	0.0	0.0	0.0		34	41
22	18.5	7.6	13.1	4.9	0.0	0.0	0.0	0.0		18	36
23	22.2	8.7	15.5	2.5	0.0	4.7	0.0	4.7		21	32

DAY	Max Temp °C	Min Temp °C	Mean Temp °C	Heat Deg Days	Cool Deg Days	Total Rain mm	Total Snow cm	Total Precip mm	Snow on Grnd cm	Dir of Max Gust 10's deg	Spd of Max Gust km/h
24	21.5	11.3	16.4	1.6	0.0	3.2	0.0	3.2		14	32
25	27.5	11.2	19.4	0.0	1.4	0.0	0.0	0.0		21	31
26	26.9	9.0	18.0	0.0	0.0	0.0	0.0	0.0		20	36
27	22.2	13.5	17.9	0.1	0.0	6.0	0.0	6.0		20	60
28	22.6	8.5	15.6	2.4	0.0	1.8	0.0	1.8		20	36
29	25.2	6.5	15.9	2.1	0.0	0.0	0.0	0.0		20	35
30	24.3	10.0	17.2	0.8	0.0	0.0	0.0	0.0		34	39
Sum				110.0^	1.4^	72.1^	M	72.1^			
Avg	20.5^	8.0^	14.3^								
Xtrm	27.5^	0.2^				32.3^	0.0^	32.3^		20^	62^
Summary, average and extreme values are based on the data above.											

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Daily Data Report for July 2022

SAINT JOHN A
NEW BRUNSWICK
Current Station Operator: NAVCAN

Latitude:	45°18'58.000" N
Longitude:	65°53'24.000" W
Elevation:	108.80 m
Climate ID:	8104901
WMO ID:	71609
TC ID:	YSJ

DAY	Max Temp °C	Min Temp °C	Mean Temp °C	Heat Deg Days	Cool Deg Days	Total Rain mm	Total Snow cm	Total Precip mm	Snow on Grnd cm	Dir of Max Gust 10's deg	Spd of Max Gust km/h
01	22.5	8.7	15.6	2.4	0.0	0.7	0.0	0.7		21	49
02	18.8	11.5	15.2	2.8	0.0	12.4	0.0	12.4		22	35
03	25.7	7.6	16.7	1.3	0.0	0.0	0.0	0.0		30	37
04	24.4	10.7	17.6	0.4	0.0	0.0	0.0	0.0		35	39
05	24.8	6.8	15.8	2.2	0.0	5.3	0.0	5.3		21	44
06	20.6	8.2	14.4	3.6	0.0	22.9	0.0	22.9		33	56
07	24.3	7.0	15.7	2.3	0.0	0.0	0.0	0.0		28	43
08	19.4	11.5	15.5	2.5	0.0	4.8	0.0	4.8		20	53
09	22.1	6.1	14.1	3.9	0.0	0.0	0.0	0.0		34	36
10	23.6	4.2	13.9	4.1	0.0	0.0	0.0	0.0		32	34
11	21.8	8.6	15.2	2.8	0.0	0.0	0.0	0.0		21	49
12	21.4	13.4	17.4	0.6	0.0	T	0.0	T		21	71
13	26.1	11.6	18.9	0.0	0.9	0.0	0.0	0.0		22	32
14	25.4	12.8	19.1	0.0	1.1	6.1	0.0	6.1		10	32
15	25.9	9.3	17.6	0.4	0.0	0.0	0.0	0.0		36	32
16	25.7	9.0	17.4	0.6	0.0	0.0	0.0	0.0		23	47
17	22.8	13.1	18.0	0.0	0.0	0.0	0.0	0.0		23	40
18	22.6	13.4	18.0	0.0	0.0	10.4	0.0	10.4		21	36
19	26.4	16.6	21.5	0.0	3.5	35.5	0.0	35.5		29	60
20	28.1	11.8	20.0	0.0	2.0	0.0	0.0	0.0		28	48
21	28.7	11.9	20.3	0.0	2.3	0.3	0.0	0.3		20	43
22	26.5	14.9	20.7	0.0	2.7	0.7	0.0	0.7		20	37
23	29.1	13.1	21.1	0.0	3.1	0.0	0.0	0.0		21	32

DAY	Max Temp °C	Min Temp °C	Mean Temp °C	Heat Deg Days	Cool Deg Days	Total Rain mm	Total Snow cm	Total Precip mm	Snow on Grnd cm	Dir of Max Gust 10's deg	Spd of Max Gust km/h
24	27.4	16.0	21.7	0.0	3.7	0.0	0.0	0.0		19	39
25	22.9	17.0	20.0	0.0	2.0	0.5	0.0	0.5		20	52
26	24.9	10.9	17.9	0.1	0.0	T	0.0	T		21	43
27	25.9	9.5	17.7	0.3	0.0	0.0	0.0	0.0		21	44
28	27.6	9.8	18.7	0.0	0.7	0.0	0.0	0.0		21	34
29	24.9	11.2	18.1	0.0	0.1	7.9	0.0	7.9		13	35
30	25.1	10.9	18.0	0.0	0.0	0.2	0.0	0.2		22	42
31	27.1	14.2	20.7	0.0	2.7	0.0	0.0	0.0		23	46
Sum				30.3	24.8	107.7	0.0	107.7			
Avg	24.6	11.0	17.8								
Xtrm	29.1	4.2				35.5	0.0	35.5		21	71

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Daily Data Report for August 2022

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WMO ID:	71609
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DAY	Max Temp °C	Min Temp °C	Mean Temp °C	Heat Deg Days	Cool Deg Days	Total Rain mm	Total Snow cm	Total Precip mm	Snow on Grnd cm	Dir of Max Gust 10's deg	Spd of Max Gust km/h
01	25.0	13.7	19.4	0.0	1.4	0.0	0.0	0.0		20	36
02	22.9	15.0	19.0	0.0	1.0	9.5	0.0	9.5		M	M
03	27.1	11.6	19.4	0.0	1.4	0.0	0.0	0.0		20	33
04	24.3	13.6	19.0	0.0	1.0	0.0	0.0	0.0		22	37
05	27.7	17.3	22.5	0.0	4.5	0.3	0.0	0.3		M	M
06	29.5	18.0	23.8	0.0	5.8	0.0	0.0	0.0		19	31
07	28.3	17.7	23.0	0.0	5.0	0.6	0.0	0.6		18	33
08	22.3	15.4	18.9	0.0	0.9	18.0	0.0	18.0		9	31
09	19.8	14.3	17.1	0.9	0.0	7.3	0.0	7.3		2	33
10	21.5	13.1	17.3	0.7	0.0	0.0	0.0	0.0		M	M
11	23.4	14.9	19.2	0.0	1.2	0.0	0.0	0.0		M	M
12	24.1	13.6	18.9	0.0	0.9	0.0	0.0	0.0		M	M
13	M	M	M	M	M	5.4	0.0	5.4		M	M
14	M	M	M	M	M	32.9	0.0	32.9		35	32
15	24.9	10.3	17.6	0.4	0.0	0.0	0.0	0.0		M	M
16	27.6	11.5	19.6	0.0	1.6	0.0	0.0	0.0		9	36
17	20.1	16.4	18.3	0.0	0.3	30.2	0.0	30.2		10	46
18	17.5	14.8	16.2	1.8	0.0	8.0	0.0	8.0		19	39
19	24.6	13.1	18.9	0.0	0.9	0.9	0.0	0.9		28	33
20	29.1	11.7	20.4	0.0	2.4	0.0	0.0	0.0		M	M
21	28.0	11.1	19.6	0.0	1.6	0.0	0.0	0.0		21	31
22	25.7	11.3	18.5	0.0	0.5	0.7	0.0	0.7		21	35
23	20.1	15.2	17.7	0.3	0.0	18.4	0.0	18.4		9	39

DAY	Max Temp °C	Min Temp °C	Mean Temp °C	Heat Deg Days	Cool Deg Days	Total Rain mm	Total Snow cm	Total Precip mm	Snow on Grnd cm	Dir of Max Gust 10's deg	Spd of Max Gust km/h
24	24.4	16.1	20.3	0.0	2.3	0.4	0.0	0.4		M	M
25	27.0	14.0	20.5	0.0	2.5	0.0	0.0	0.0		M	M
26	22.4	14.0	18.2	0.0	0.2	2.1	0.0	2.1		22	32
27	21.4	10.8	16.1	1.9	0.0	1.0	0.0	1.0		M	M
28	23.8	8.1	16.0	2.0	0.0	0.0	0.0	0.0		M	M
29	21.9	8.1	15.0	3.0	0.0	0.3	0.0	0.3		20	35
30	19.5	16.9	18.2	0.0	0.2	0.3	0.0	0.3		20	42
31	20.5	15.4	18.0	0.0	0.0	32.9	0.0	32.9		17	61
Sum				11.0^	35.6^	169.2	0.0	169.2			
Avg	23.9^	13.7^	18.8^								
Xtrm	29.5^	8.1^				32.9	0.0	32.9		17^	61^
Summary, average and extreme values are based on the data above.											

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Longitude:	65°53'24.000" W
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Climate ID:	8104901
WMO ID:	71609
TC ID:	YSJ

DAY	Max Temp °C	Min Temp °C	Mean Temp °C	Heat Deg Days	Cool Deg Days	Total Rain mm	Total Snow cm	Total Precip mm	Snow on Grnd cm	Dir of Max Gust 10's deg	Spd of Max Gust km/h
01	22.9	11.1	17.0	1.0	0.0	0.2	0.0	0.2		31	39
02	20.9	5.9	13.4	4.6	0.0	0.0	0.0	0.0		33	32
03	22.3	5.4	13.9	4.1	0.0	0.0	0.0	0.0		M	M
04	21.4	6.1	13.8	4.2	0.0	0.0	0.0	0.0		1	38
05	21.6	12.7	17.2	0.8	0.0	1.1	0.0	1.1		M	M
06	20.7	7.0	13.9	4.1	0.0	1.3	0.0	1.3		M	M
07	22.2	5.9	14.1	3.9	0.0	0.0	0.0	0.0		M	M
08	23.9	5.4	14.7	3.3	0.0	0.0	0.0	0.0		M	M
09	25.3	9.0	17.2	0.8	0.0	0.0	0.0	0.0		M	M
10	24.4	10.7	17.6	0.4	0.0	0.0	0.0	0.0		M	M
11	27.2	12.5	19.9	0.0	1.9	0.0	0.0	0.0		M	M
12	24.9	12.8	18.9	0.0	0.9	0.0	0.0	0.0		M	M
13	21.1	13.3	17.2	0.8	0.0	2.1	0.0	2.1		M	M
14	21.6	14.8	18.2	0.0	0.2	4.1	0.0	4.1		20	52
15	17.2	9.9	13.6	4.4	0.0	0.0	0.0	0.0		29	56
16	17.5	6.1	11.8	6.2	0.0	0.0	0.0	0.0		30	60
17	19.2	6.7	13.0	5.0	0.0	0.0	0.0	0.0		32	43
18	14.8	6.4	10.6	7.4	0.0	7.5	0.0	7.5		M	M
19	18.0	5.6	11.8	6.2	0.0	1.1	0.0	1.1		10	32
20	13.4	10.4	11.9	6.1	0.0	21.7	0.0	21.7		10	65
21	18.2	12.7	15.5	2.5	0.0	T	0.0	T		M	M
22	16.4	12.2	14.3	3.7	0.0	60.8	0.0	60.8		17	59
23	13.6	8.6	11.1	6.9	0.0	0.9	0.0	0.9		34	86

DAY	Max Temp °C	Min Temp °C	Mean Temp °C	Heat Deg Days	Cool Deg Days	Total Rain mm	Total Snow cm	Total Precip mm	Snow on Grnd cm	Dir of Max Gust 10's deg	Spd of Max Gust km/h
24	15.8	6.8	11.3	6.7	0.0	6.6	0.0	6.6		30	91
25	18.9	7.7	13.3	4.7	0.0	0.8	0.0	0.8		20	50
26	16.7	13.5	15.1	2.9	0.0	15.1	0.0	15.1		21	44
27	22.5	13.4	18.0	0.0	0.0	T	0.0	T		20	35
28	19.6	6.3	13.0	5.0	0.0	0.0	0.0	0.0		M	M
29	18.2	3.4	10.8	7.2	0.0	0.0	0.0	0.0		32	35
30	17.0	0.4	8.7	9.3	0.0	0.0	0.0	0.0		M	M
Sum				112.2	3.0	123.3	0.0	123.3			
Avg	19.9	8.8	14.4								
Xtrm	27.2	0.4				60.8	0.0	60.8		30^	91^
Summary, average and extreme values are based on the data above.											

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DAY	Max Temp °C	Min Temp °C	Mean Temp °C	Heat Deg Days	Cool Deg Days	Total Rain mm	Total Snow cm	Total Precip mm	Snow on Grnd cm	Dir of Max Gust 10's deg	Spd of Max Gust km/h
01	22.9	11.1	17.0	1.0	0.0	0.2	0.0	0.2		31	39
02	20.9	5.9	13.4	4.6	0.0	0.0	0.0	0.0		33	32
03	22.3	5.4	13.9	4.1	0.0	0.0	0.0	0.0		M	M
04	21.4	6.1	13.8	4.2	0.0	0.0	0.0	0.0		1	38
05	21.6	12.7	17.2	0.8	0.0	1.1	0.0	1.1		M	M
06	20.7	7.0	13.9	4.1	0.0	1.3	0.0	1.3		M	M
07	22.2	5.9	14.1	3.9	0.0	0.0	0.0	0.0		M	M
08	23.9	5.4	14.7	3.3	0.0	0.0	0.0	0.0		M	M
09	25.3	9.0	17.2	0.8	0.0	0.0	0.0	0.0		M	M
10	24.4	10.7	17.6	0.4	0.0	0.0	0.0	0.0		M	M
11	27.2	12.5	19.9	0.0	1.9	0.0	0.0	0.0		M	M
12	24.9	12.8	18.9	0.0	0.9	0.0	0.0	0.0		M	M
13	21.1	13.3	17.2	0.8	0.0	2.1	0.0	2.1		M	M
14	21.6	14.8	18.2	0.0	0.2	4.1	0.0	4.1		20	52
15	17.2	9.9	13.6	4.4	0.0	0.0	0.0	0.0		29	56
16	17.5	6.1	11.8	6.2	0.0	0.0	0.0	0.0		30	60
17	19.2	6.7	13.0	5.0	0.0	0.0	0.0	0.0		32	43
18	14.8	6.4	10.6	7.4	0.0	7.5	0.0	7.5		M	M
19	18.0	5.6	11.8	6.2	0.0	1.1	0.0	1.1		10	32
20	13.4	10.4	11.9	6.1	0.0	21.7	0.0	21.7		10	65
21	18.2	12.7	15.5	2.5	0.0	T	0.0	T		M	M
22	16.4	12.2	14.3	3.7	0.0	60.8	0.0	60.8		17	59
23	13.6	8.6	11.1	6.9	0.0	0.9	0.0	0.9		34	86

DAY	Max Temp °C	Min Temp °C	Mean Temp °C	Heat Deg Days	Cool Deg Days	Total Rain mm	Total Snow cm	Total Precip mm	Snow on Grnd cm	Dir of Max Gust 10's deg	Spd of Max Gust km/h
24	15.8	6.8	11.3	6.7	0.0	6.6	0.0	6.6		30	91
25	18.9	7.7	13.3	4.7	0.0	0.8	0.0	0.8		20	50
26	16.7	13.5	15.1	2.9	0.0	15.1	0.0	15.1		21	44
27	22.5	13.4	18.0	0.0	0.0	T	0.0	T		20	35
28	19.6	6.3	13.0	5.0	0.0	0.0	0.0	0.0		M	M
29	18.2	3.4	10.8	7.2	0.0	0.0	0.0	0.0		32	35
30	17.0	0.4	8.7	9.3	0.0	0.0	0.0	0.0		M	M
Sum				112.2	3.0	123.3	0.0	123.3			
Avg	19.9	8.8	14.4								
Xtrm	27.2	0.4				60.8	0.0	60.8		30^	91^
Summary, average and extreme values are based on the data above.											

Legend

- A = Accumulated
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Climate ID:	8104901
WMO ID:	71609
TC ID:	YSJ

DAY	Max Temp °C	Min Temp °C	Mean Temp °C	Heat Deg Days	Cool Deg Days	Total Rain mm	Total Snow cm	Total Precip mm	Snow on Grnd cm	Dir of Max Gust 10's deg	Spd of Max Gust km/h
01	16.5	9.9	13.2	4.8	0.0	0.2	0.0	0.2		M	M
02	14.8	2.1	8.5	9.5	0.0	0.0	0.0	0.0		32	54
03	12.0	-2.0	5.0	13.0	0.0	0.0	0.0	0.0		22	45
04	17.1	8.3	12.7	5.3	0.0	0.0	0.0	0.0		21	32
05	16.4	12.1	14.3	3.7	0.0	0.0	0.0	0.0		21	40
06	17.7	13.3	15.5	2.5	0.0	0.0	0.0	0.0		23	62
07	16.7	7.5	12.1	5.9	0.0	T	0.0	T		33	57
08	7.6	1.1	4.4	13.6	0.0	0.0	0.0	0.0		31	75
09	7.3	-1.6	2.9	15.1	0.0	0.0	0.0	0.0		33	43
10	13.7	5.3	9.5	8.5	0.0	T	0.0	T		22	56
11	16.3	3.6	10.0	8.0	0.0	1.5	0.0	1.5		20	34
12	16.9	2.4	9.7	8.3	0.0	58.7	0.0	58.7		19	77
13	8.3	1.3	4.8	13.2	0.0	19.0	0.0	19.0		10	58
14	7.6	-1.5	3.1	14.9	0.0	1.8	0.0	1.8		28	59
15	3.2	-2.7	0.3	17.7	0.0	0.0	0.0	0.0		33	34
16	11.8	-2.4	4.7	13.3	0.0	13.0	1.5	14.5	T	9	62
17	2.9	-2.6	0.2	17.8	0.0	0.0	T	T		29	42
18	1.0	-8.3	-3.7	21.7	0.0	0.0	0.0	0.0		26	39
19	2.8	-8.8	-3.0	21.0	0.0	0.0	1.7	1.7	1E	M	M
20	3.2	-5.4	-1.1	19.1	0.0	2.5	2.0	4.5	T	28	59
21	1.8	-8.5	-3.4	21.4	0.0	0.6	2.0	2.6	2E	28	51
22	2.4	-5.6	-1.6	19.6	0.0	0.0	0.0	0.0		33	47
23	3.0	-7.3	-2.2	20.2	0.0	0.0	0.0	0.0		33	51

DAY	Max Temp °C	Min Temp °C	Mean Temp °C	Heat Deg Days	Cool Deg Days	Total Rain mm	Total Snow cm	Total Precip mm	Snow on Grnd cm	Dir of Max Gust 10's deg	Spd of Max Gust km/h
24	-0.8	-9.4	-5.1	23.1	0.0	0.0	0.0	0.0		32	38
25	8.1	-9.1	-0.5	18.5	0.0	9.7	0.0	9.7		17	46
26	4.2	-0.5	1.9	16.1	0.0	0.0	0.0	0.0	T	34	80
27	10.1	-5.5	2.3	15.7	0.0	4.9	0.0	4.9		21	39
28	7.5	-1.2	3.2	14.8	0.0	16.4	T	16.4		34	53
29	1.0	-8.7	-3.9	21.9	0.0	0.0	0.0	0.0		33	42
30	10.9	-9.1	0.9	17.1	0.0	9.1	0.0	9.1		15	68
Sum				425.3	0.0	137.4	7.2	144.6			
Avg	8.7	-1.1	3.8								
Xtrm	17.7	-9.4				58.7	2.0	58.7		34^	80^
Summary, average and extreme values are based on the data above.											

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DAY	Max Temp °C	Min Temp °C	Mean Temp °C	Heat Deg Days	Cool Deg Days	Total Rain mm	Total Snow cm	Total Precip mm	Snow on Grnd cm	Dir of Max Gust 10's deg	Spd of Max Gust km/h
01	12.0	-2.3	4.9	13.1	0.0	19.6	0.0	19.6		17	65
02	0.6	-7.7	-3.6	21.6	0.0	0.0	0.0	0.0		29	35
03	11.2	-5.0	3.1	14.9	0.0	28.6	0.0	28.6		18	74
04	9.2	-7.3	1.0	17.0	0.0	0.3	0.0	0.3		28	48
05	4.2	-9.1	-2.5	20.5	0.0	0.0	0.0	0.0		20	40
06	6.5	-1.6	2.5	15.5	0.0	0.0	0.0	0.0		M	M
07	9.8	4.3	7.1	10.9	0.0	29.4	0.0	29.4		14	47
08	10.4	0.4	5.4	12.6	0.0	28.0	0.0	28.0		35	57
09	3.1	-3.0	0.1	17.9	0.0	0.0	0.0	0.0		36	59
10	M	M	M	M	M	M	M	M		2	57
11	-4.1	-8.1	-6.1	24.1	0.0	0.0	T	T	T	3	31
12	-5.0	-10.9	-8.0	26.0	0.0	0.0	0.0	0.0		35	40
13	-2.0	-9.9	-6.0	24.0	0.0	0.0	0.0	0.0		32	52
14	1.1	-8.9	-3.9	21.9	0.0	0.0	7.0	6.9	3	1	50
15	2.1	-0.3	0.9	17.1	0.0	0.0	T	T	5	1	59
16	1.8	-0.4	0.7	17.3	0.0	0.0	0.4	0.4	5	7	47
17	2.1	0.4	1.3	16.7	0.0	18.3	T	18.3	2	7	57
18	1.0	0.0	0.5	17.5	0.0	8.3	3.8	11.8	4	M	M
19	0.4	-0.4	0.0	18.0	0.0	3.1	1.0	3.9	6	34	54
20	1.2	-0.3	0.5	17.5	0.0	0.0	0.3	0.3	6	34	63
21	1.4	-4.6	-1.6	19.6	0.0	0.0	T	T	6	M	M
22	-1.6	-10.8	-6.2	24.2	0.0	0.0	0.0	0.0	6	M	M
23	11.7	-3.3	4.2	13.8	0.0	26.9	0.0	26.9	6	11	80

DAY	Max Temp °C	Min Temp °C	Mean Temp °C	Heat Deg Days	Cool Deg Days	Total Rain mm	Total Snow cm	Total Precip mm	Snow on Grnd cm	Dir of Max Gust 10's deg	Spd of Max Gust km/h
24	5.2	-6.2	-0.5	18.5	0.0	0.0	4.1	4.1	1E	20	99
25	-3.9	-9.2	-6.6	24.6	0.0	0.0	3.8	3.8	3	27	35
26	-1.6	-9.2	-5.4	23.4	0.0	0.0	0.0	0.0	7	26	43
27	-2.3	-10.8	-6.6	24.6	0.0	0.3	1.3	1.6	7	29	32
28	-2.0	-16.5	-9.3	27.3	0.0	3.3	5.5	5.5	8	M	M
29	1.4	-6.5	-2.6	20.6	0.0	0.0	T	T	13	M	M
30	7.2	1.2	4.2	13.8	0.0	0.0	0.0	0.0	9	19	32
31	10.3	4.6	7.5	10.5	0.0	6.2	0.0	6.2		22	32
Sum				565.0^	0.0^	172.3^	27.2^	195.6^			
Avg	3.0^	-4.7^	-0.8^								
Xtrm	12.0^	-16.5^				29.4^	7.0^	29.4^		20^	99^
Summary, average and extreme values are based on the data above.											

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- A = Accumulated
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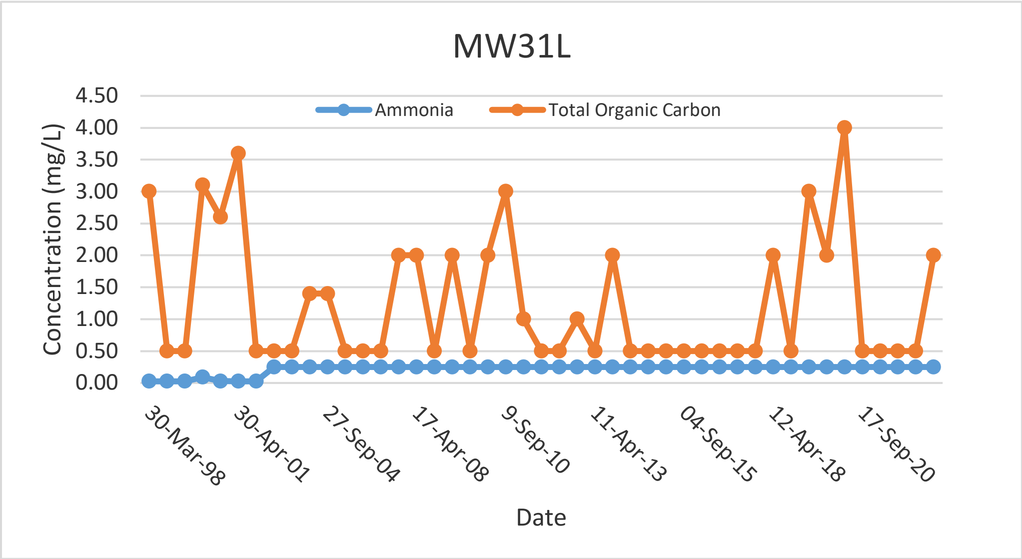
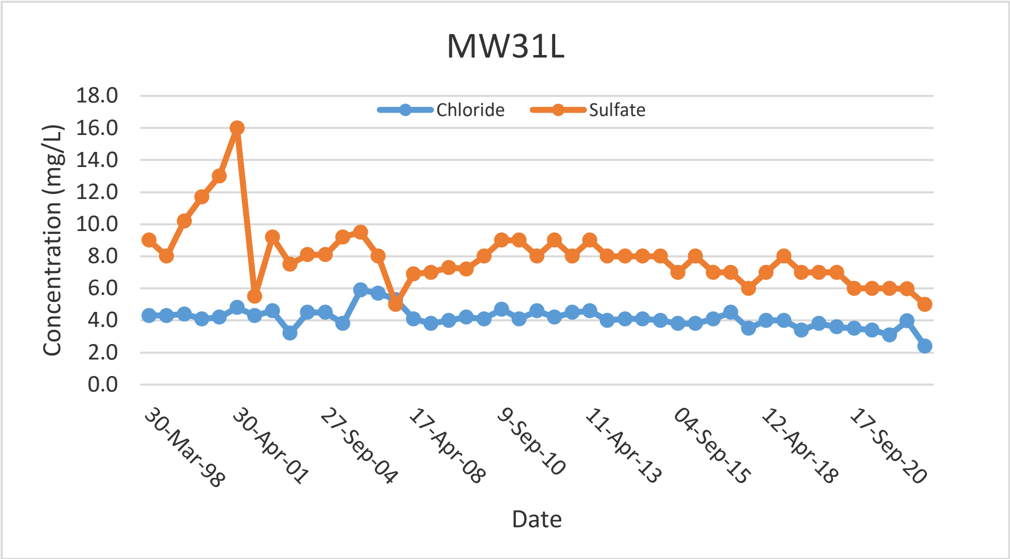
APPENDIX J

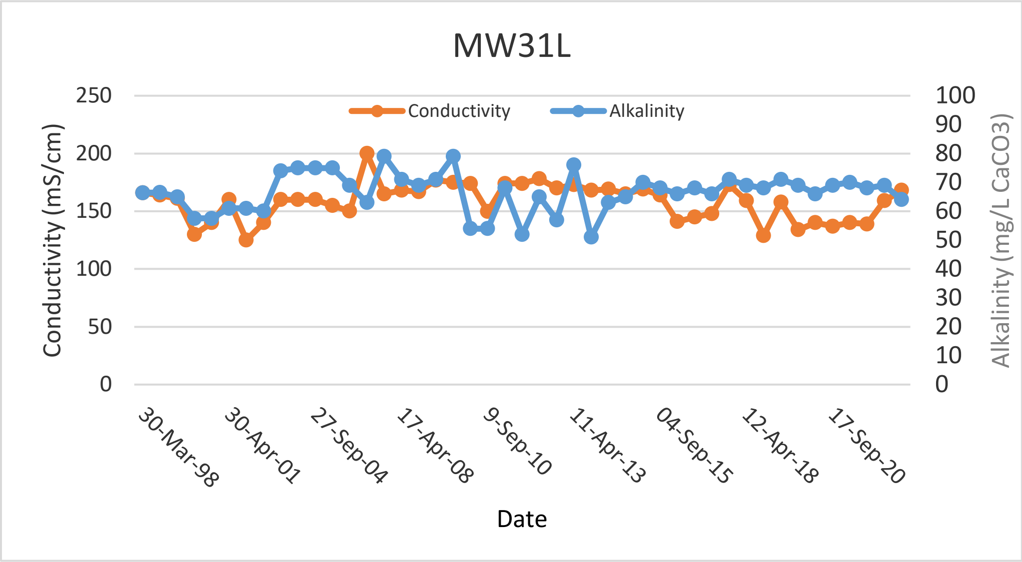
2022 Trending Data

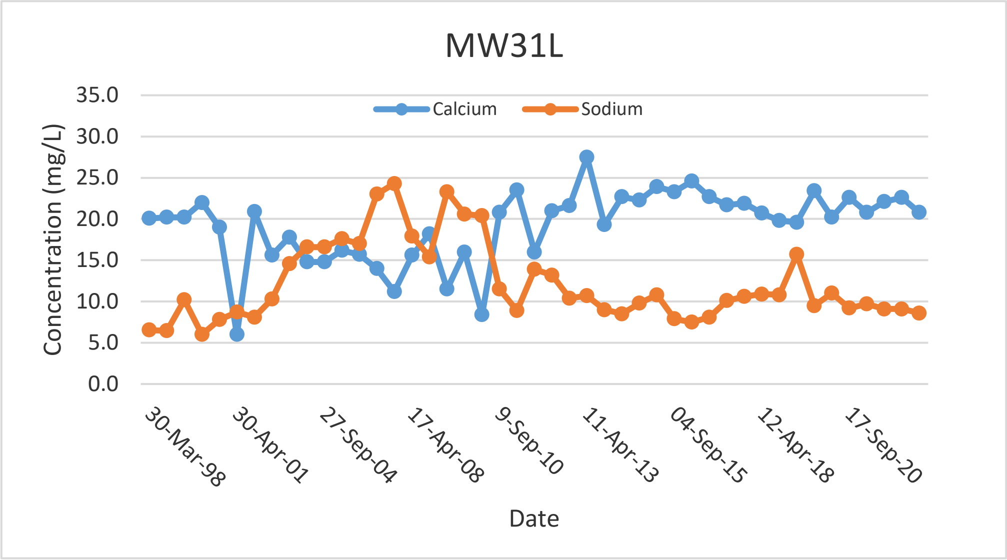
Appendix J:
Trend Graphs MW31L
1997 - 2022

Client: Fundy Regional Services Commission
Project Number: 4662.09









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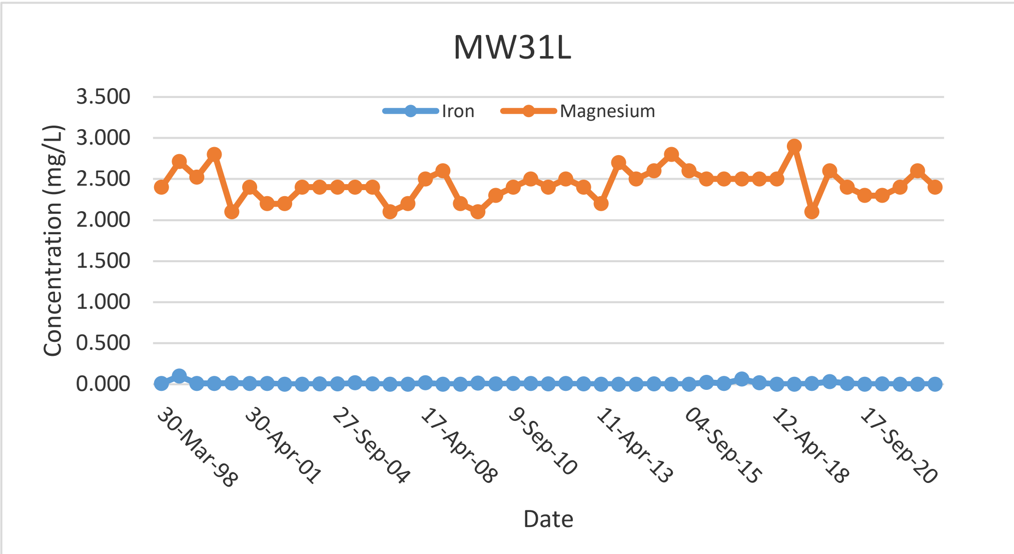
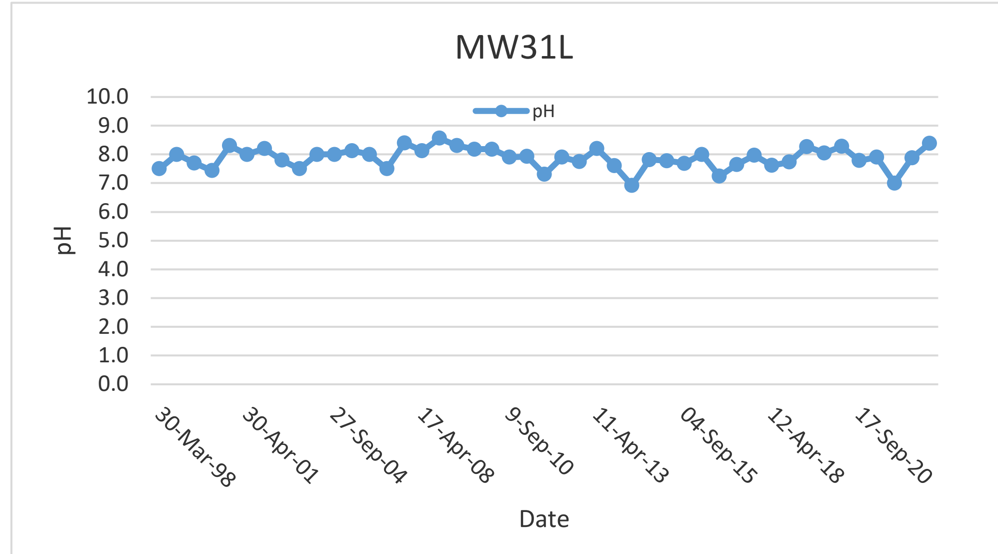
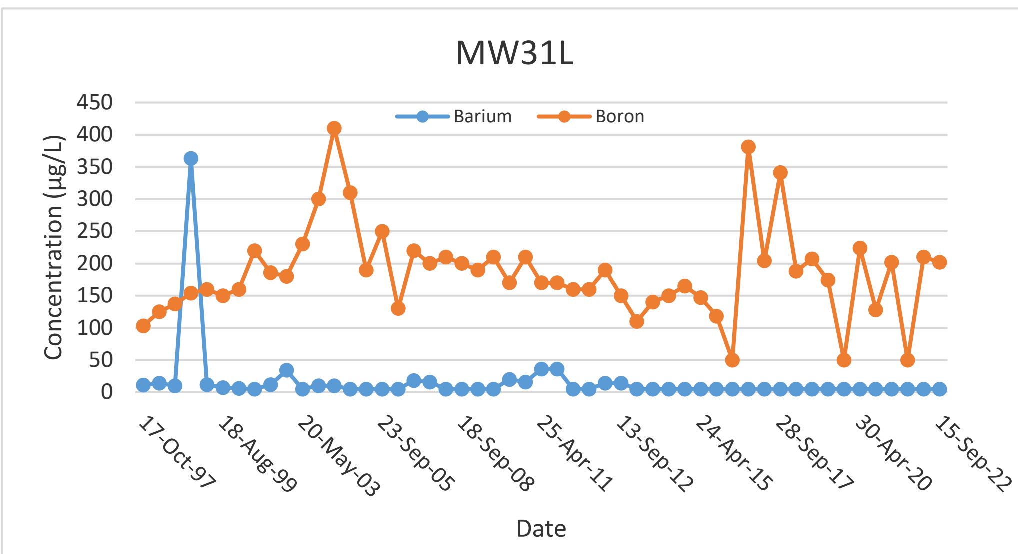
Appendix J:
Trend Graphs MW31L
1997 - 2022

Client: Fundy Regional Services Commission
Project Number: 4662.09

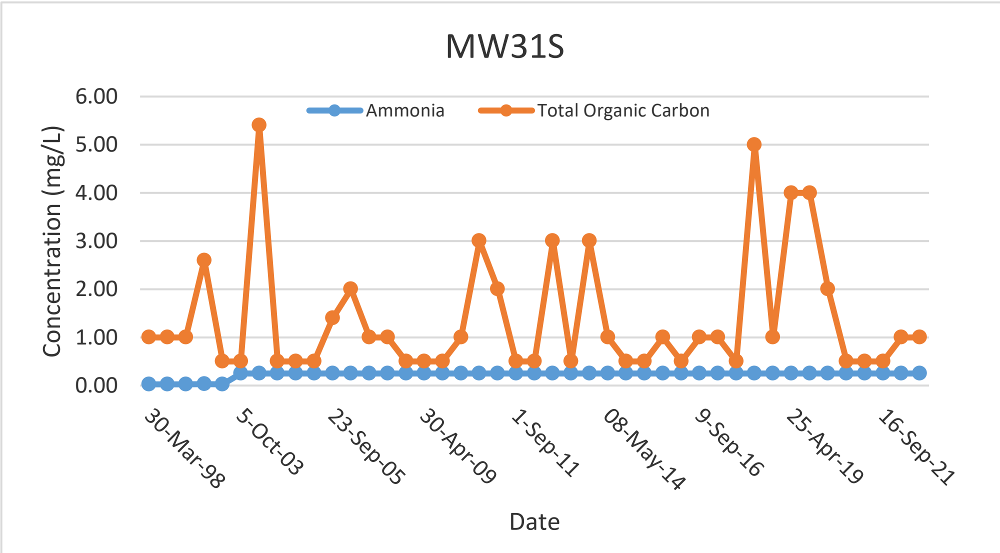


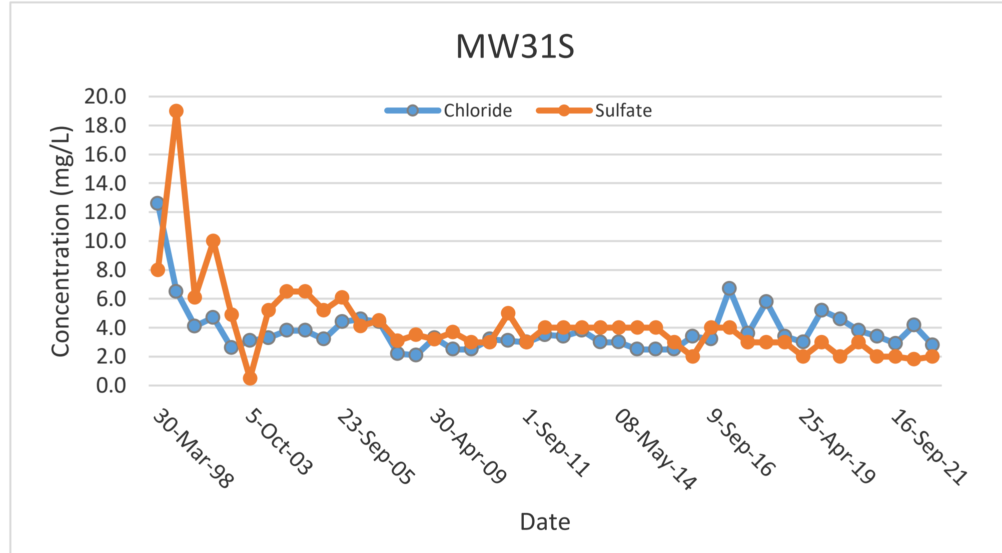


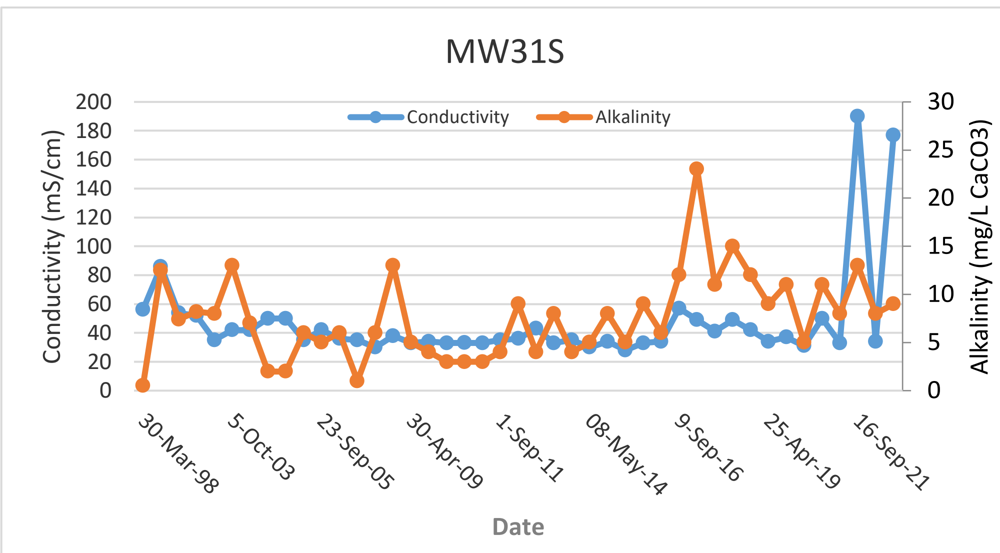


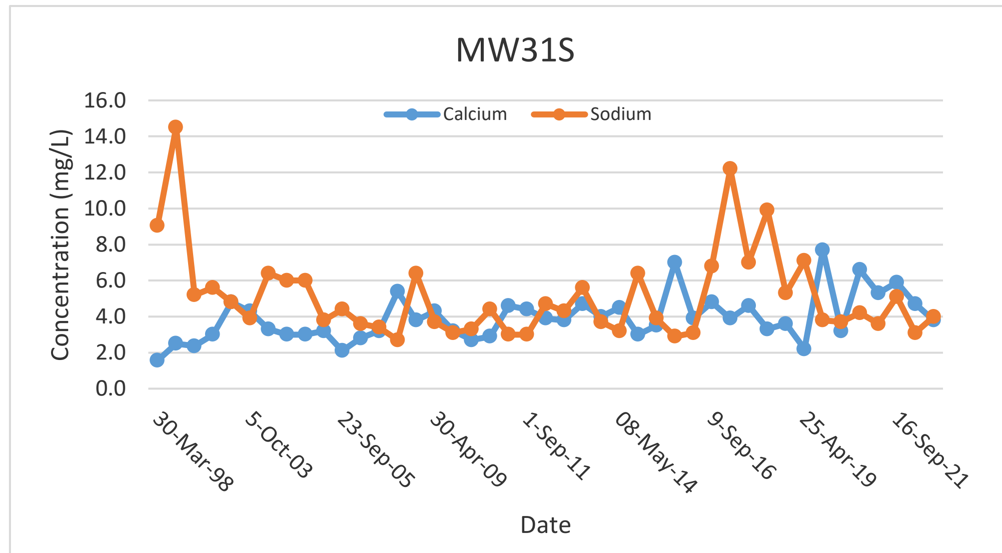
Appendix J:
Trend Graphs MW31S
1997 - 2022

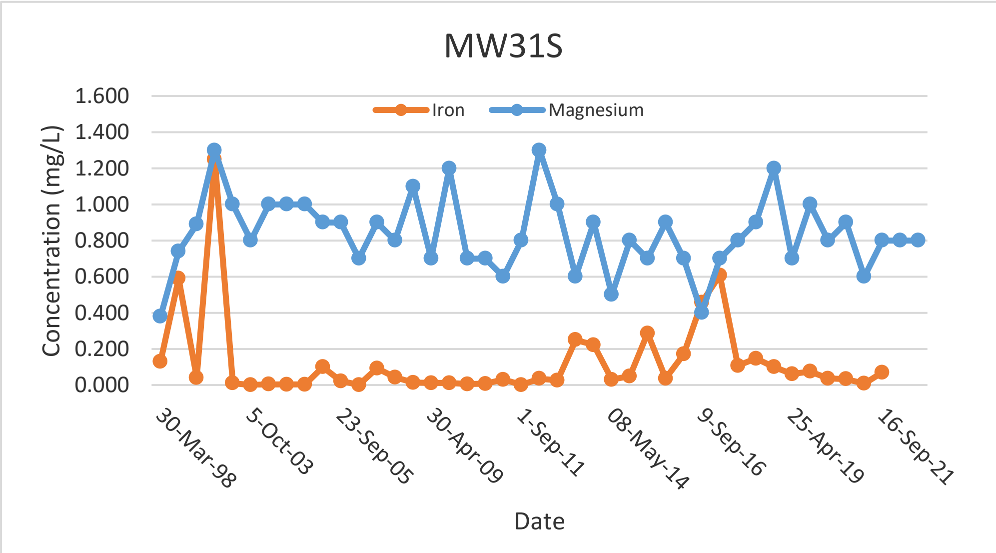
Client: Fundy Regional Services Commission
Project Number: 4662.09

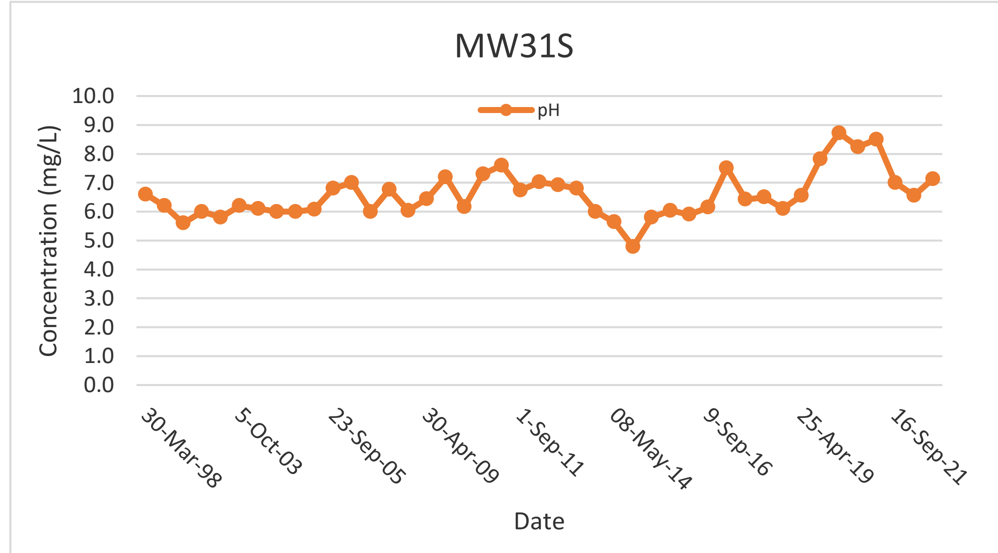


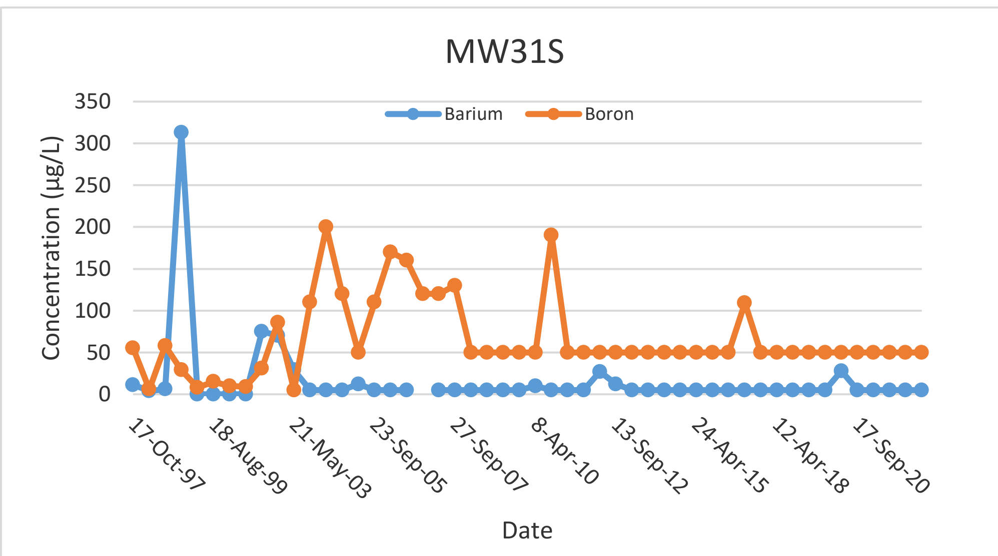






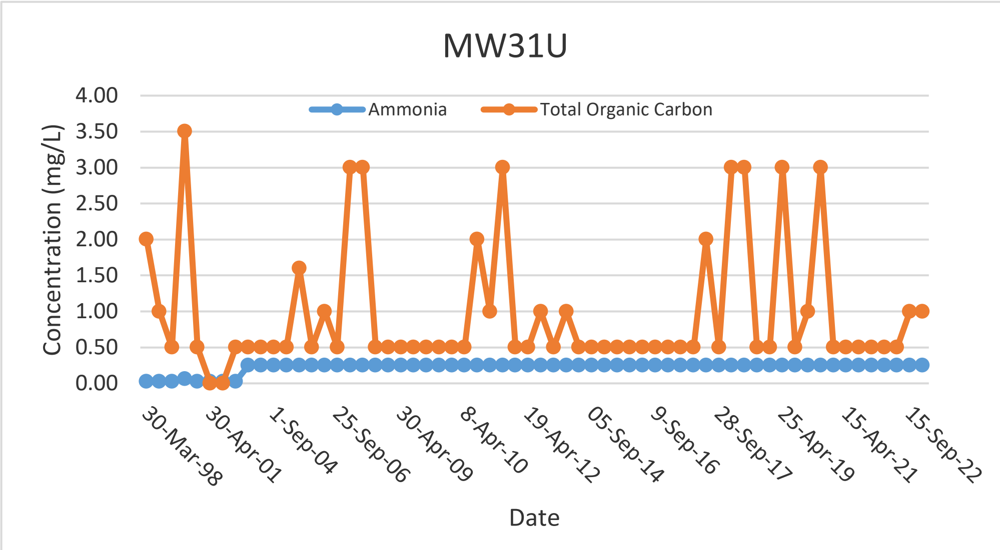

MW31S
Iron
Magnesium
Concentration (mg/L)
1.600
1.400
1.200
1.000
0.800
0.600
0.400
0.200
0.000
30-Mar-98
5-Oct-03
23-Sep-05
30-Apr-09
1-Sep-11
08-May-14
9-Sep-16
25-Apr-19
16-Sep-21
Date

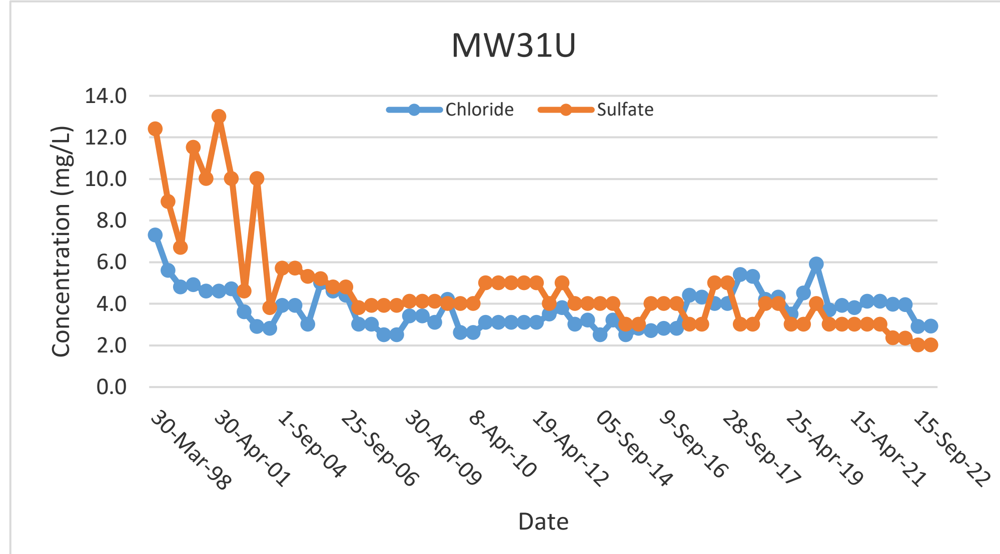

MW31S
pH
Concentration (mg/L)
10.0
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
30-Mar-98
5-Oct-03
23-Sep-05
30-Apr-09
1-Sep-11
08-May-14
9-Sep-16
25-Apr-19
16-Sep-21
Date

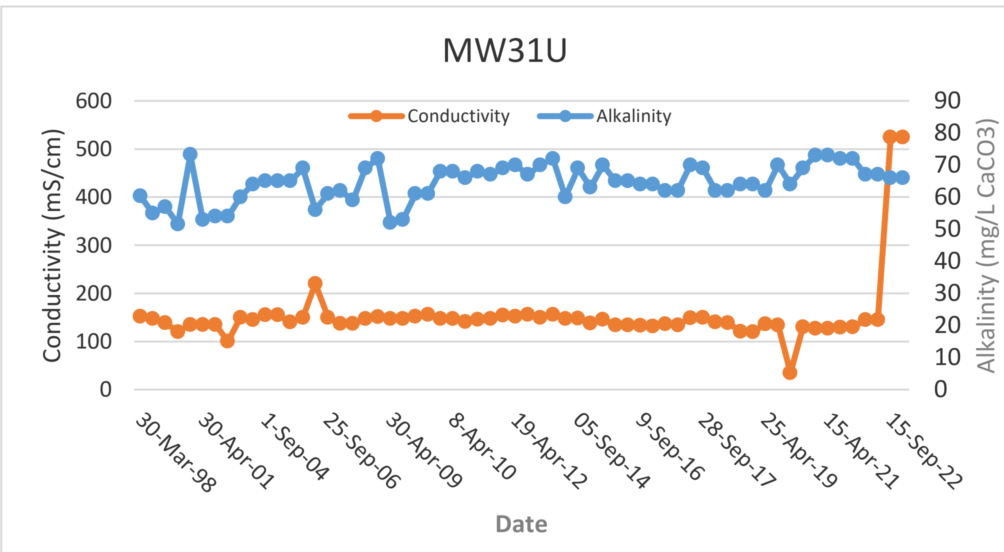

MW31S
Barium
Boron
Concentration (µg/L)
350
300
250
200
150
100
50
0
17-Oct-97
18-Aug-99
21-May-03
23-Sep-05
27-Sep-07
8-Apr-10
13-Sep-12
24-Apr-15
12-Apr-18
17-Sep-20
Date

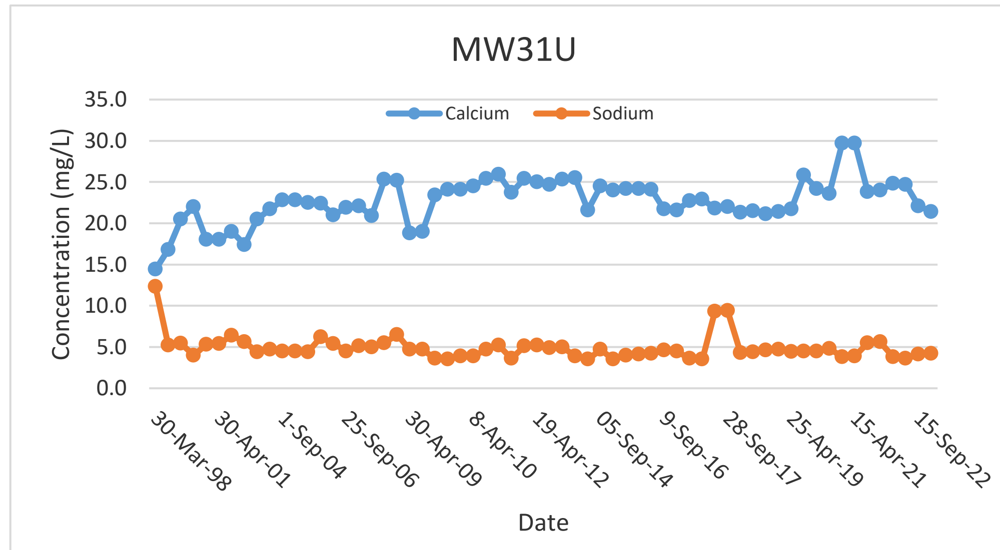
Appendix J:
Trend Graphs MW31U
1997 - 2022

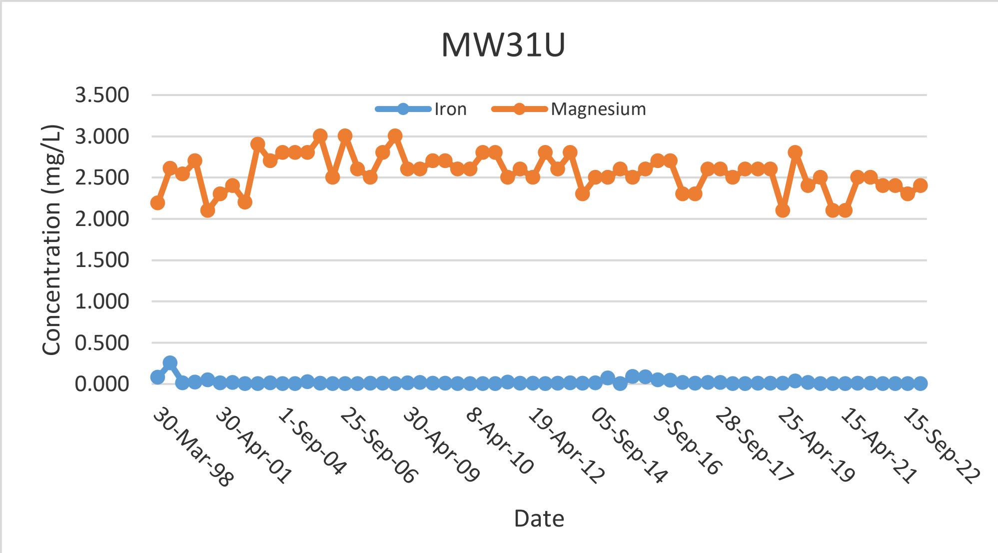
Client: Fundy Regional Services Commission
Project Number: 4662.09

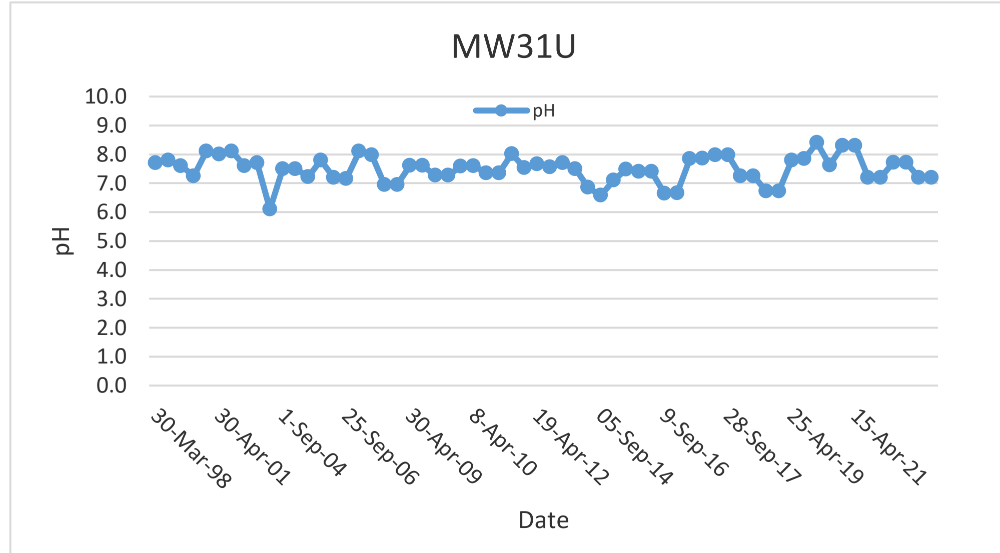


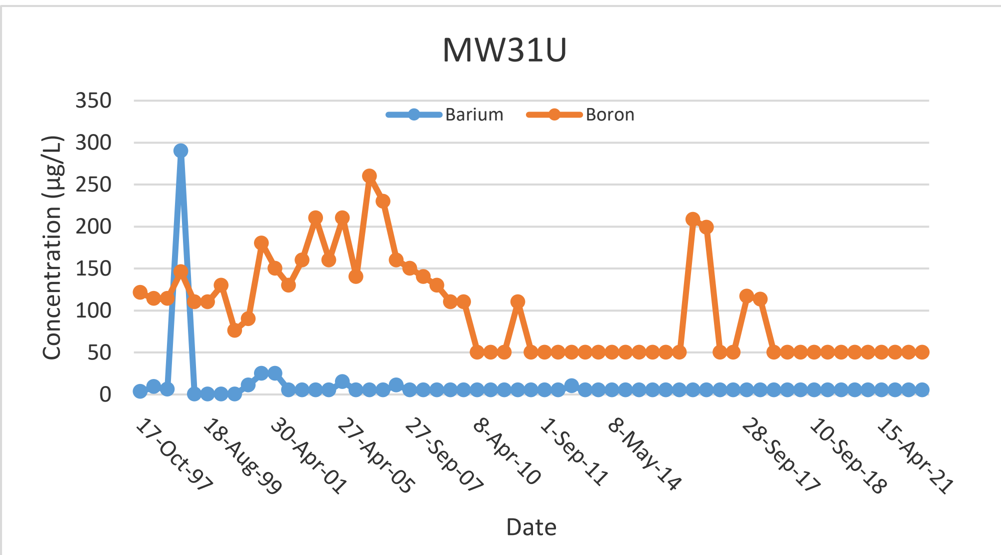


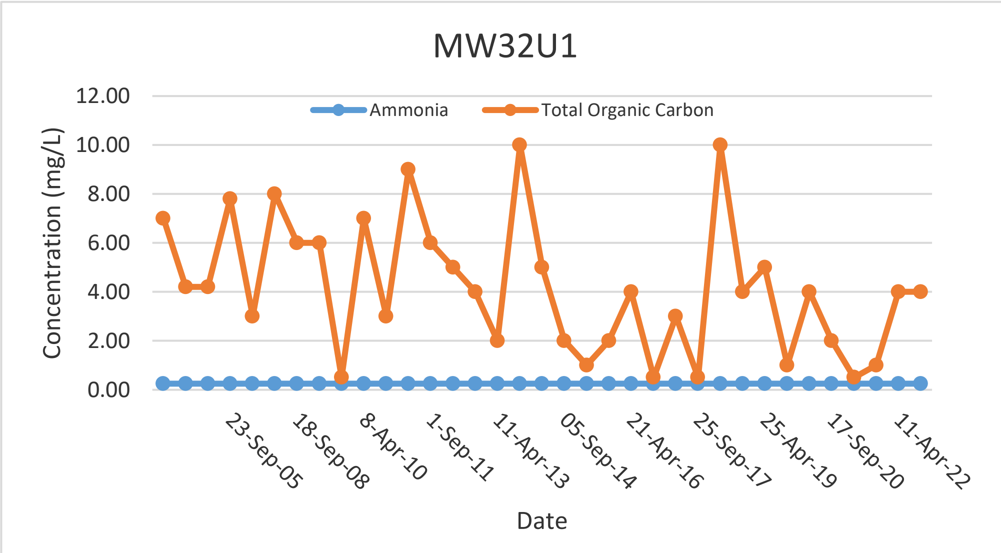


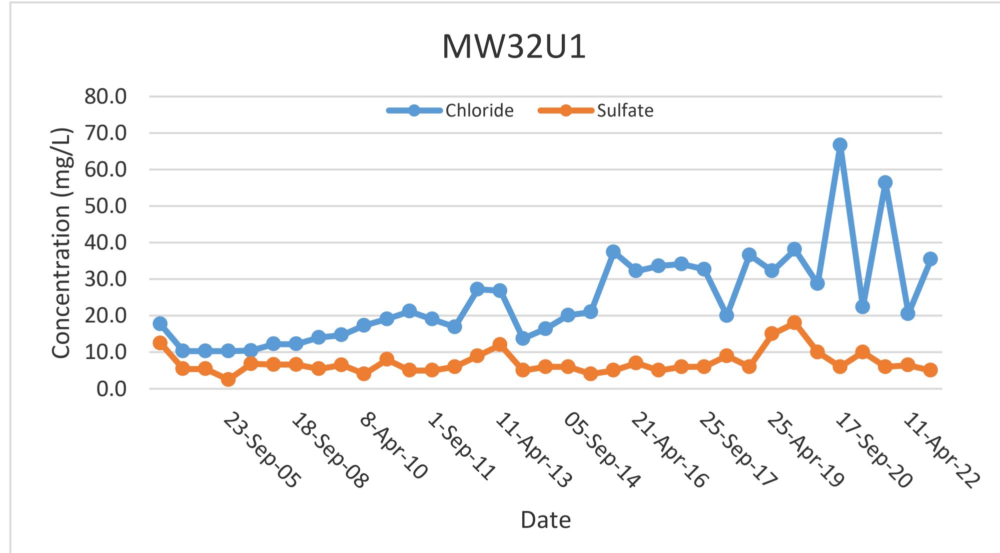


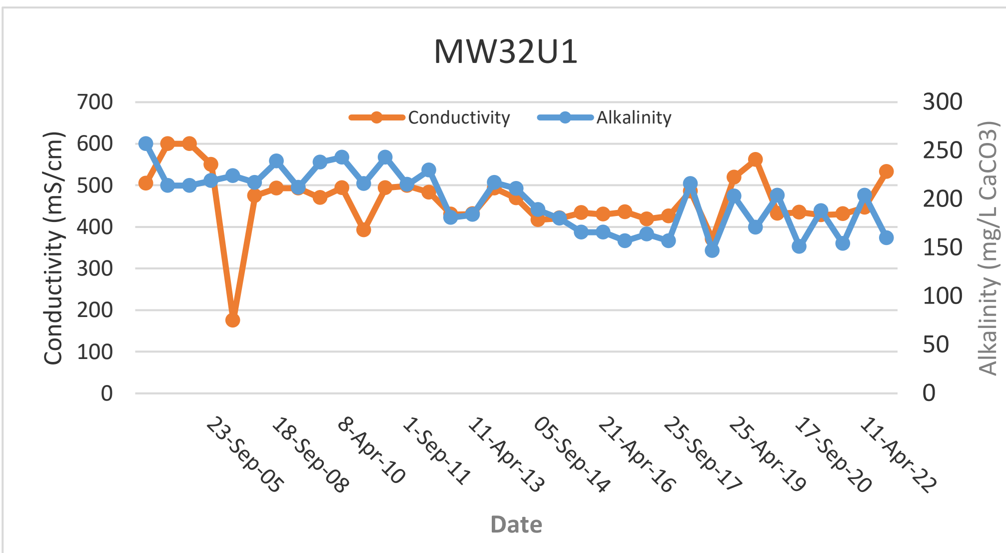

MW31U
Iron
Magnesium
Concentration (mg/L)
3.500
3.000
2.500
2.000
1.500
1.000
0.500
0.000
30-Mar-98
30-Apr-01
1-Sep-04
25-Sep-06
30-Apr-09
8-Apr-10
19-Apr-12
05-Sep-14
9-Sep-16
28-Sep-17
25-Apr-19
15-Apr-21
15-Sep-22
Date

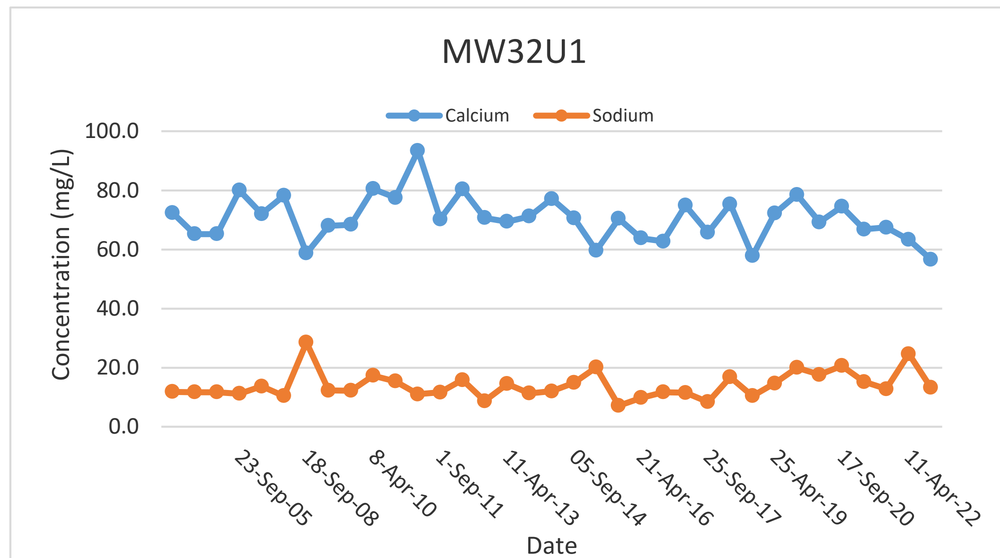

MW31U
pH
pH
10.0
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
30-Mar-98
30-Apr-01
1-Sep-04
25-Sep-06
30-Apr-09
8-Apr-10
19-Apr-12
05-Sep-14
9-Sep-16
28-Sep-17
25-Apr-19
15-Apr-21
Date


MW31U
Barium
Boron
Concentration (µg/L)
350
300
250
200
150
100
50
0
17-Oct-97
18-Aug-99
30-Apr-01
27-Apr-05
27-Sep-07
8-Apr-10
1-Sep-11
8-May-14
28-Sep-17
10-Sep-18
15-Apr-21
Date


MW32U1
Ammonia
Total Organic Carbon
Concentration (mg/L)
12.00
10.00
8.00
6.00
4.00
2.00
0.00
23-Sep-05
18-Sep-08
8-Apr-10
1-Sep-11
11-Apr-13
05-Sep-14
21-Apr-16
25-Sep-17
25-Apr-19
17-Sep-20
11-Apr-22
Date

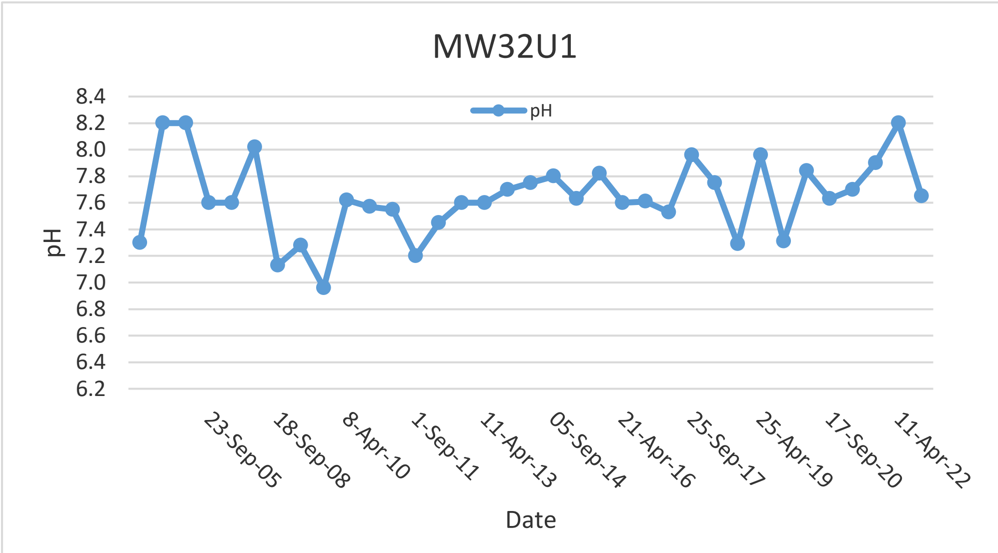

MW32U1
Chloride
Sulfate
Concentration (mg/L)
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0.0
23-Sep-05
18-Sep-08
8-Apr-10
1-Sep-11
11-Apr-13
05-Sep-14
21-Apr-16
25-Sep-17
25-Apr-19
17-Sep-20
11-Apr-22
Date

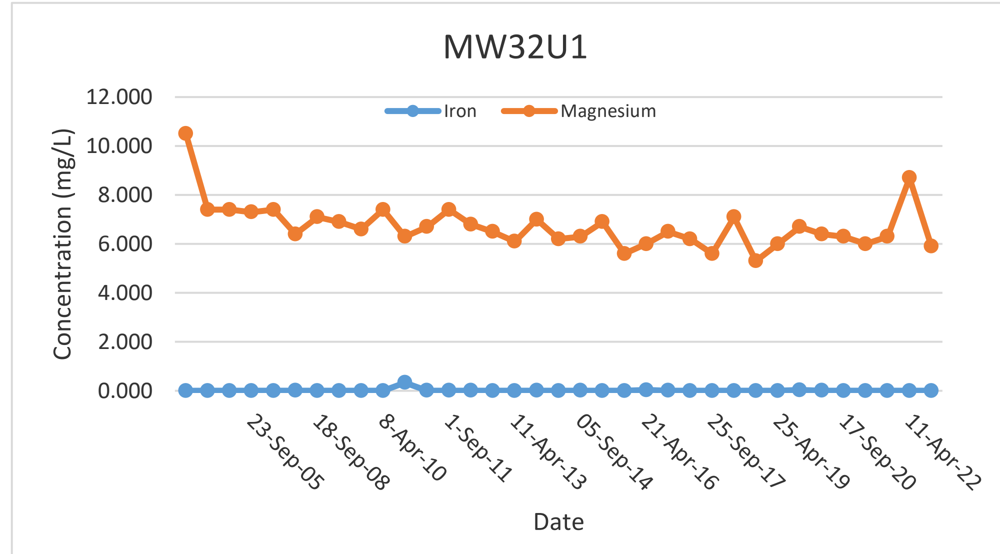

MW32U1
Conductivity
Alkalinity
Conductivity (mS/cm)
700
600
500
400
300
200
100
0
Alkalinity (mg/L CaCO3)
300
250
200
150
100
50
0
23-Sep-05
18-Sep-08
8-Apr-10
1-Sep-11
11-Apr-13
05-Sep-14
21-Apr-16
25-Sep-17
25-Apr-19
17-Sep-20
11-Apr-22
Date

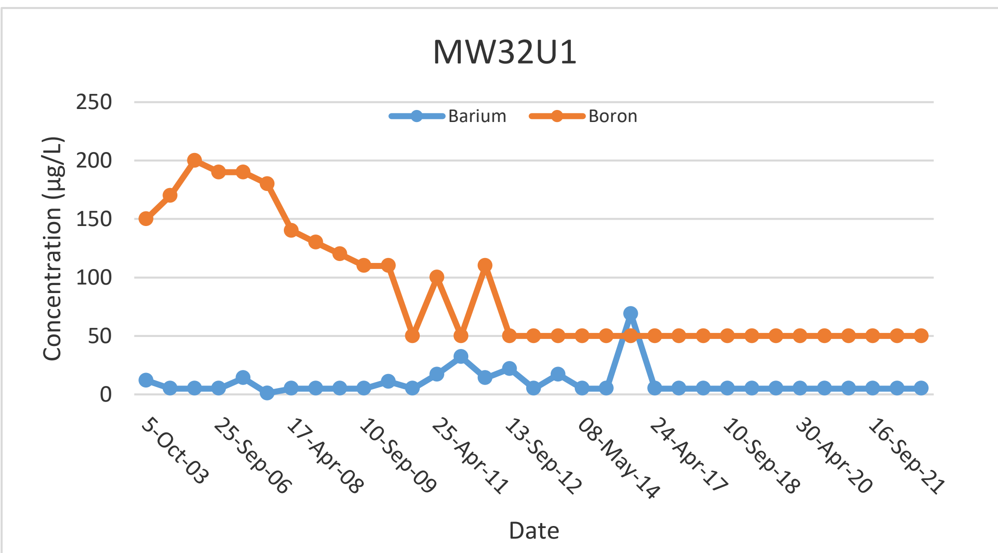

MW32U1
Calcium
Sodium
Concentration (mg/L)
100.0
80.0
60.0
40.0
20.0
0.0
23-Sep-05
18-Sep-08
8-Apr-10
1-Sep-11
11-Apr-13
05-Sep-14
21-Apr-16
25-Sep-17
25-Apr-19
17-Sep-20
11-Apr-22
Date

Appendix J:
Trend Graphs MW32U1
1997 - 2022

Client: Fundy Regional Services Commission
Project Number: 4662.09

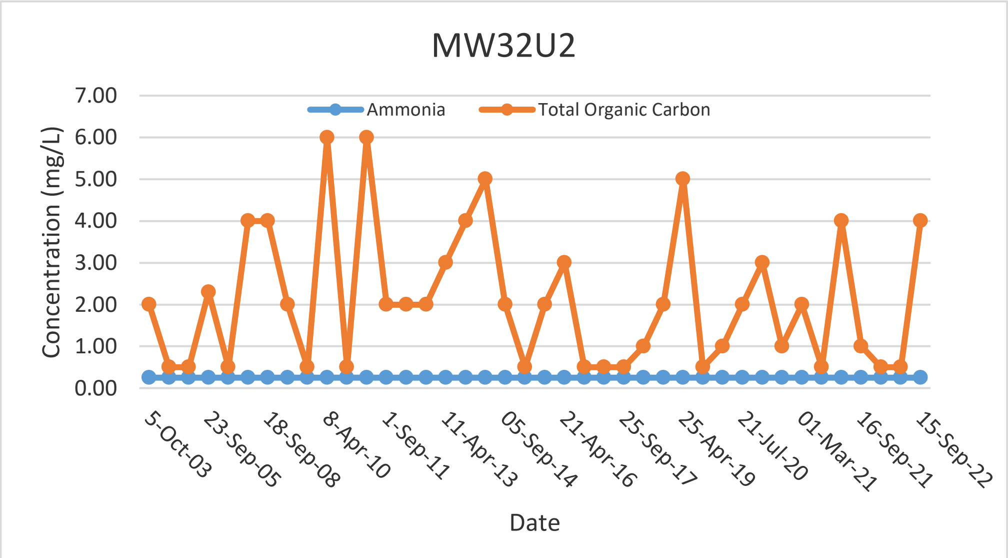


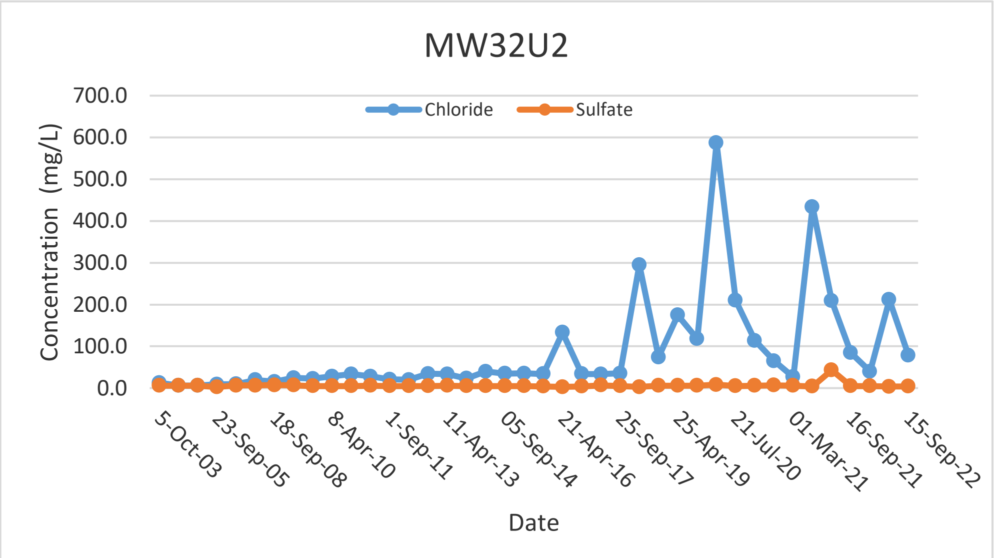


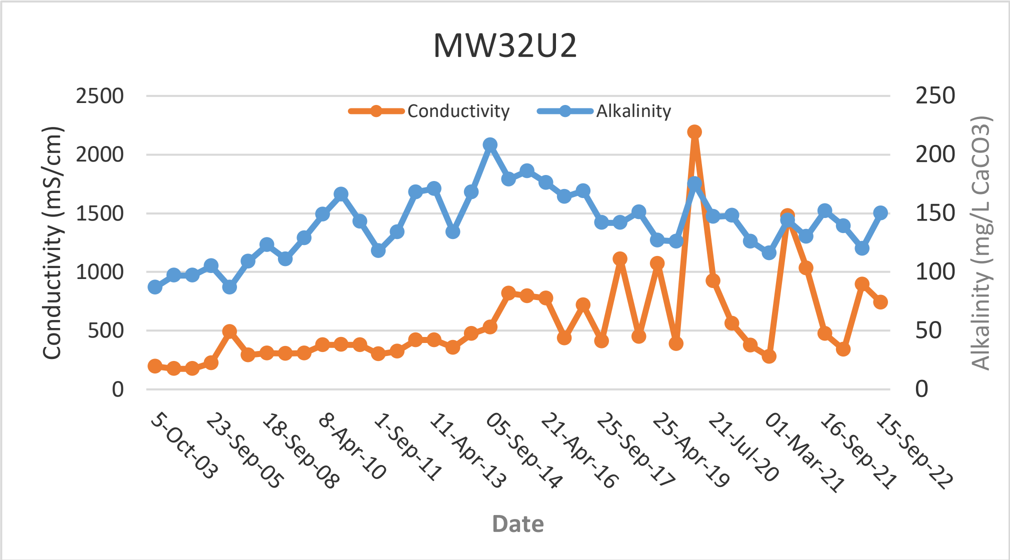


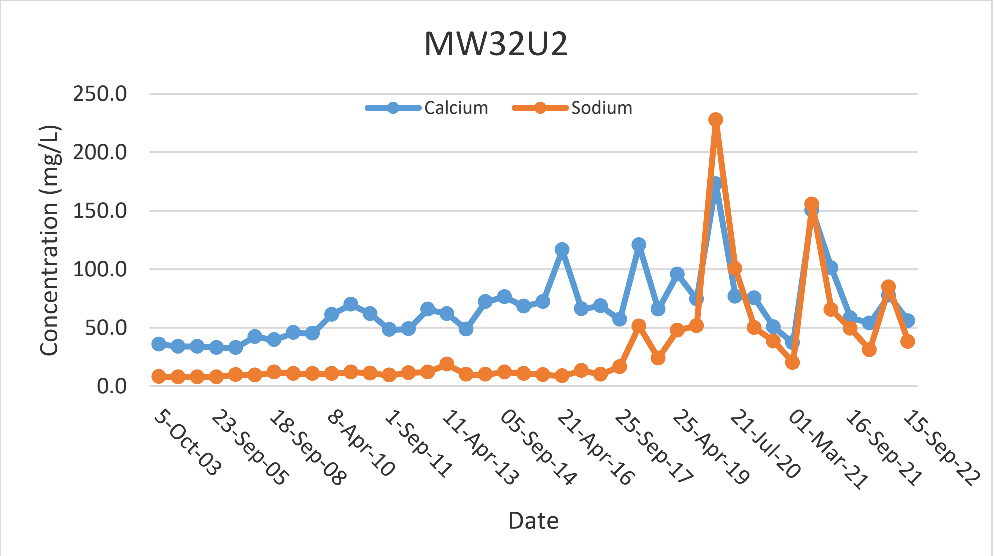
Appendix J:
Trend Graphs MW32U2
1997 - 2022

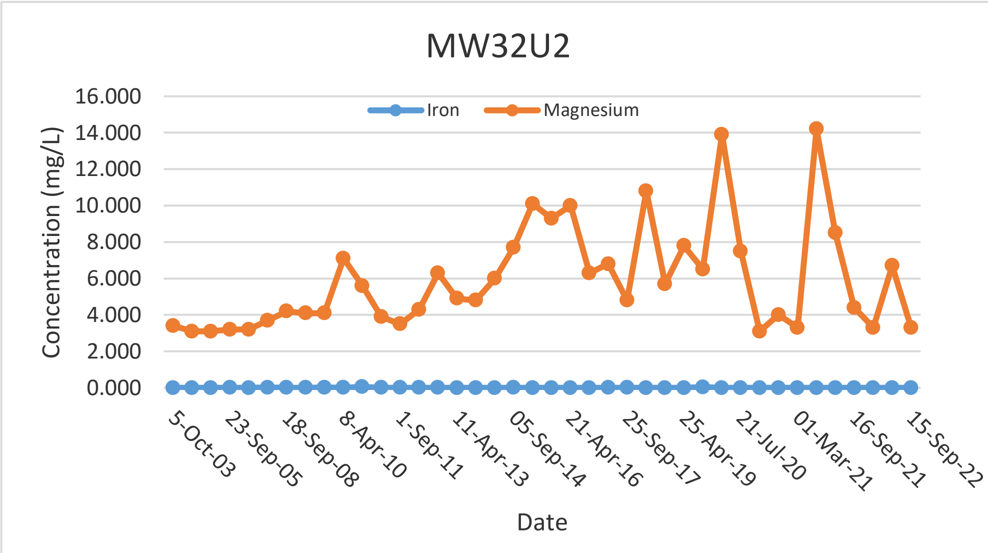
Client: Fundy Regional Services Commission
Project Number: 4662.09

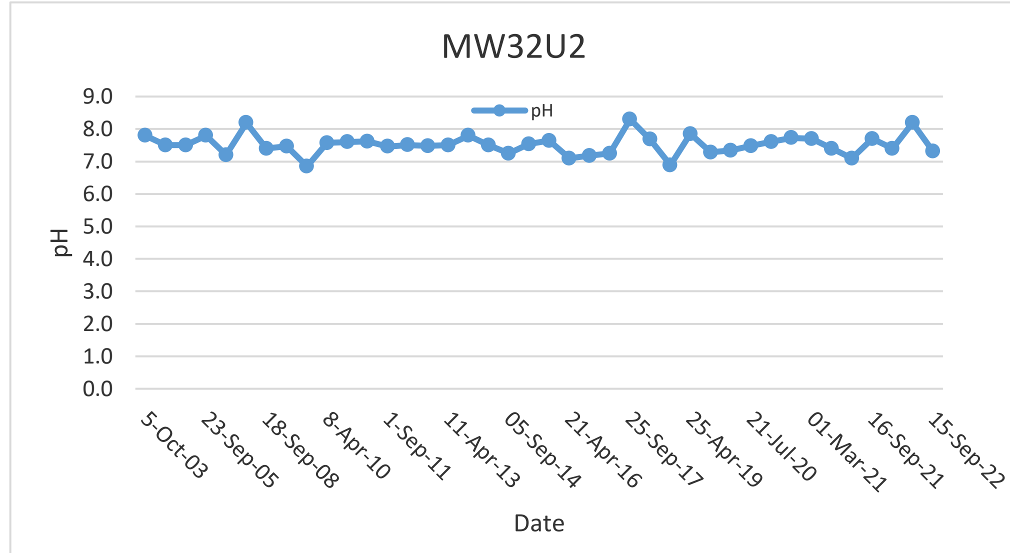


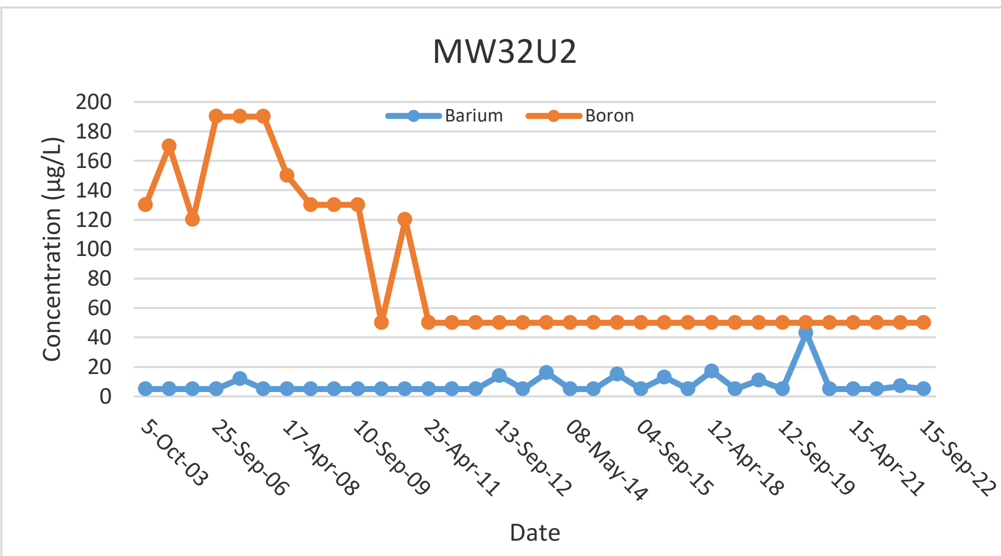


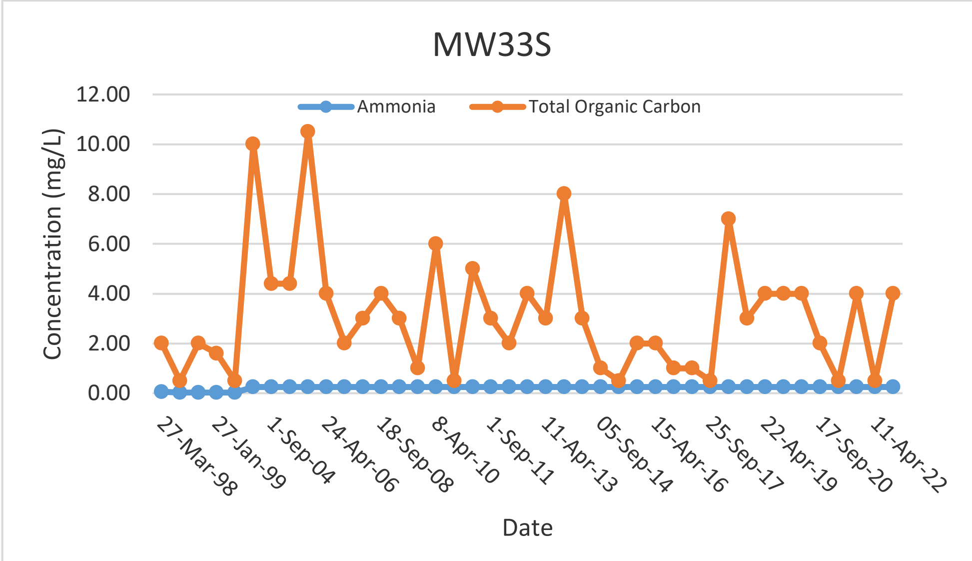


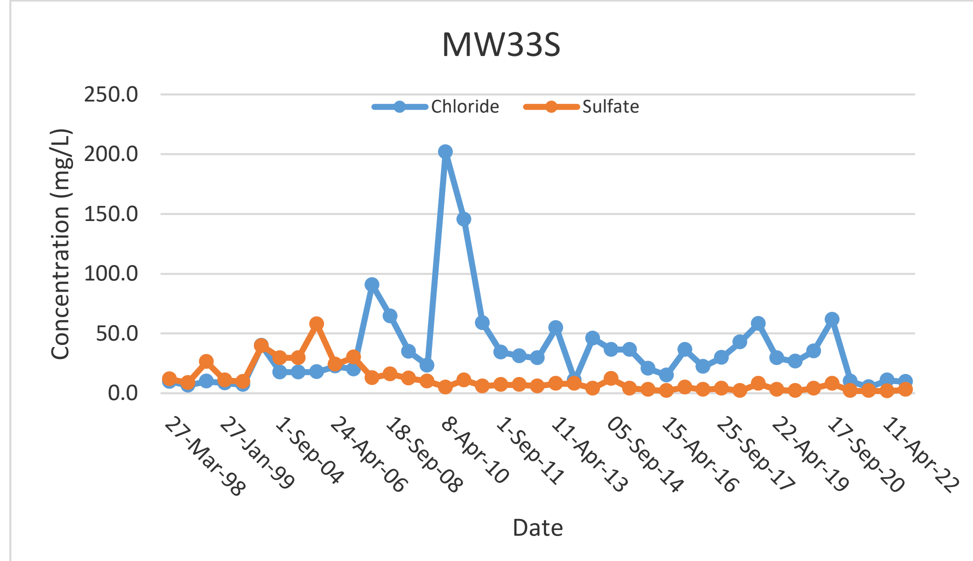


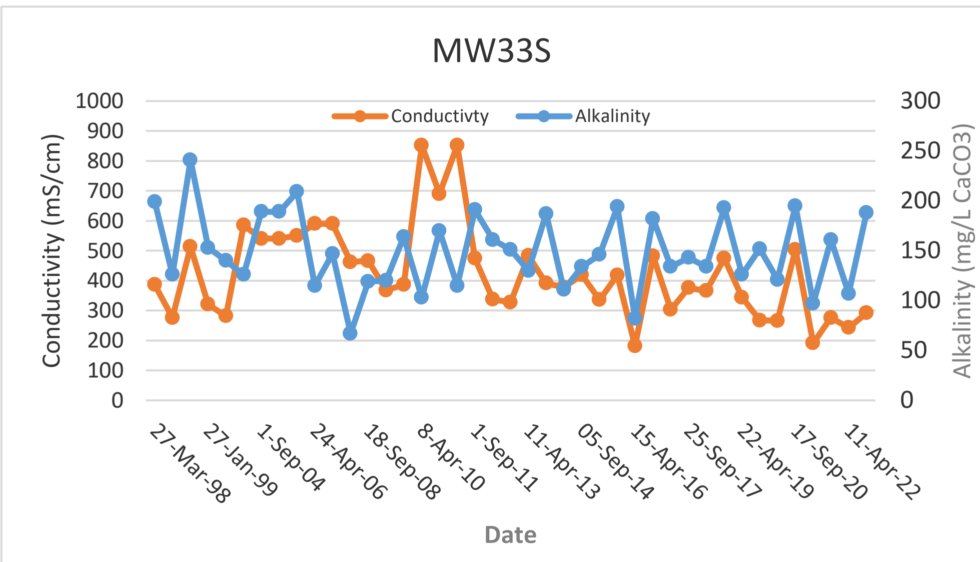

MW32U2
Iron
Magnesium
Concentration (mg/L)
16.000
14.000
12.000
10.000
8.000
6.000
4.000
2.000
0.000
5-Oct-03
23-Sep-05
18-Sep-08
8-Apr-10
1-Sep-11
11-Apr-13
05-Sep-14
21-Apr-16
25-Sep-17
25-Apr-19
21-Jul-20
01-Mar-21
16-Sep-21
15-Sep-22
Date

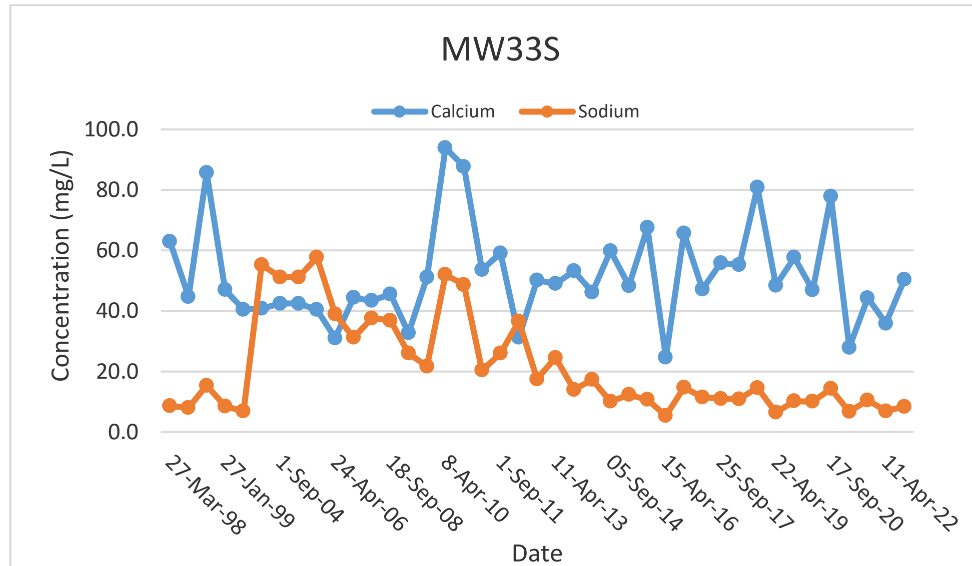

MW32U2
pH
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
5-Oct-03
23-Sep-05
18-Sep-08
8-Apr-10
1-Sep-11
11-Apr-13
05-Sep-14
21-Apr-16
25-Sep-17
25-Apr-19
21-Jul-20
01-Mar-21
16-Sep-21
15-Sep-22
Date


MW32U2
Barium
Boron
Concentration (µg/L)
200
180
160
140
120
100
80
60
40
20
0
5-Oct-03
25-Sep-06
17-Apr-08
10-Sep-09
25-Apr-11
13-Sep-12
08-May-14
04-Sep-15
12-Apr-18
12-Sep-19
15-Apr-21
15-Sep-22
Date


MW33S
Ammonia
Total Organic Carbon
Concentration (mg/L)
12.00
10.00
8.00
6.00
4.00
2.00
0.00
27-Mar-98
27-Jan-99
1-Sep-04
24-Apr-06
18-Sep-08
8-Apr-10
1-Sep-11
11-Apr-13
05-Sep-14
15-Apr-16
25-Sep-17
22-Apr-19
17-Sep-20
11-Apr-22
Date


MW33S
Chloride
Sulfate
Concentration (mg/L)
250.0
200.0
150.0
100.0
50.0
0.0
27-Mar-98
27-Jan-99
1-Sep-04
24-Apr-06
18-Sep-08
8-Apr-10
1-Sep-11
11-Apr-13
05-Sep-14
15-Apr-16
25-Sep-17
22-Apr-19
17-Sep-20
11-Apr-22
Date


MW33S
Conductivty
Alkalinity
Conductivity (mS/cm)
1000
900
800
700
600
500
400
300
200
100
0
Alkalinity (mg/L CaCO3)
300
250
200
150
100
50
0
27-Mar-98
27-Jan-99
1-Sep-04
24-Apr-06
18-Sep-08
8-Apr-10
1-Sep-11
11-Apr-13
05-Sep-14
15-Apr-16
25-Sep-17
22-Apr-19
17-Sep-20
11-Apr-22
Date


MW33S
Calcium
Sodium
Concentration (mg/L)
100.0
80.0
60.0
40.0
20.0
0.0
27-Mar-98
27-Jan-99
1-Sep-04
24-Apr-06
18-Sep-08
8-Apr-10
1-Sep-11
11-Apr-13
05-Sep-14
15-Apr-16
25-Sep-17
22-Apr-19
17-Sep-20
11-Apr-22
Date

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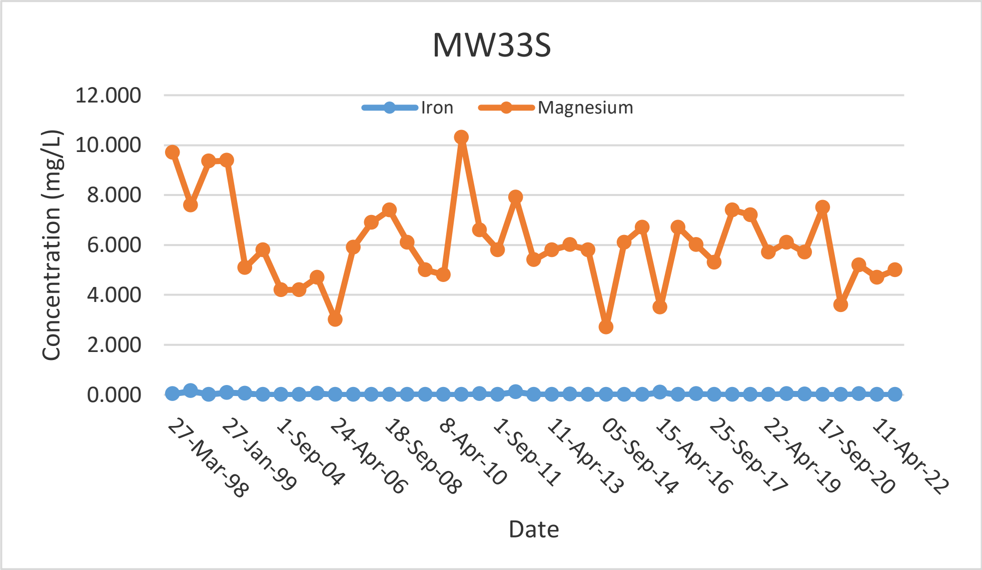
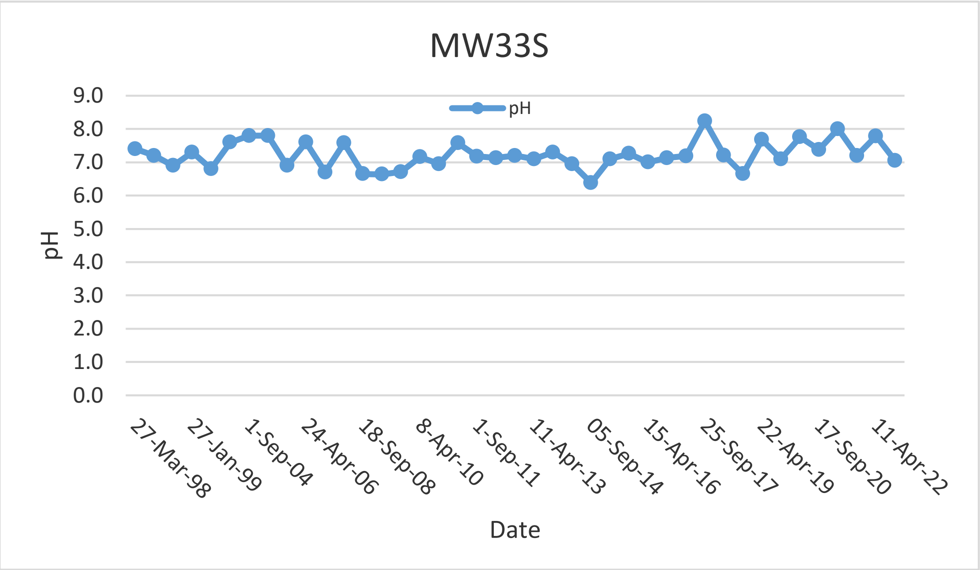
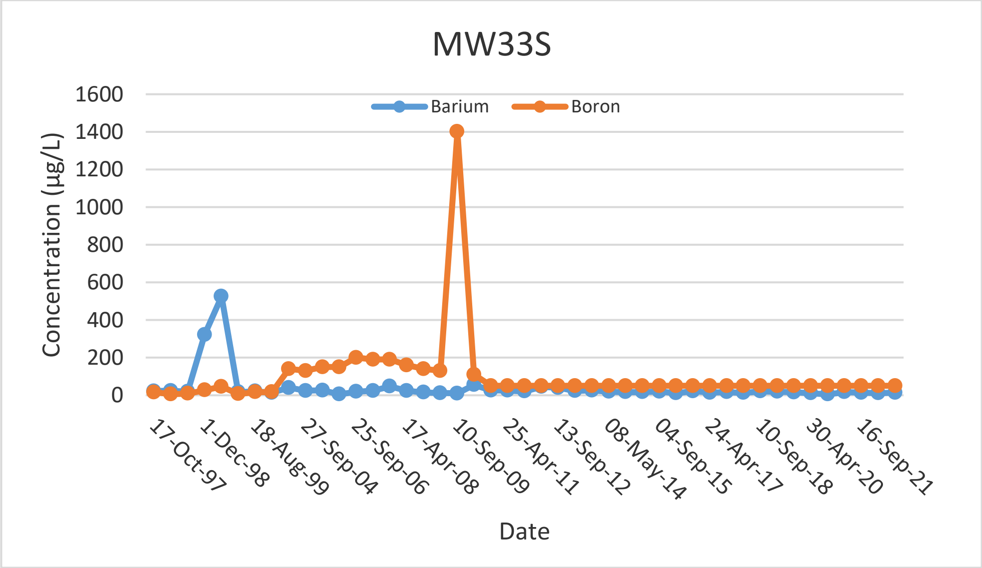
Appendix J:
Trend Graphs MW33S
1997 - 2022

Client: Fundy Regional Services Commission
Project Number: 4662.09







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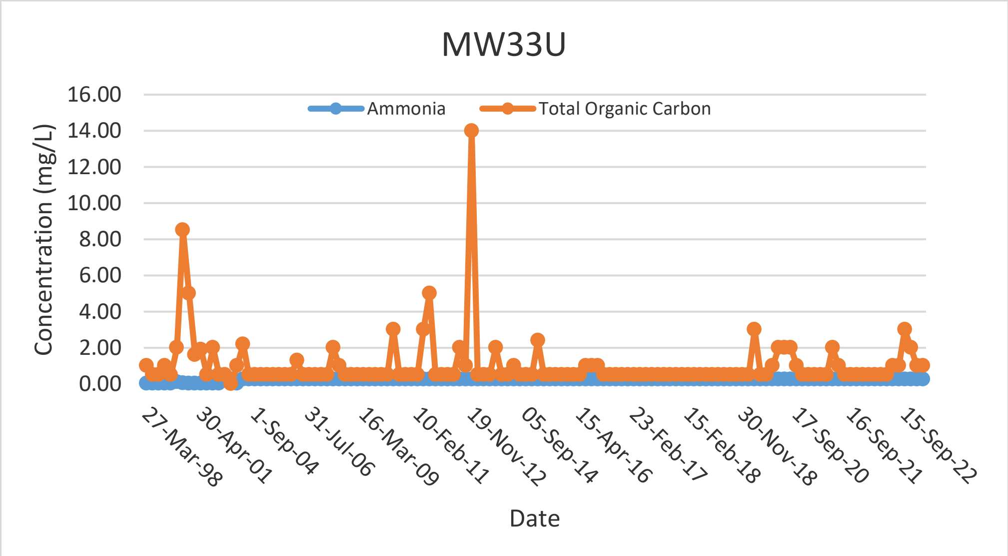
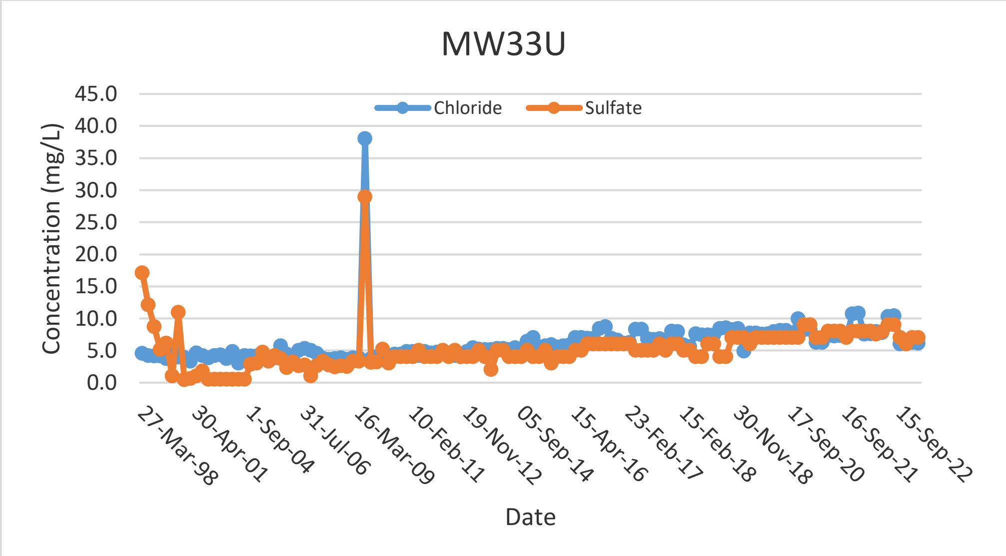
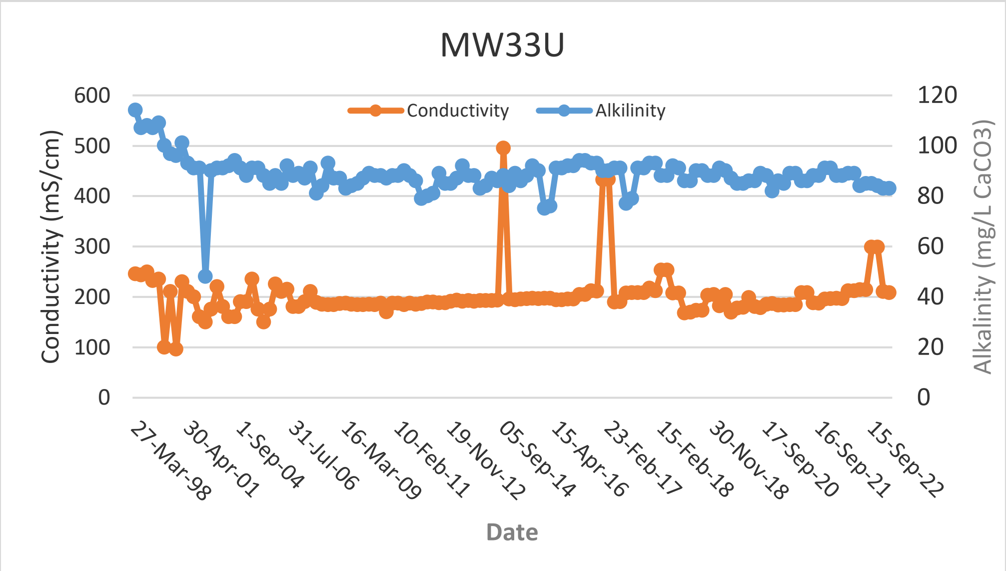
and Scientists

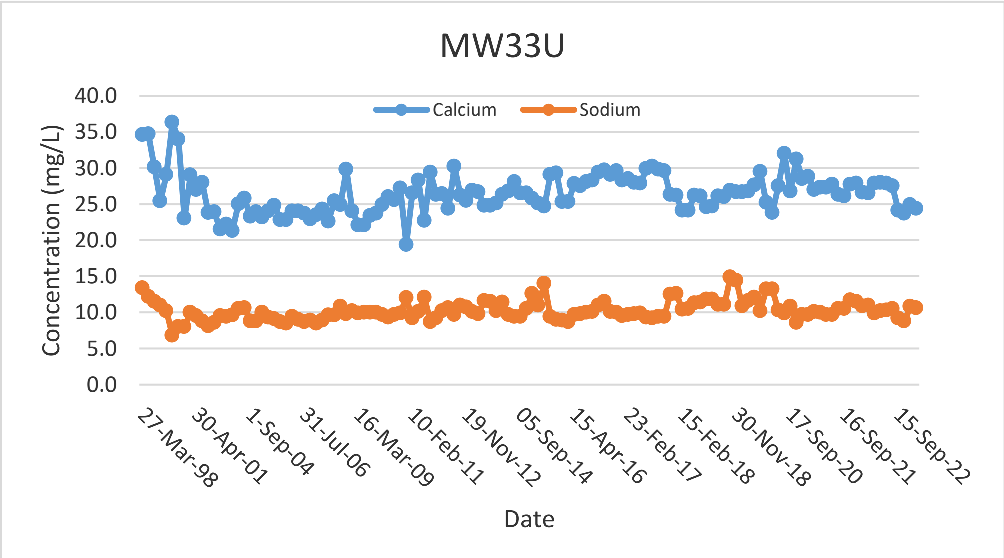
Appendix J:
Trend Graphs MW33U
1997 - 2022

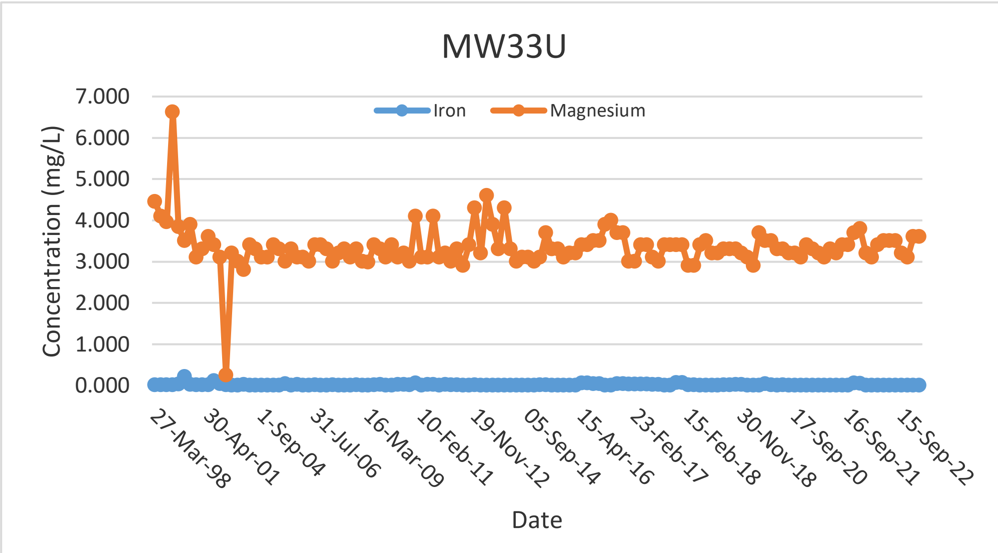
Client: Fundy Regional Services Commission
Project Number: 4662.09

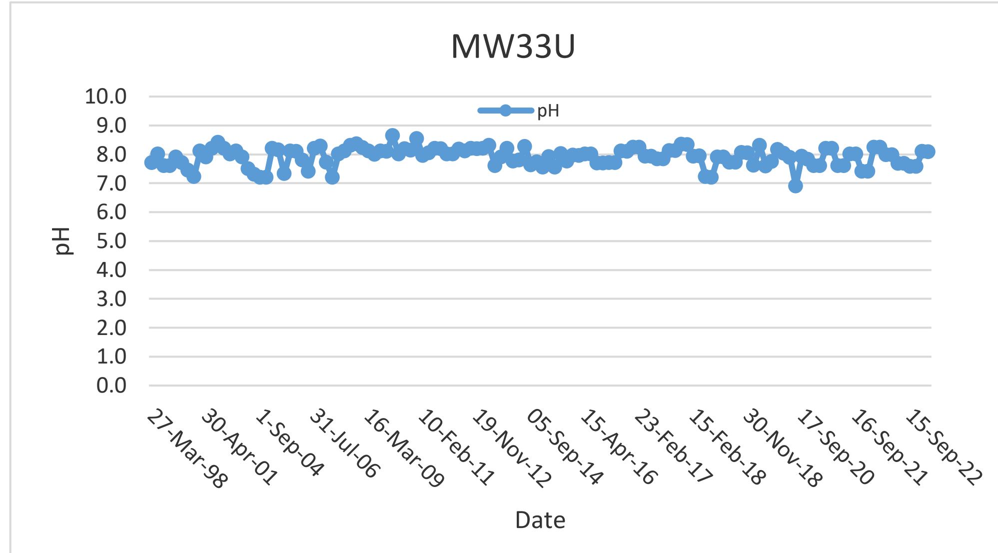


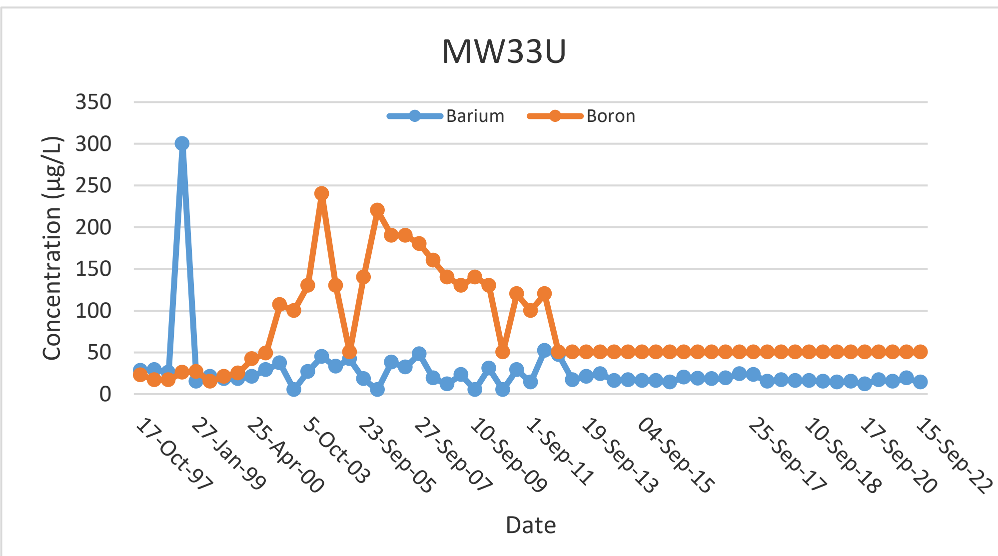






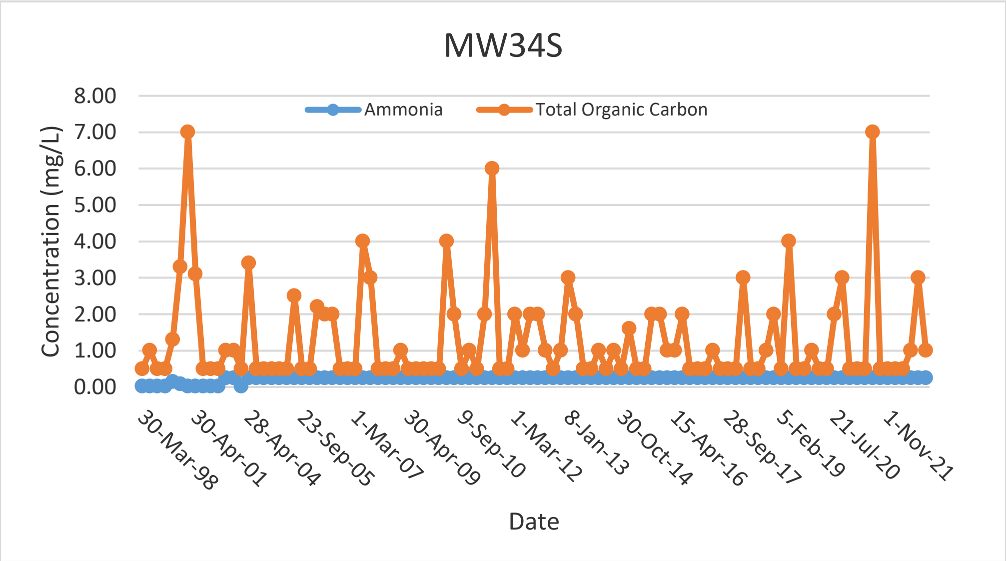

MW33U
Iron
Magnesium
Concentration (mg/L)
7.000
6.000
5.000
4.000
3.000
2.000
1.000
0.000
27-Mar-98
30-Apr-01
1-Sep-04
31-Jul-06
16-Mar-09
10-Feb-11
19-Nov-12
05-Sep-14
15-Apr-16
23-Feb-17
15-Feb-18
30-Nov-18
17-Sep-20
16-Sep-21
15-Sep-22
Date

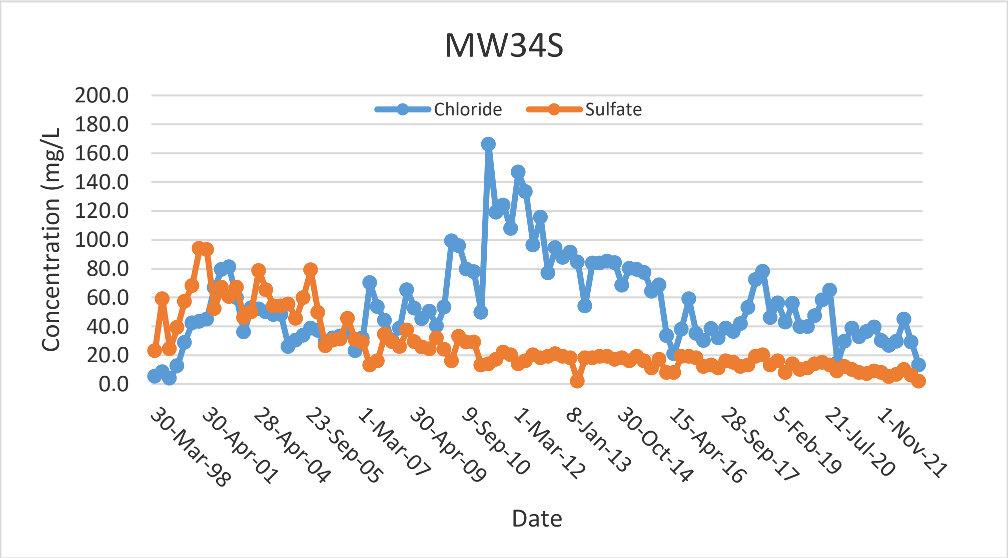

MW33U
pH
pH
10.0
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
27-Mar-98
30-Apr-01
1-Sep-04
31-Jul-06
16-Mar-09
10-Feb-11
19-Nov-12
05-Sep-14
15-Apr-16
23-Feb-17
15-Feb-18
30-Nov-18
17-Sep-20
16-Sep-21
15-Sep-22
Date

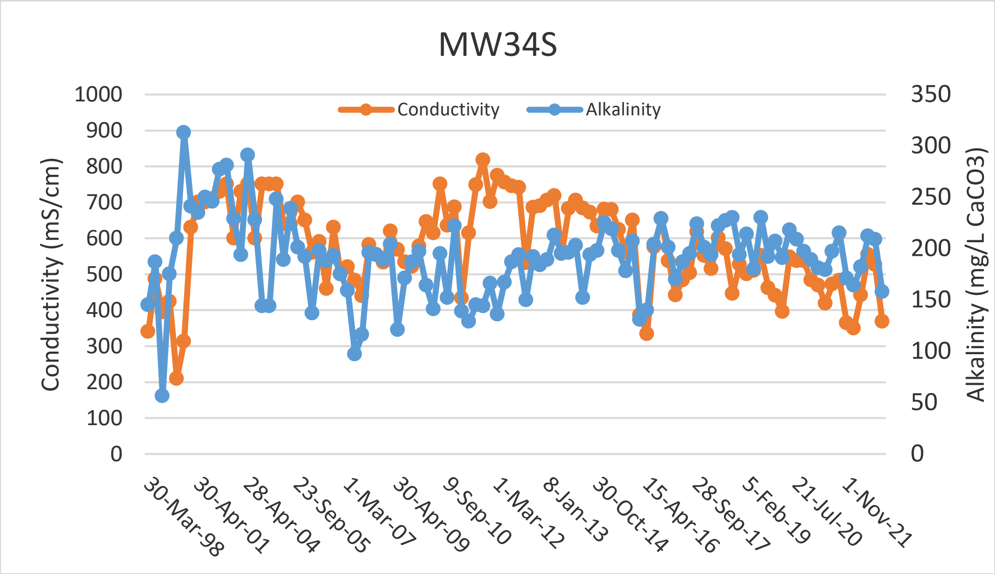

MW33U
Barium
Boron
Concentration (µg/L)
350
300
250
200
150
100
50
0
17-Oct-97
27-Jan-99
25-Apr-00
5-Oct-03
23-Sep-05
27-Sep-07
10-Sep-09
1-Sep-11
19-Sep-13
04-Sep-15
25-Sep-17
10-Sep-18
17-Sep-20
15-Sep-22
Date

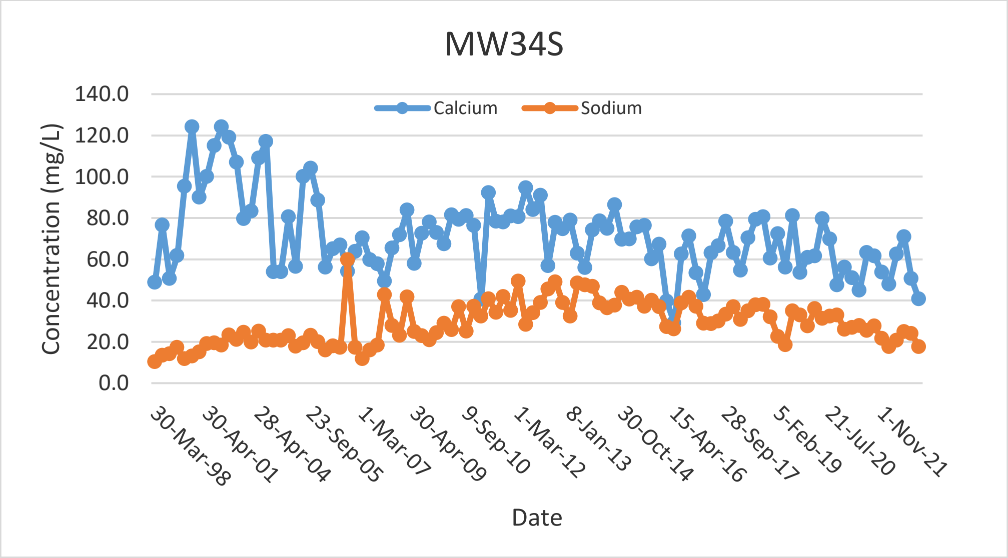
Appendix J:
Trend Graphs MW34S
1997 - 2022

Client: Fundy Regional Services Commission
Project Number: 4662.09









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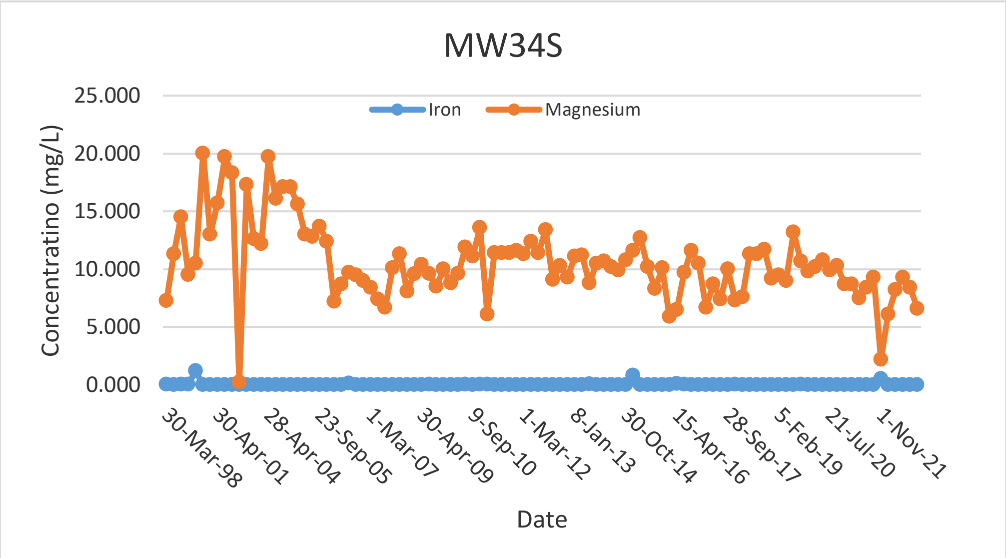
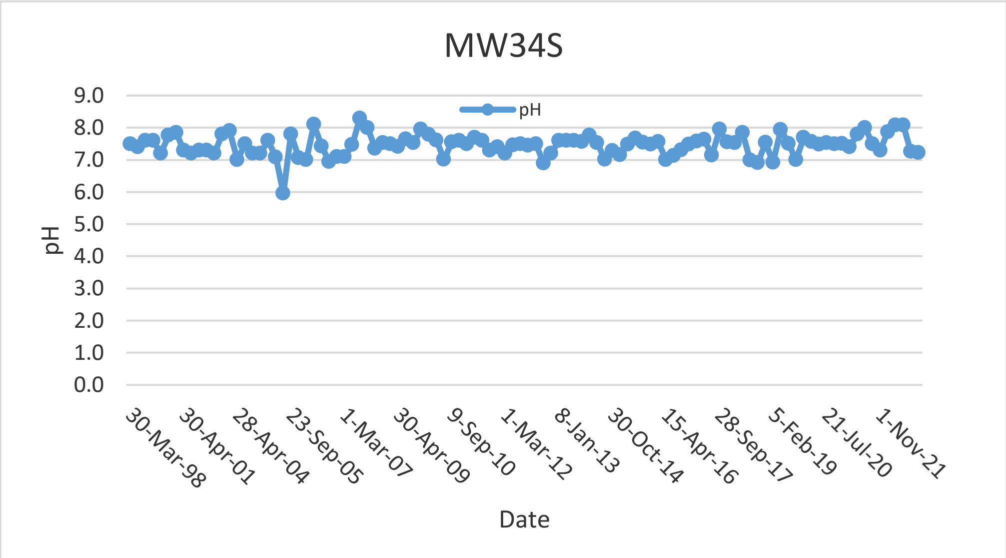
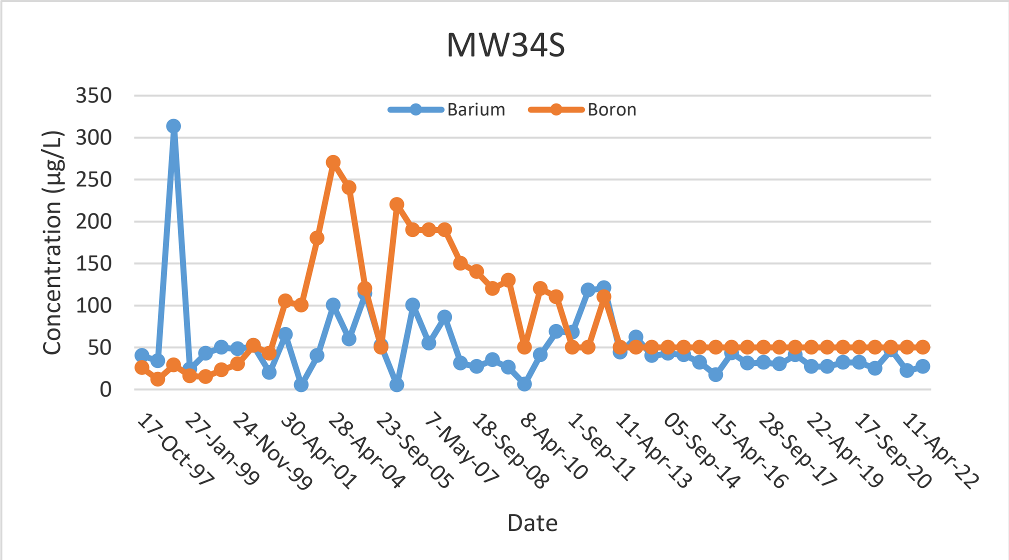
Appendix J:
Trend Graphs MW34S
1997 - 2022

Client: Fundy Regional Services Commission
Project Number: 4662.09







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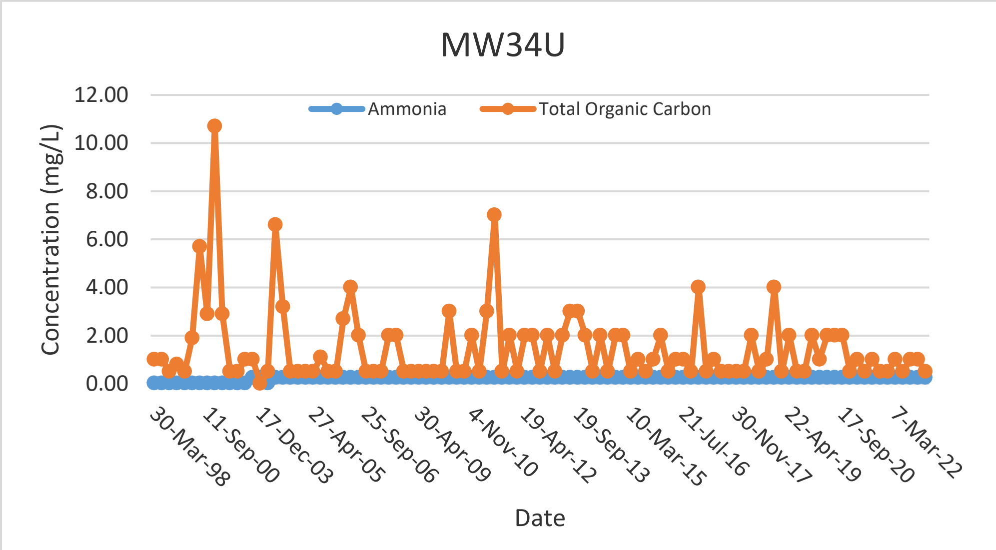
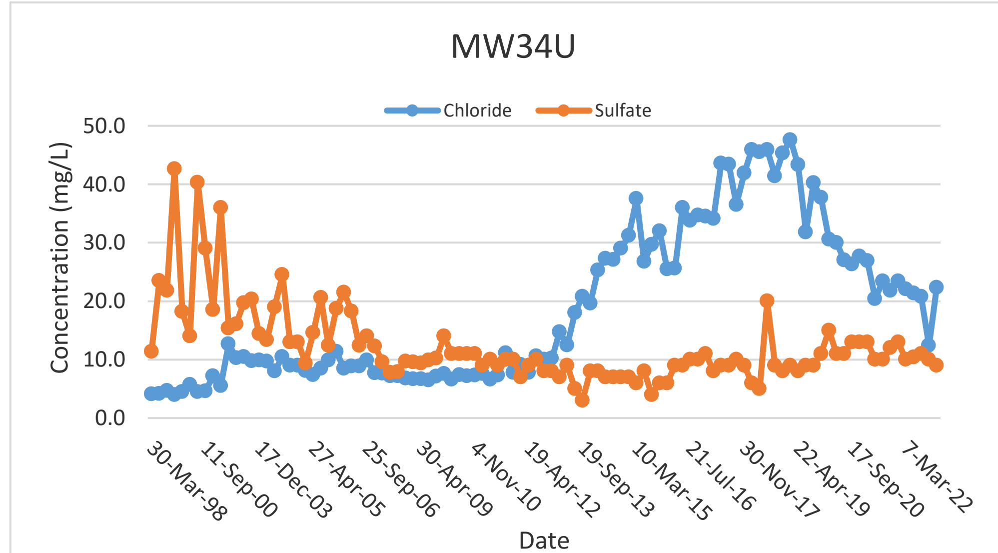
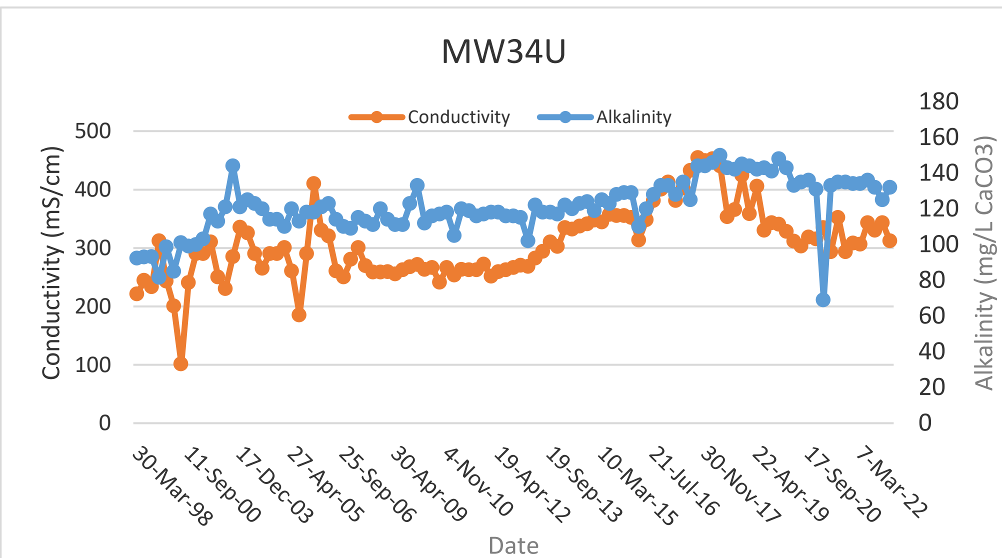
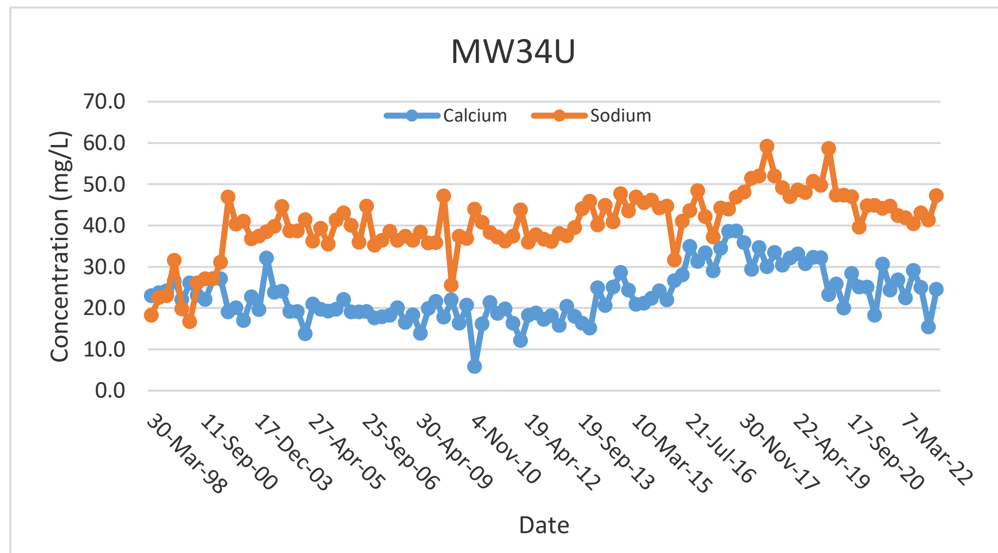
Appendix J:
Trend Graphs MW34U
1997 - 2022

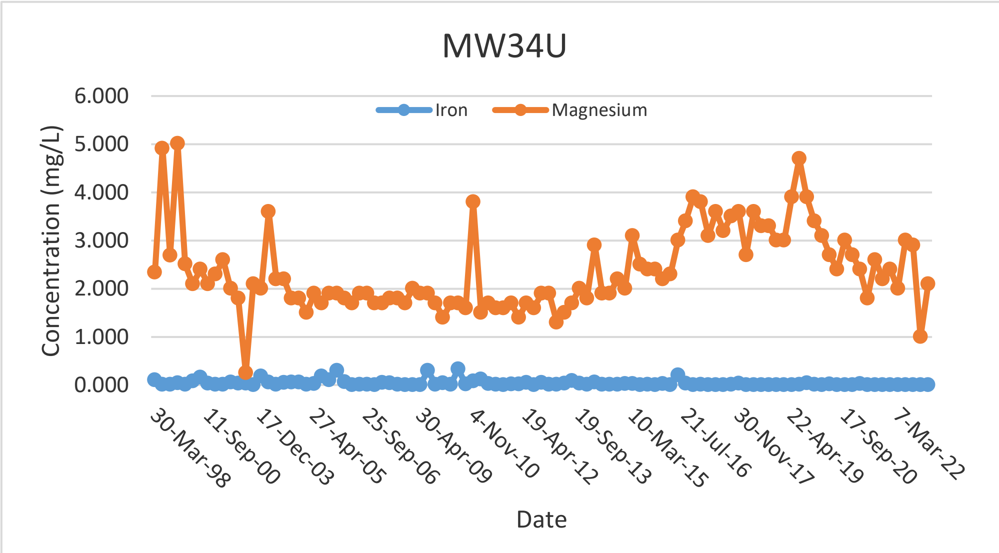
Client: Fundy Regional Services Commission
Project Number: 4662.09

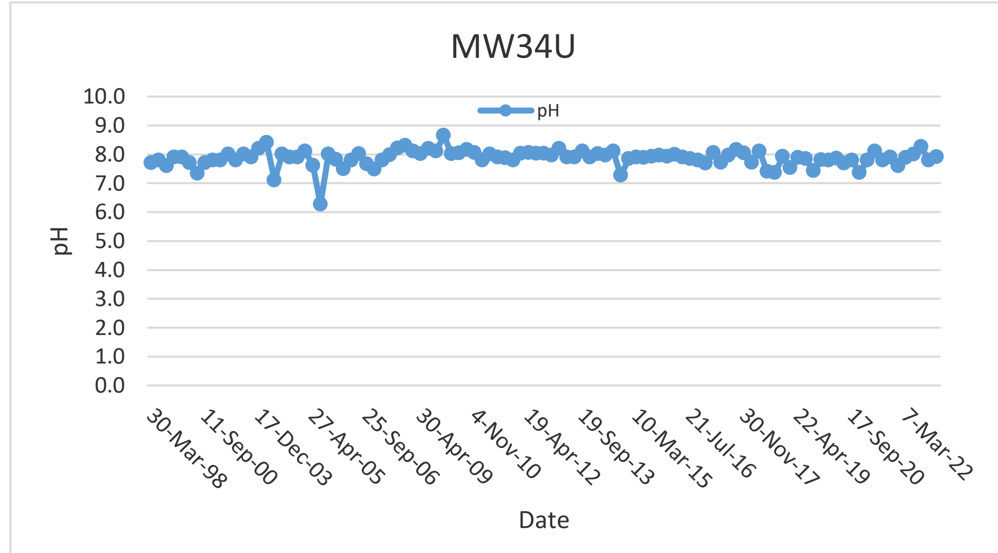


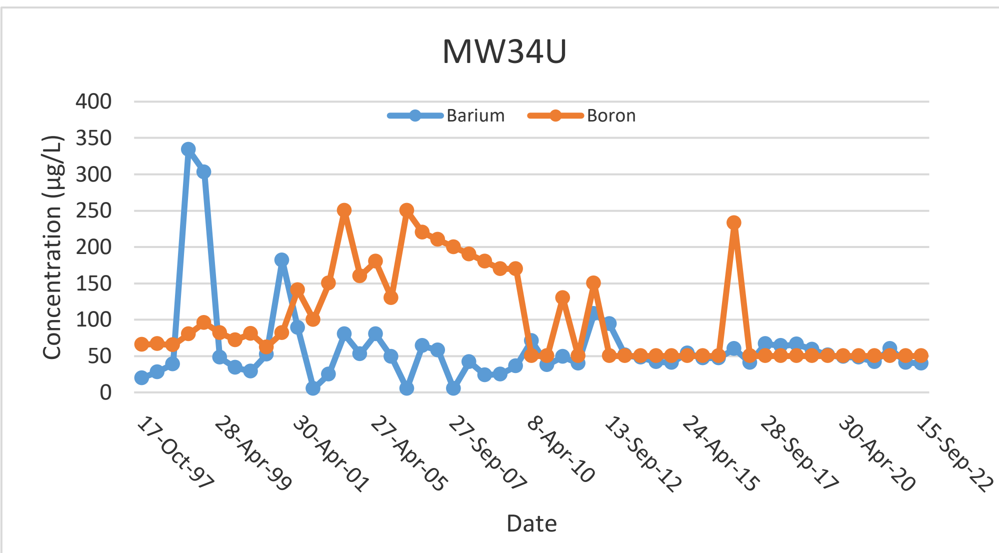







MW34U
Iron
Magnesium
Concentration (mg/L)
6.000
5.000
4.000
3.000
2.000
1.000
0.000
30-Mar-98
11-Sep-00
17-Dec-03
27-Apr-05
25-Sep-06
30-Apr-09
4-Nov-10
19-Apr-12
19-Sep-13
10-Mar-15
21-Jul-16
30-Nov-17
22-Apr-19
17-Sep-20
7-Mar-22
Date


MW34U
pH
pH
10.0
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
30-Mar-98
11-Sep-00
17-Dec-03
27-Apr-05
25-Sep-06
30-Apr-09
4-Nov-10
19-Apr-12
19-Sep-13
10-Mar-15
21-Jul-16
30-Nov-17
22-Apr-19
17-Sep-20
7-Mar-22
Date


MW34U
Barium
Boron
Concentration (µg/L)
400
350
300
250
200
150
100
50
0
17-Oct-97
28-Apr-99
30-Apr-01
27-Apr-05
27-Sep-07
8-Apr-10
13-Sep-12
24-Apr-15
28-Sep-17
30-Apr-20
15-Sep-22
Date

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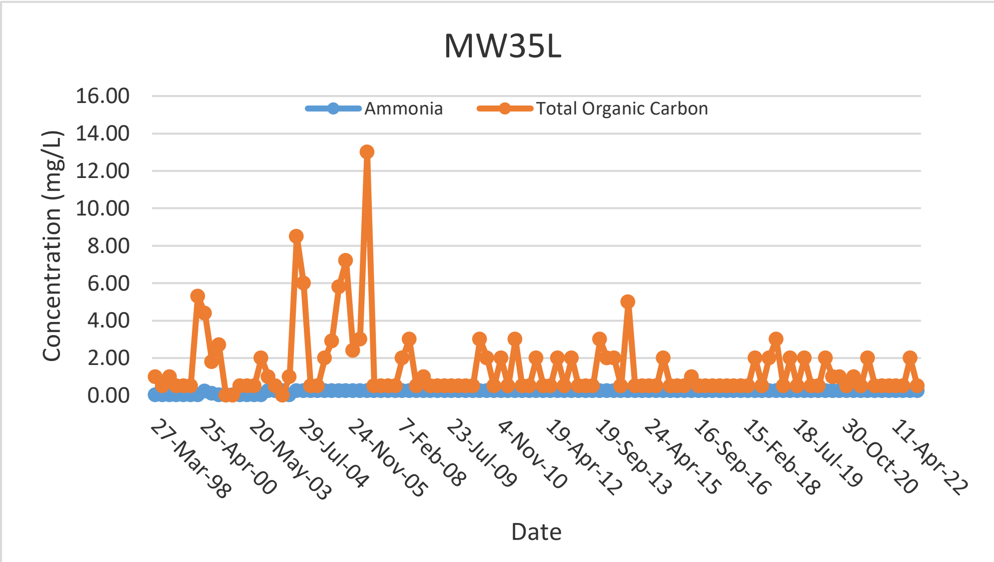
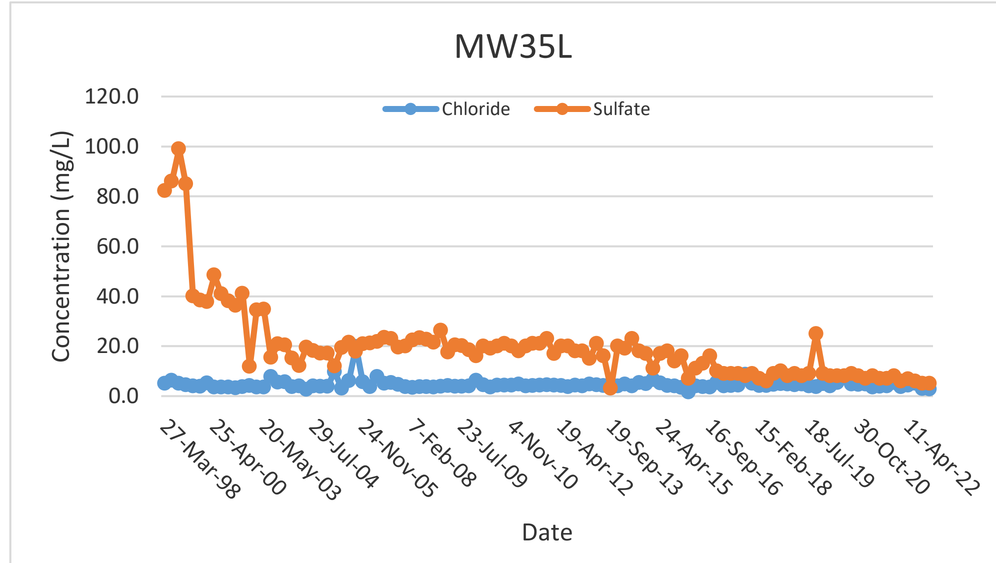
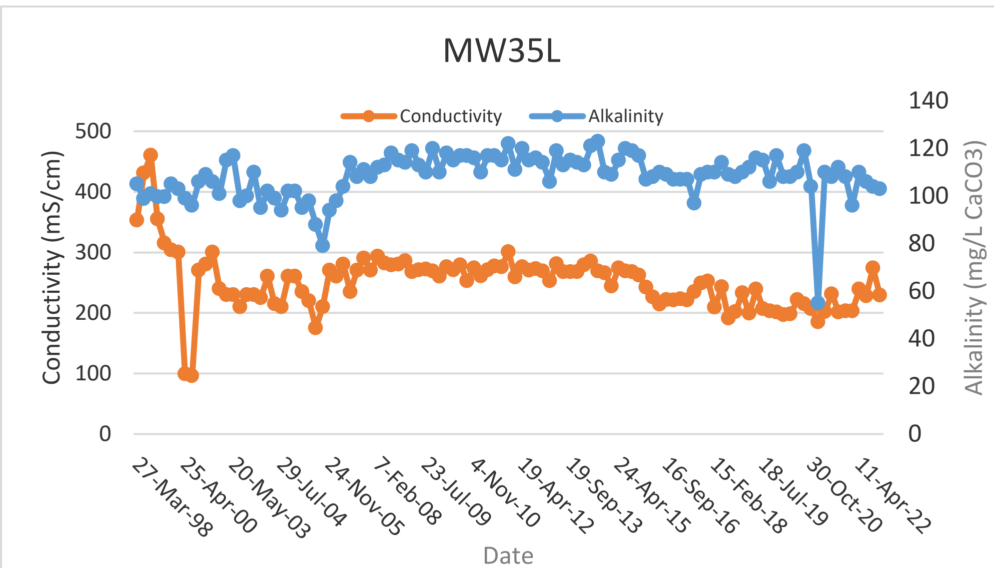
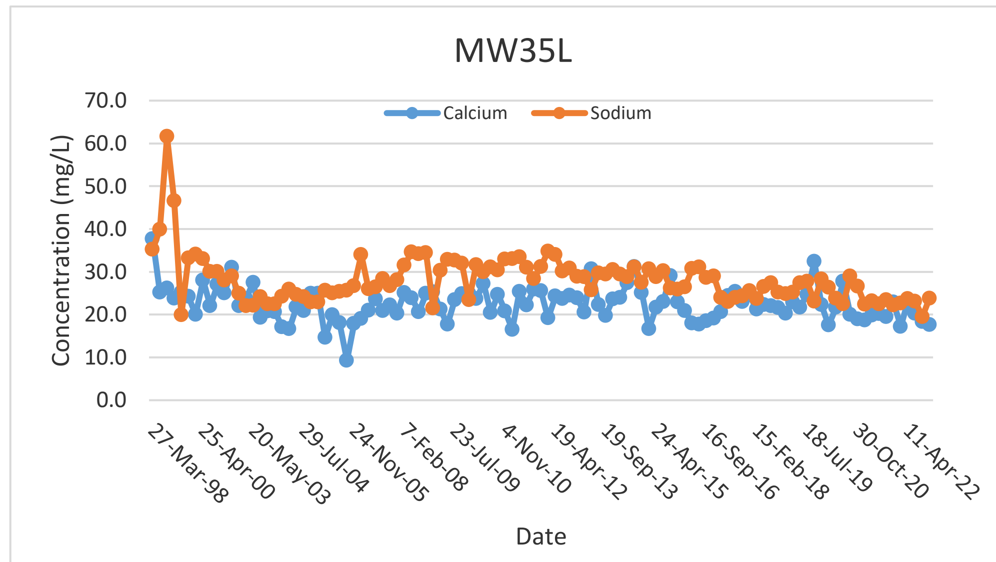
Appendix J:
Trend Graphs MW35L
1997 - 2022

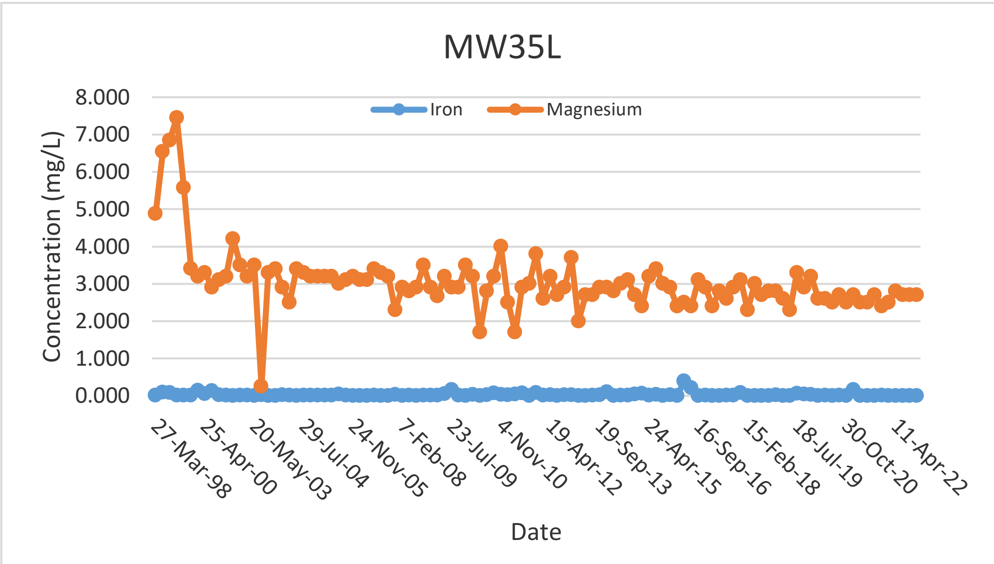
Client: Fundy Regional Services Commission
Project Number: 4662.09

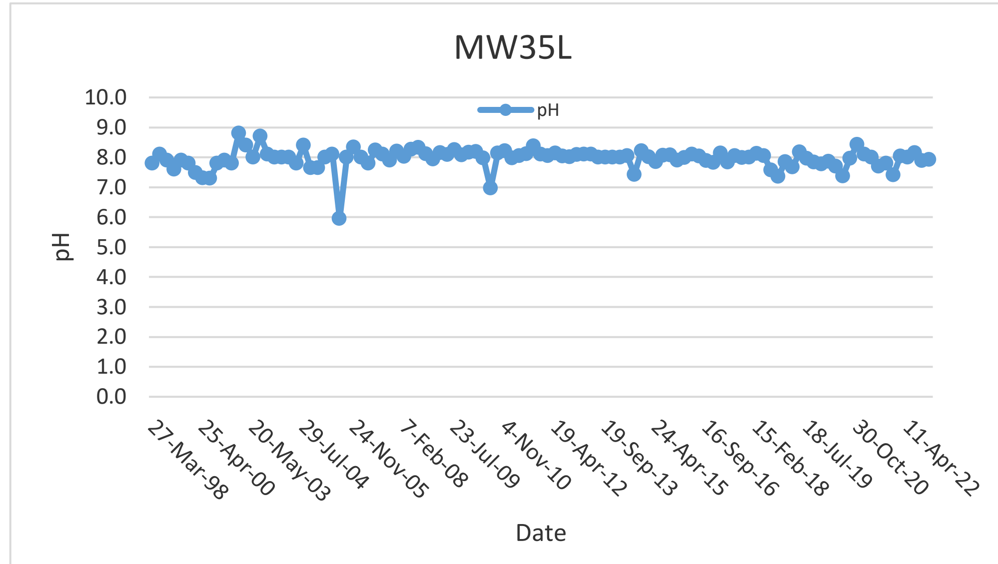


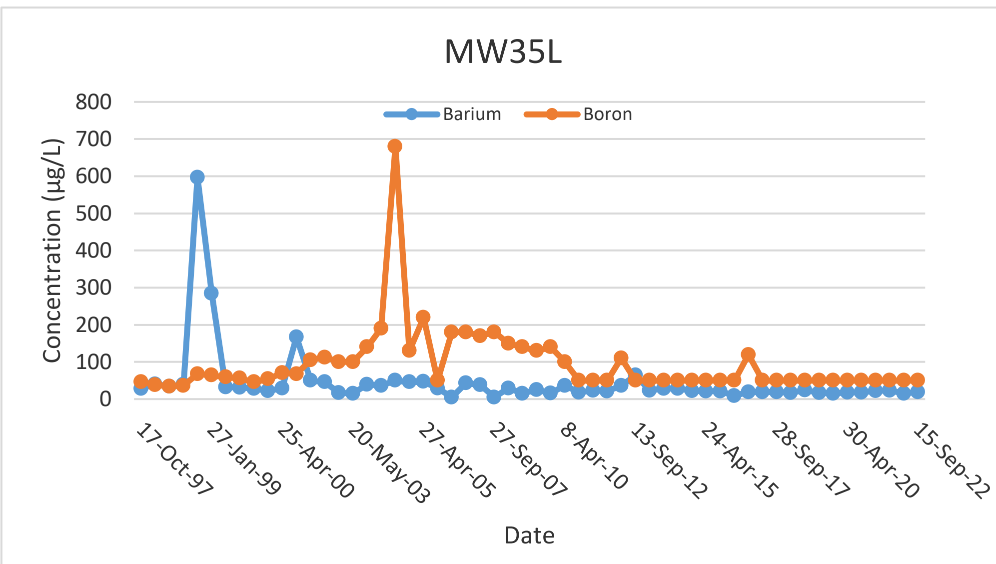


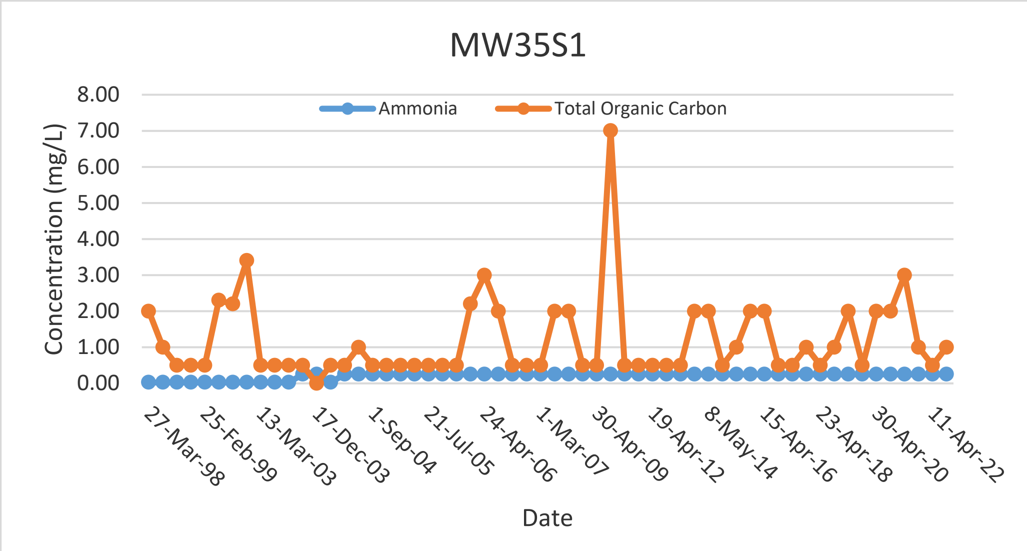


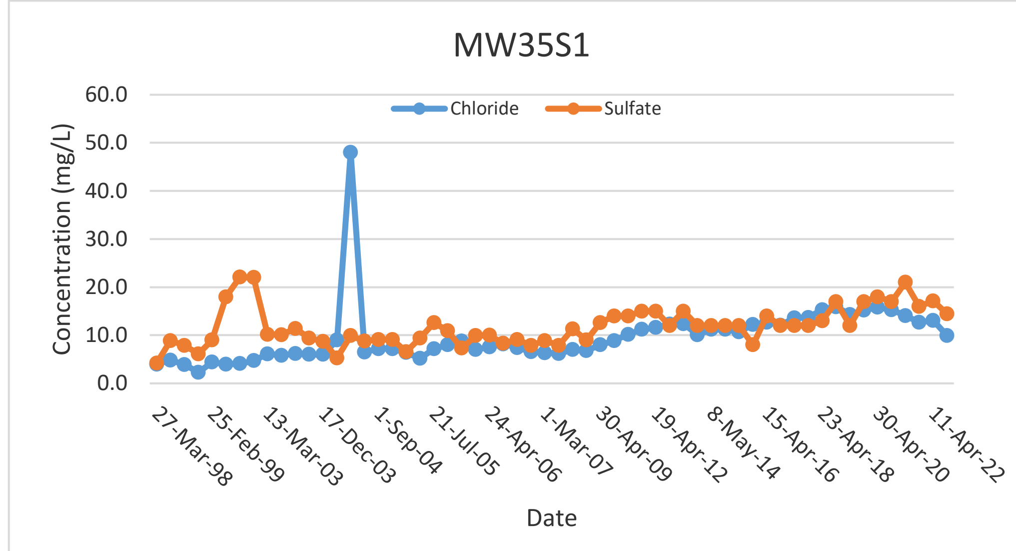


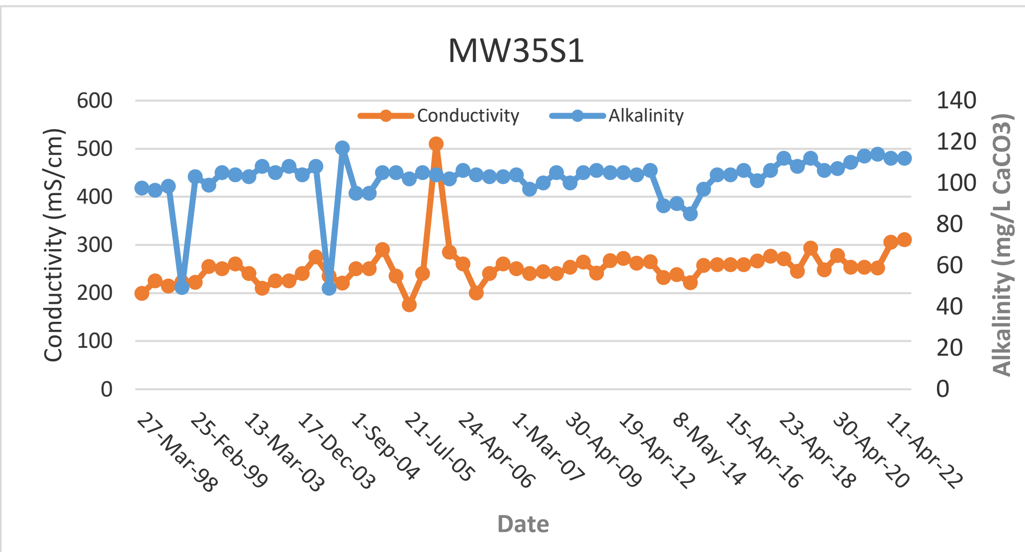

MW35L
Iron
Magnesium
Concentration (mg/L)
8.000
7.000
6.000
5.000
4.000
3.000
2.000
1.000
0.000
27-Mar-98
25-Apr-00
20-May-03
29-Jul-04
24-Nov-05
7-Feb-08
23-Jul-09
4-Nov-10
19-Apr-12
19-Sep-13
24-Apr-15
16-Sep-16
15-Feb-18
18-Jul-19
30-Oct-20
11-Apr-22
Date

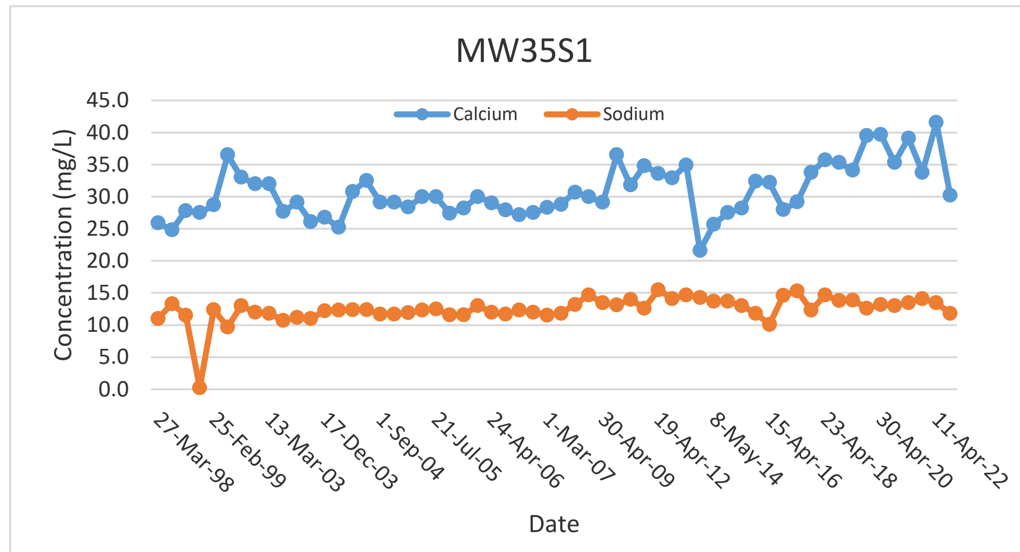

MW35L
pH
pH
10.0
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
27-Mar-98
25-Apr-00
20-May-03
29-Jul-04
24-Nov-05
7-Feb-08
23-Jul-09
4-Nov-10
19-Apr-12
19-Sep-13
24-Apr-15
16-Sep-16
15-Feb-18
18-Jul-19
30-Oct-20
11-Apr-22
Date


MW35L
Barium
Boron
Concentration (µg/L)
800
700
600
500
400
300
200
100
0
17-Oct-97
27-Jan-99
25-Apr-00
20-May-03
27-Apr-05
27-Sep-07
8-Apr-10
13-Sep-12
24-Apr-15
28-Sep-17
30-Apr-20
15-Sep-22
Date


MW35S1
Ammonia
Total Organic Carbon
Concentration (mg/L)
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
27-Mar-98
25-Feb-99
13-Mar-03
17-Dec-03
1-Sep-04
21-Jul-05
24-Apr-06
1-Mar-07
30-Apr-09
19-Apr-12
8-May-14
15-Apr-16
23-Apr-18
30-Apr-20
11-Apr-22
Date


MW35S1
Chloride
Sulfate
Concentration (mg/L)
60.0
50.0
40.0
30.0
20.0
10.0
0.0
27-Mar-98
25-Feb-99
13-Mar-03
17-Dec-03
1-Sep-04
21-Jul-05
24-Apr-06
1-Mar-07
30-Apr-09
19-Apr-12
8-May-14
15-Apr-16
23-Apr-18
30-Apr-20
11-Apr-22
Date


MW35S1
Conductivity
Alkalinity
Conductivity (mS/cm)
600
500
400
300
200
100
0
Alkalinity (mg/L CaCO3)
140
120
100
80
60
40
20
0
27-Mar-98
25-Feb-99
13-Mar-03
17-Dec-03
1-Sep-04
21-Jul-05
24-Apr-06
1-Mar-07
30-Apr-09
19-Apr-12
8-May-14
15-Apr-16
23-Apr-18
30-Apr-20
11-Apr-22
Date


MW35S1
Calcium
Sodium
Concentration (mg/L)
45.0
40.0
35.0
30.0
25.0
20.0
15.0
10.0
5.0
0.0
27-Mar-98
25-Feb-99
13-Mar-03
17-Dec-03
1-Sep-04
21-Jul-05
24-Apr-06
1-Mar-07
30-Apr-09
19-Apr-12
8-May-14
15-Apr-16
23-Apr-18
30-Apr-20
11-Apr-22
Date

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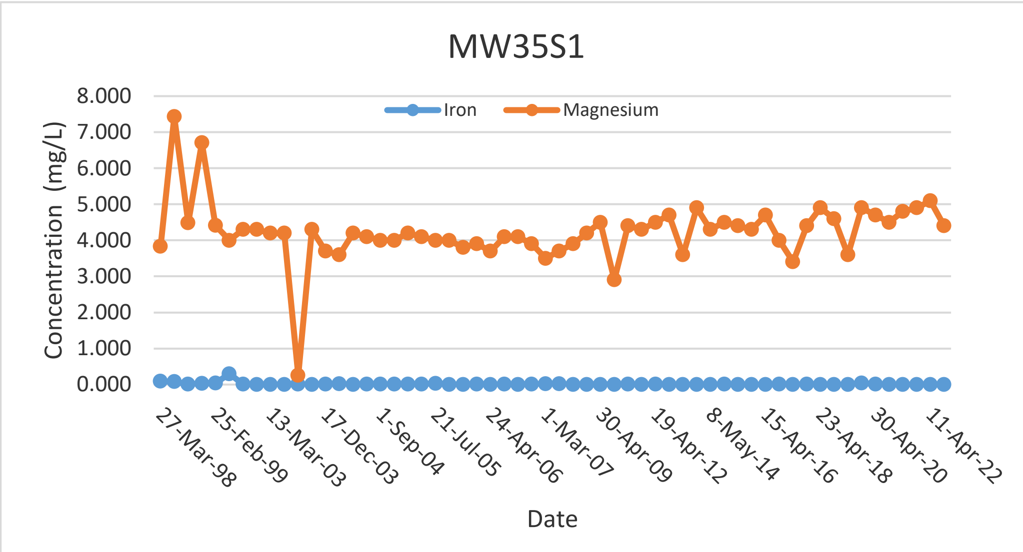
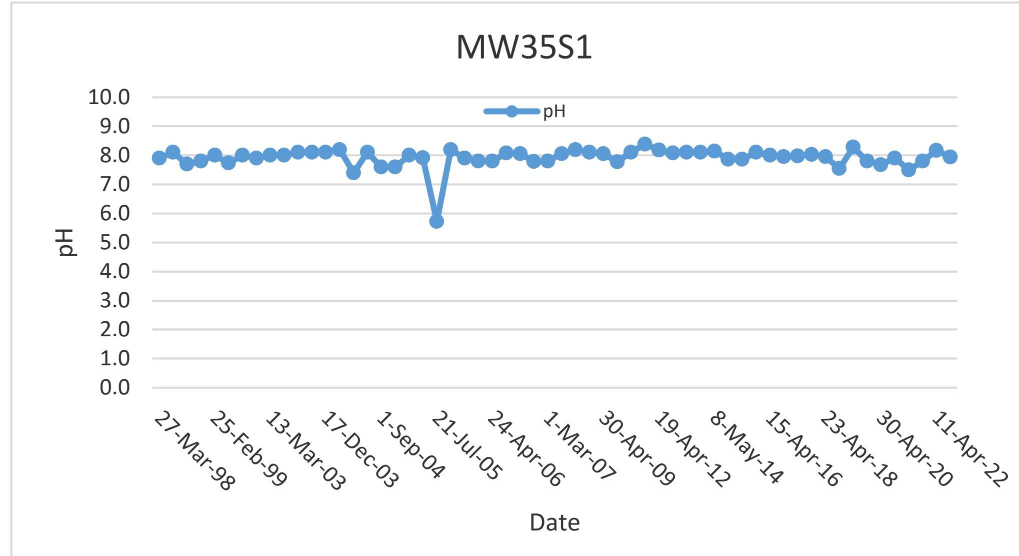
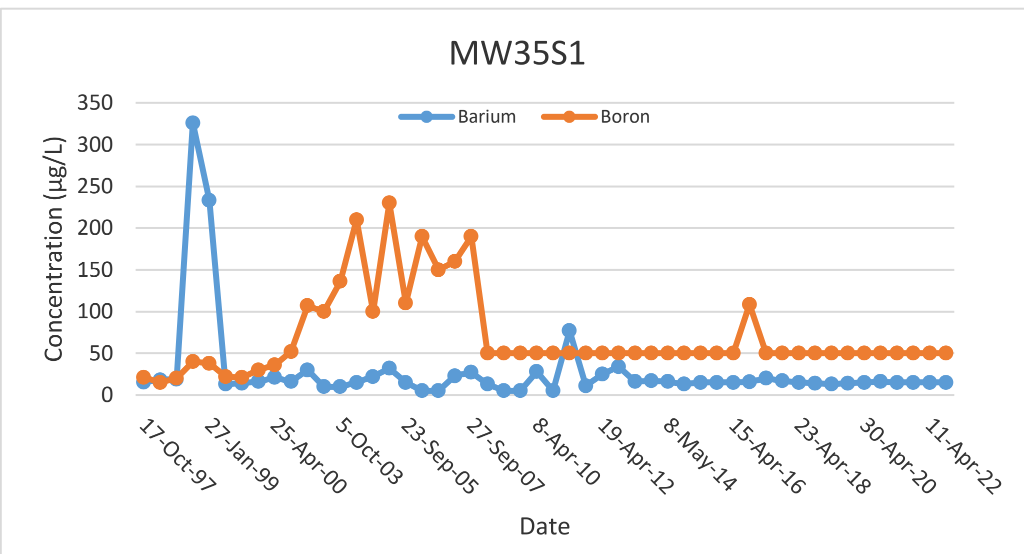
Appendix J:
Trend Graphs MW35S1
1997 - 2022

Client: Fundy Regional Services Commission
Project Number: 4662.09







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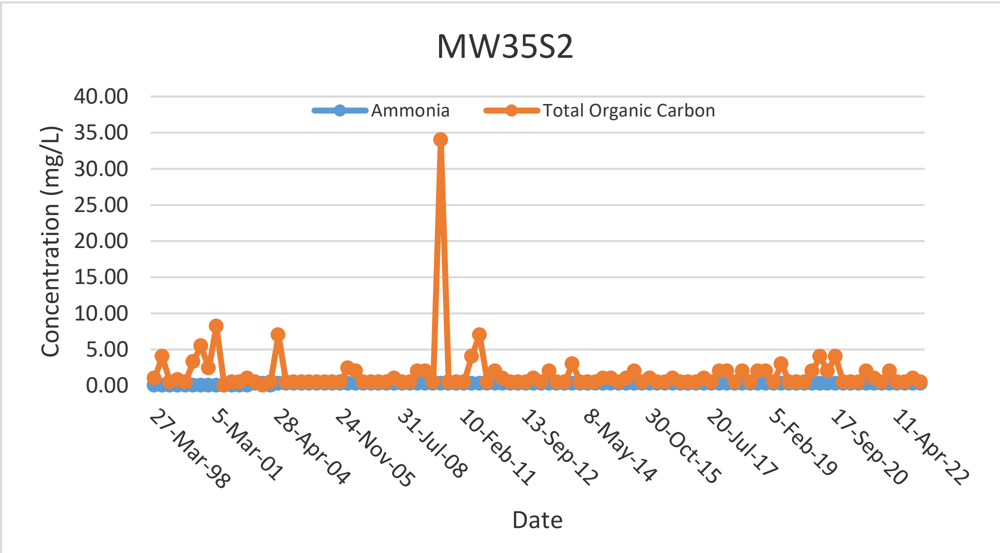
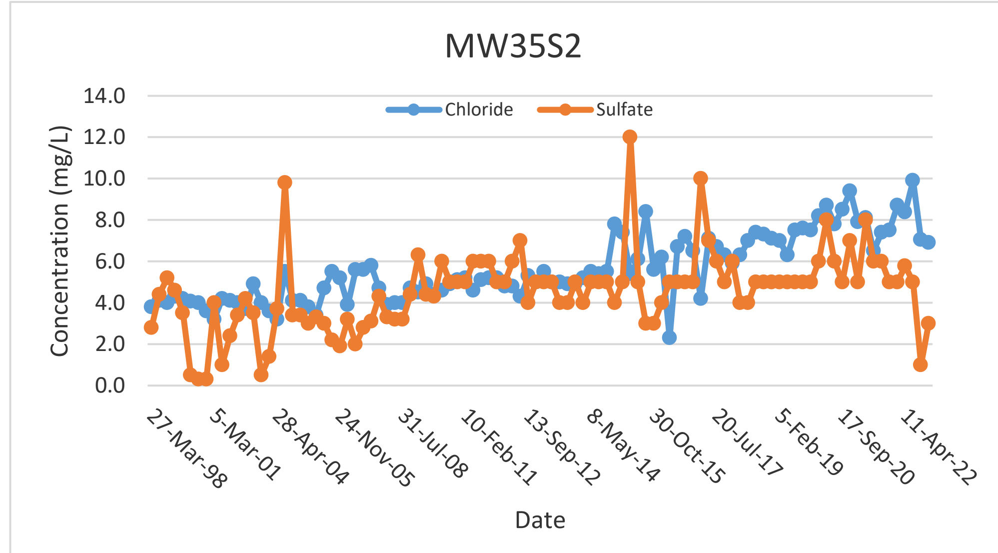
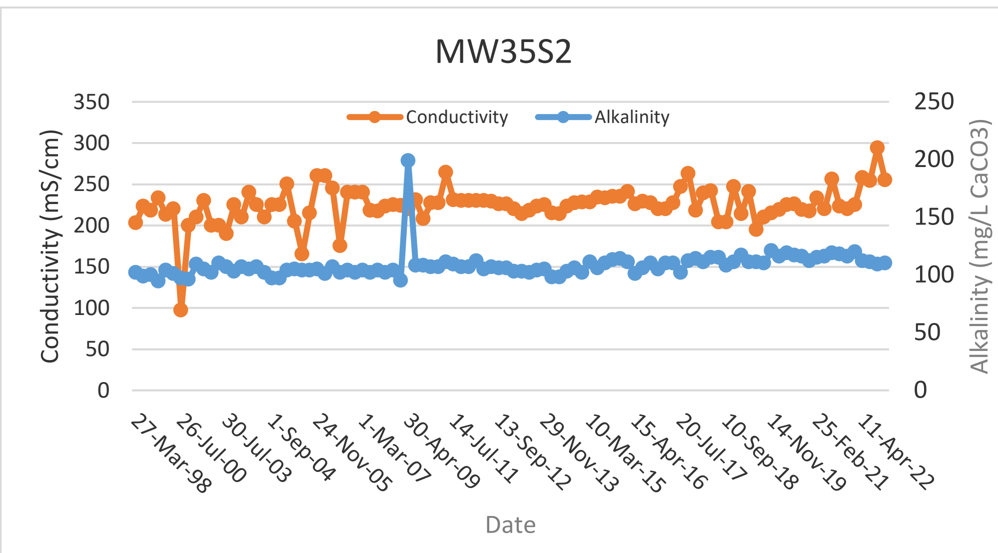
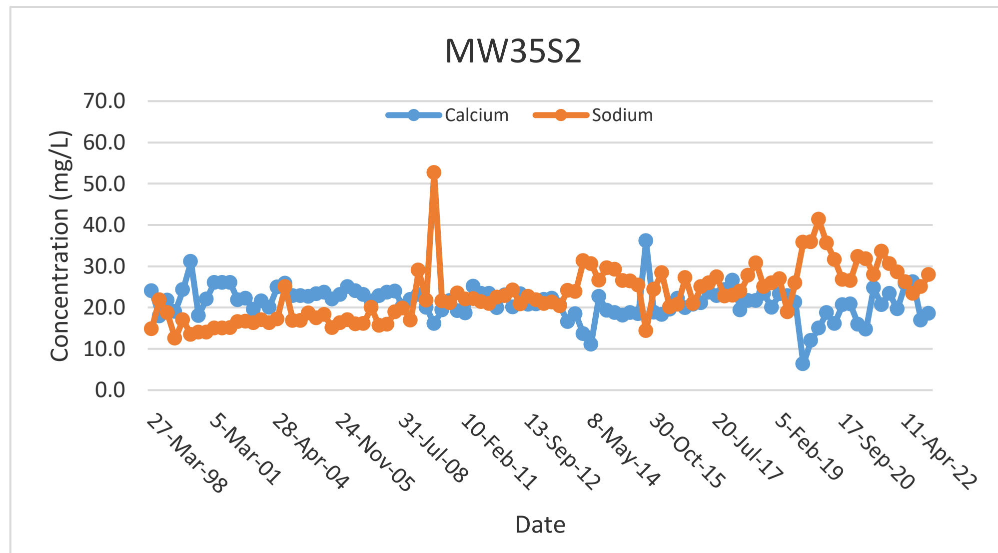
Appendix J:
Trend Graphs MW35S2
1997 - 2022

Client: Fundy Regional Services Commission
Project Number: 4662.09









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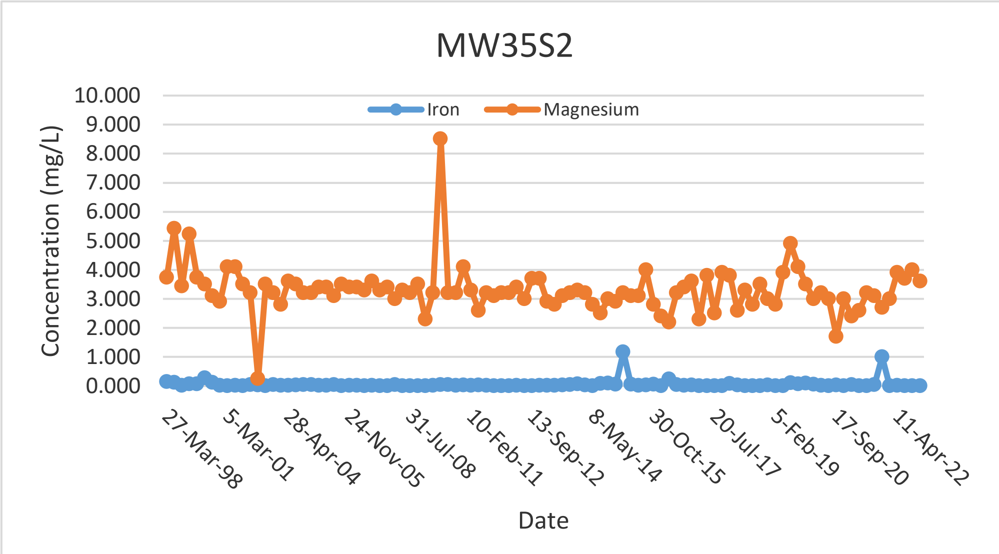
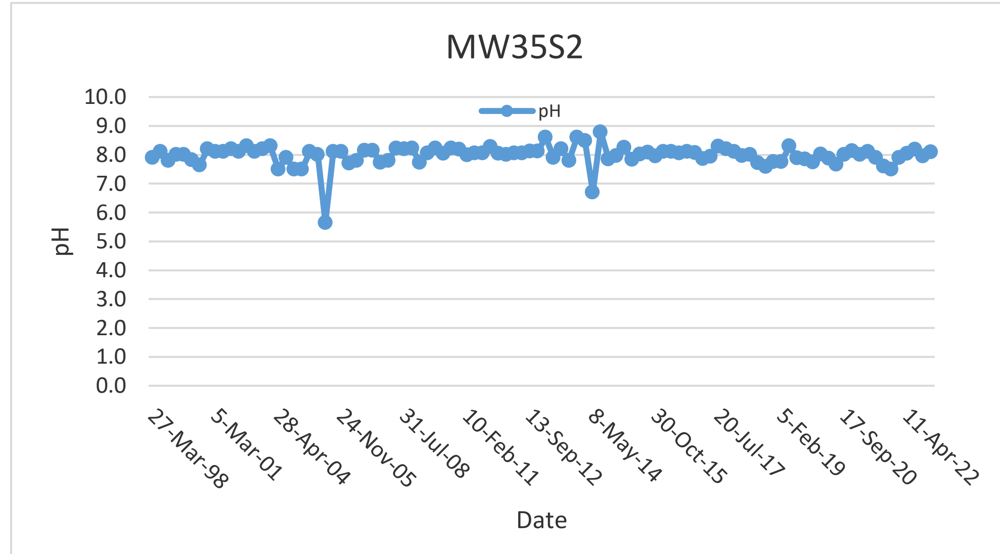
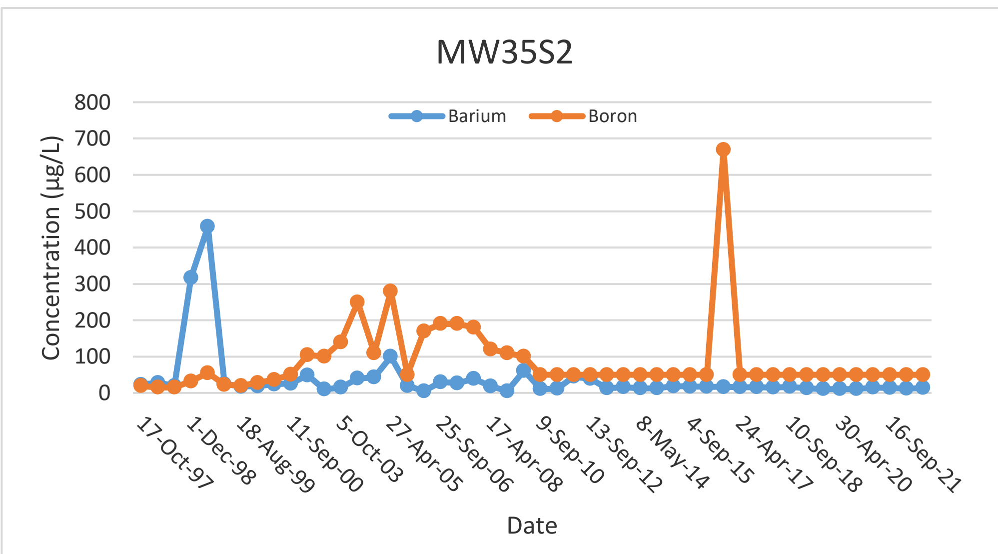
Appendix J:
Trend Graphs MW35S2
1997 - 2022

Client: Fundy Regional Services Commission
Project Number: 4662.09

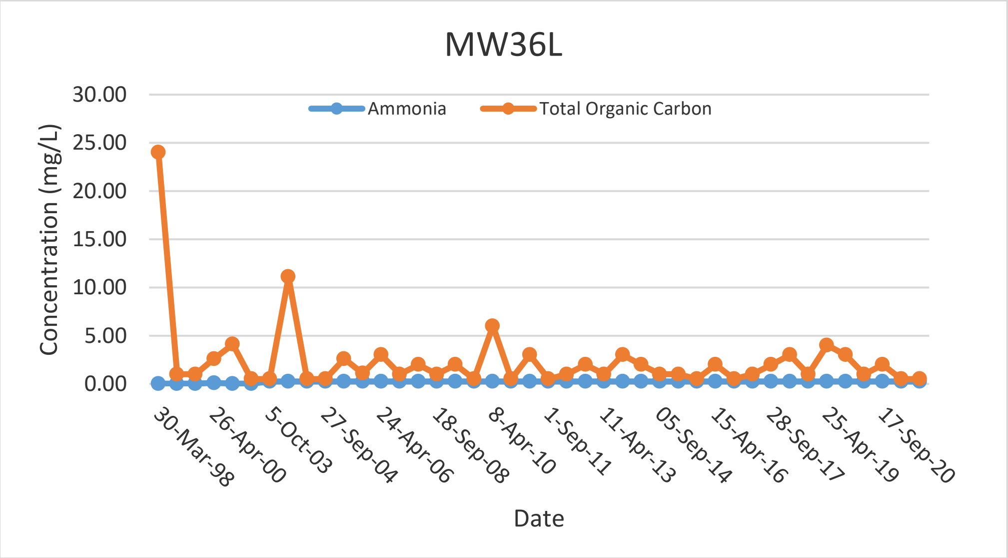


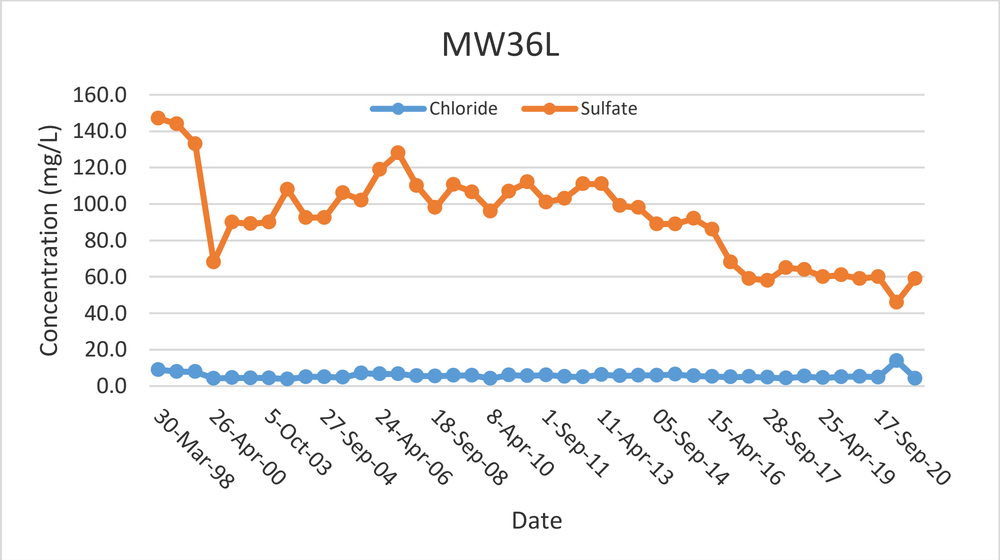


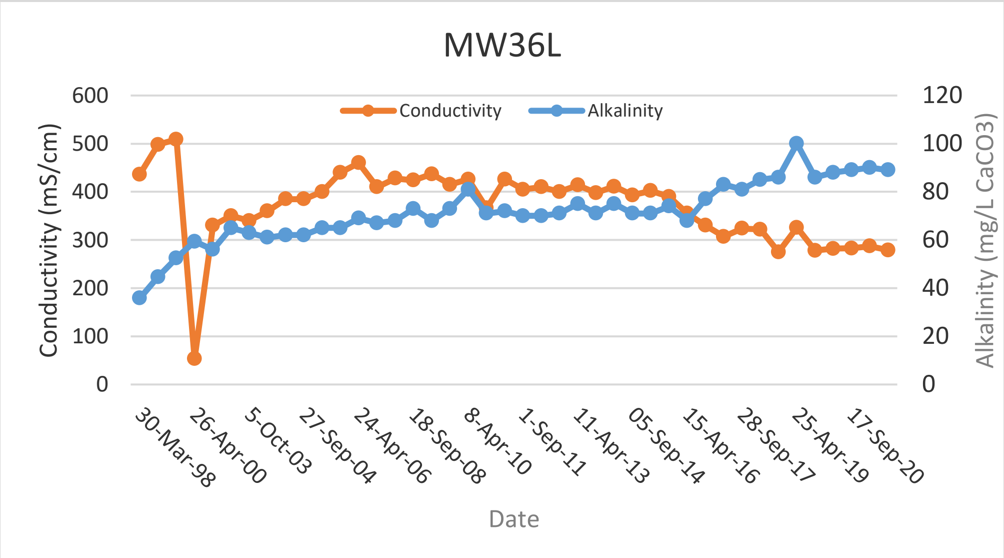


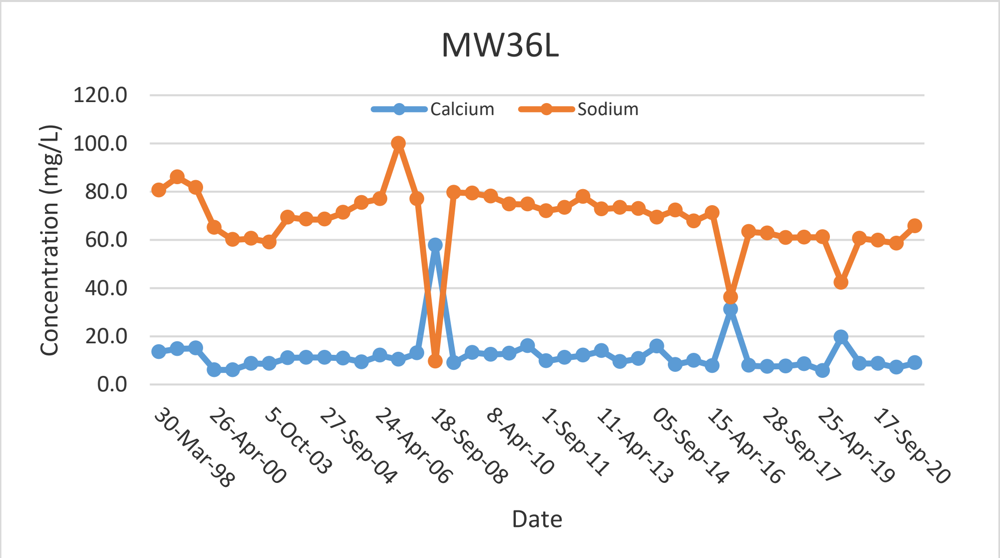
Appendix J:
Trend Graphs MW36L
1997 - 2022

Client: Fundy Regional Services Commission
Project Number: 4662.09









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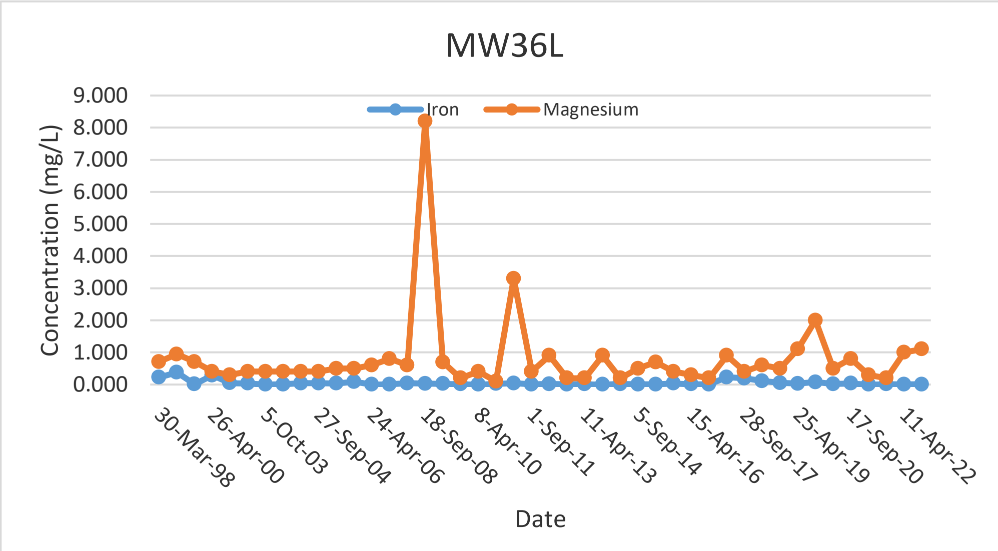
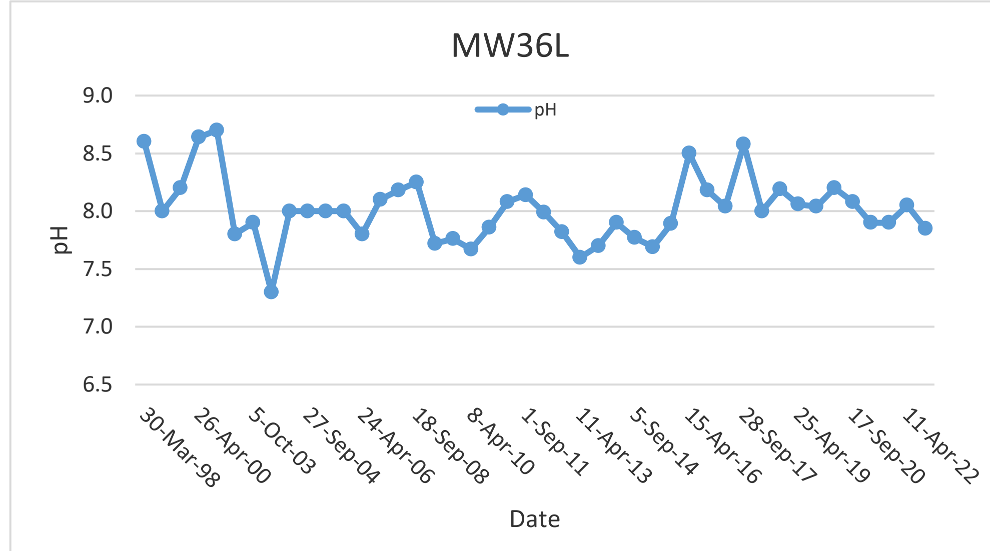
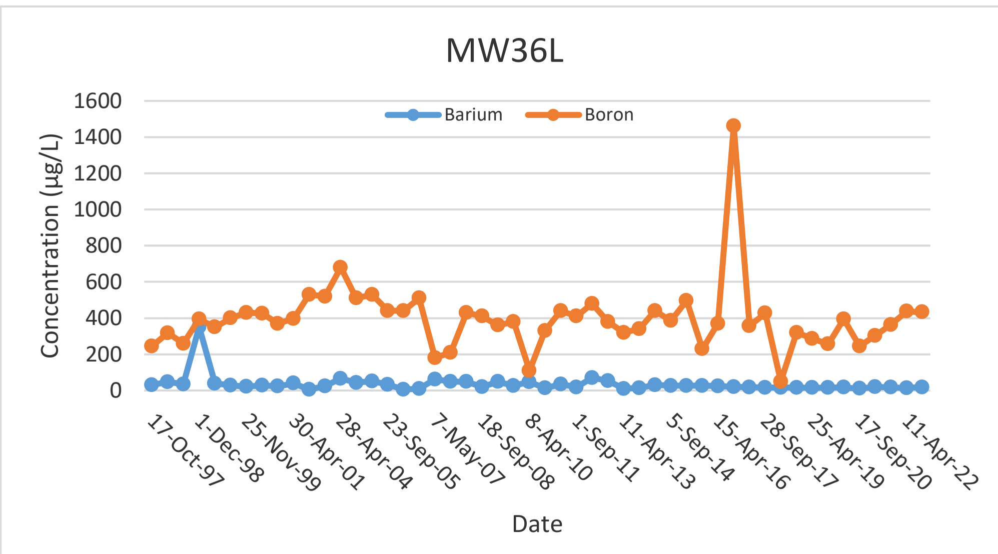
Appendix J:
Trend Graphs MW36L
1997 - 2022

Client: Fundy Regional Services Commission
Project Number: 4662.09

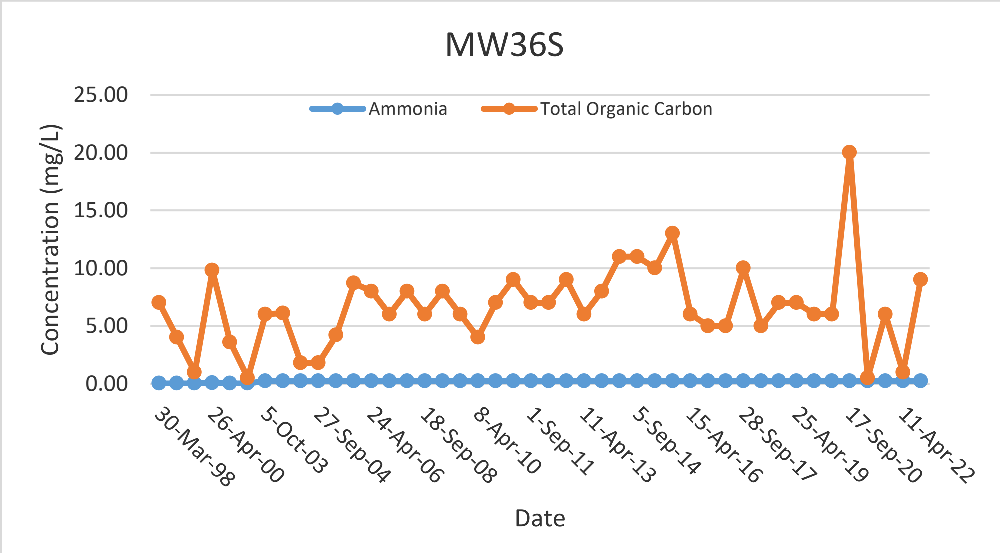


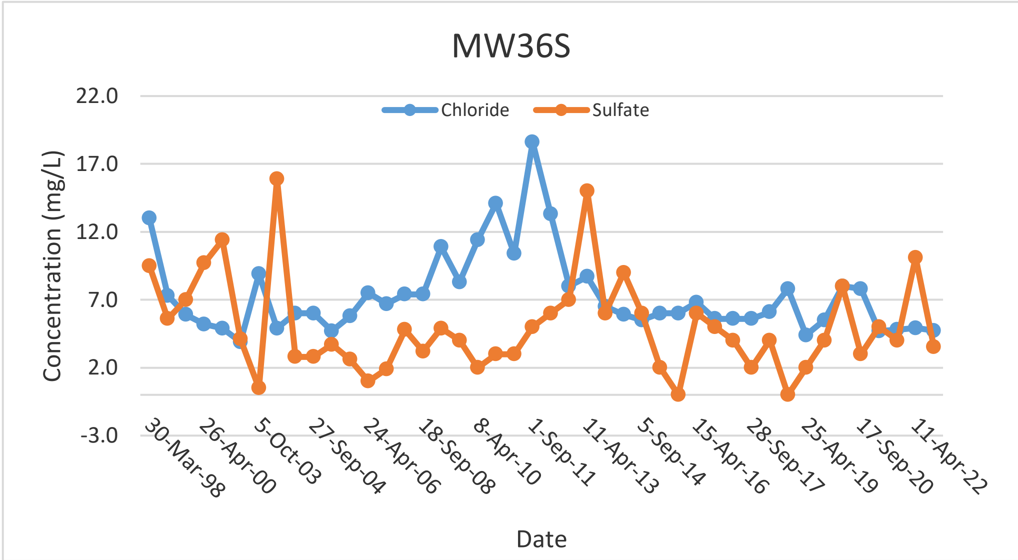


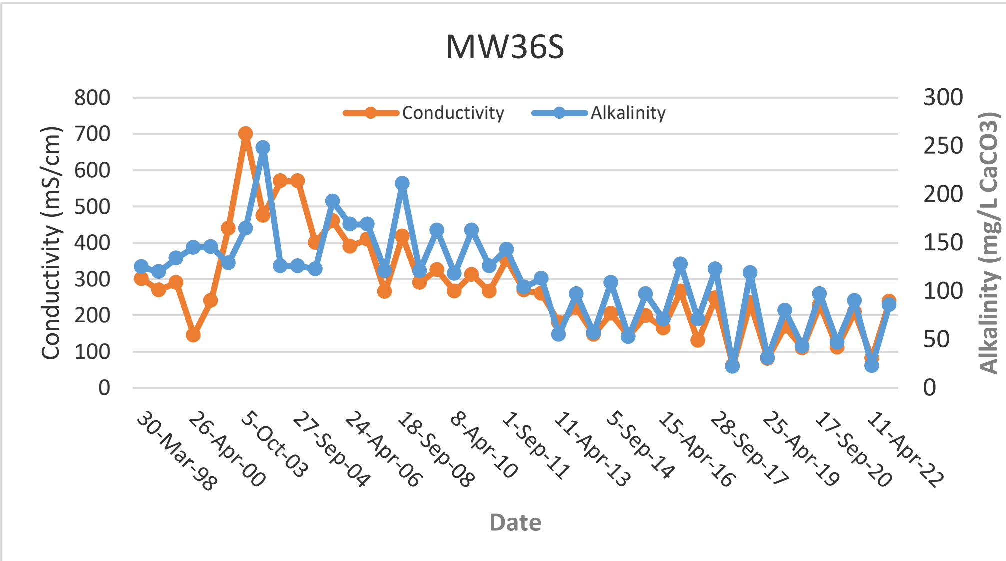


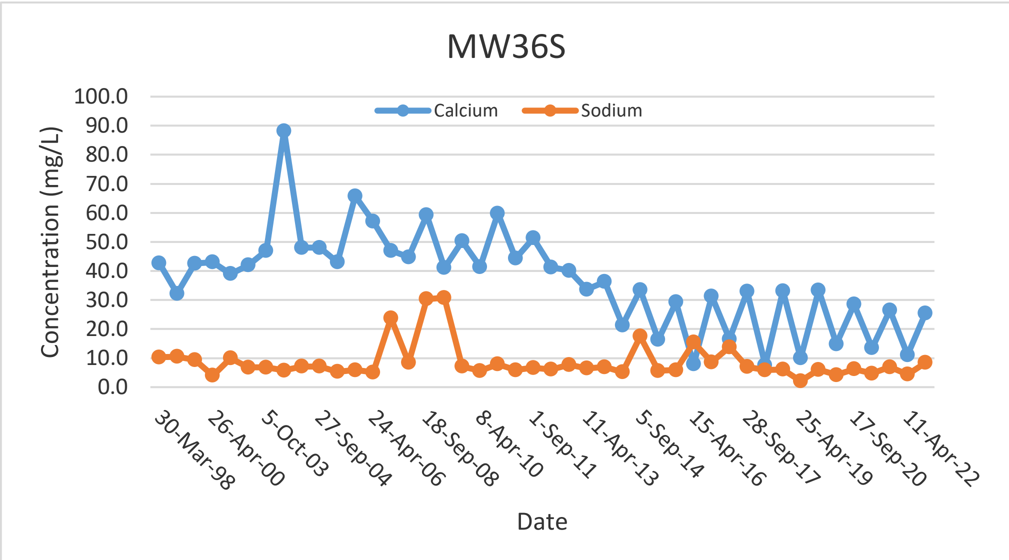
Appendix J:
Trend Graphs MW36S
1997 - 2022

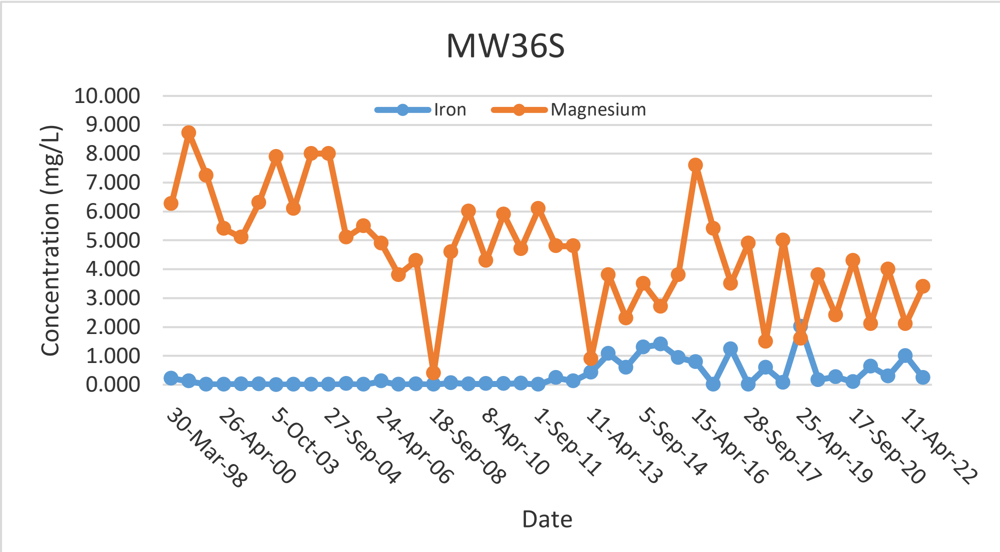
Client: Fundy Regional Services Commission
Project Number: 4662.09

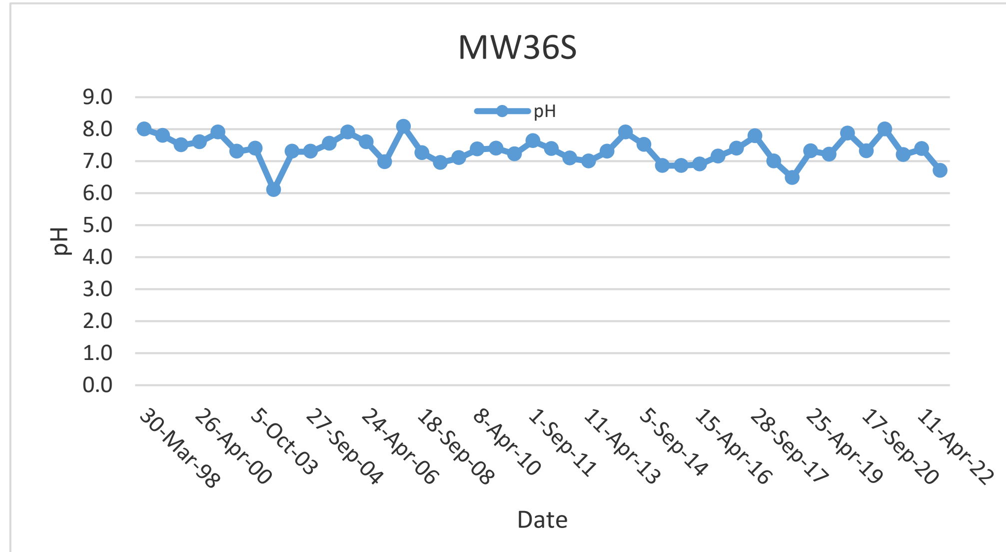


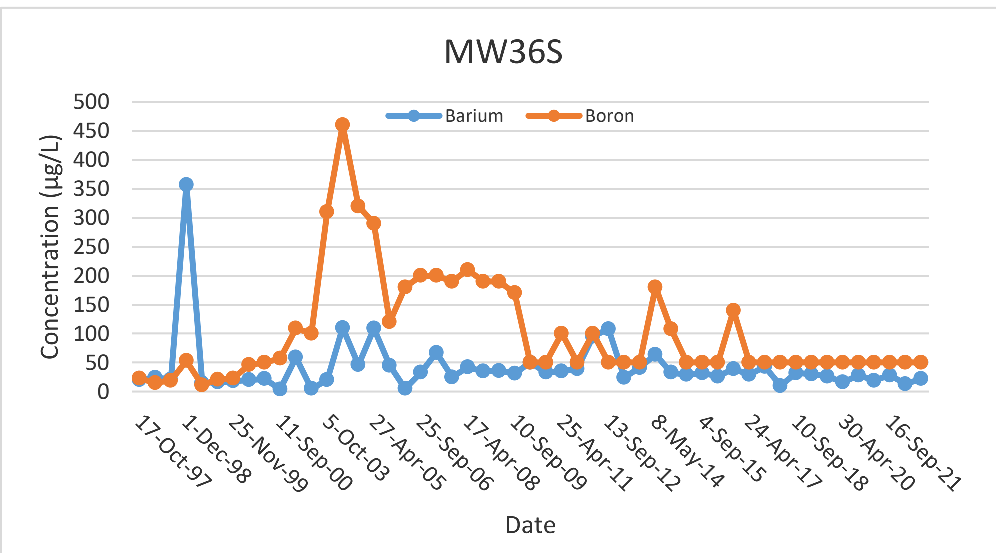







MW36S
Iron
Magnesium
Concentration (mg/L)
10.000
9.000
8.000
7.000
6.000
5.000
4.000
3.000
2.000
1.000
0.000
30-Mar-98
26-Apr-00
5-Oct-03
27-Sep-04
24-Apr-06
18-Sep-08
8-Apr-10
1-Sep-11
11-Apr-13
5-Sep-14
15-Apr-16
28-Sep-17
25-Apr-19
17-Sep-20
11-Apr-22
Date


MW36S
pH
pH
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
30-Mar-98
26-Apr-00
5-Oct-03
27-Sep-04
24-Apr-06
18-Sep-08
8-Apr-10
1-Sep-11
11-Apr-13
5-Sep-14
15-Apr-16
28-Sep-17
25-Apr-19
17-Sep-20
11-Apr-22
Date


MW36S
Barium
Boron
Concentration (µg/L)
500
450
400
350
300
250
200
150
100
50
0
17-Oct-97
1-Dec-98
25-Nov-99
11-Sep-00
5-Oct-03
27-Apr-05
25-Sep-06
17-Apr-08
10-Sep-09
25-Apr-11
13-Sep-12
8-May-14
4-Sep-15
24-Apr-17
10-Sep-18
30-Apr-20
16-Sep-21
Date

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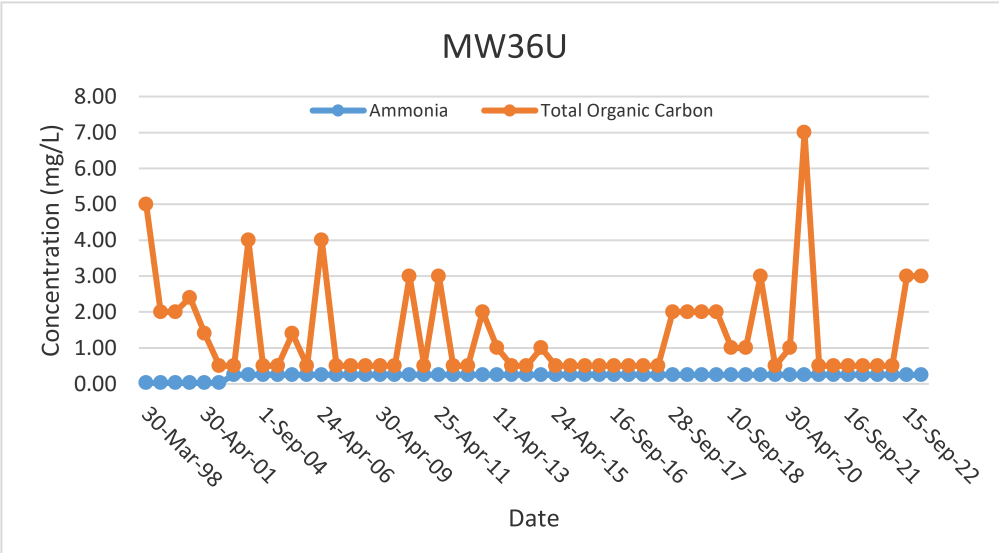
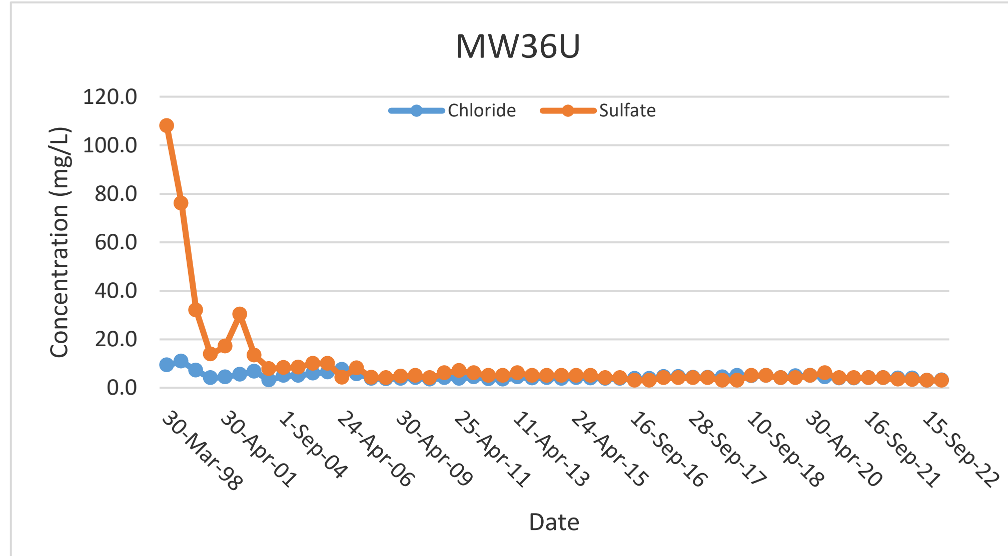
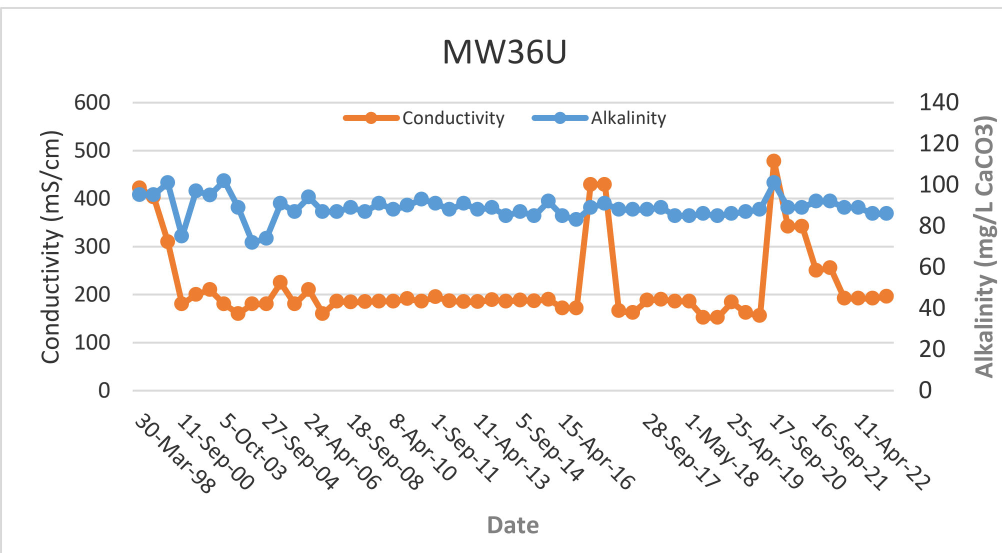
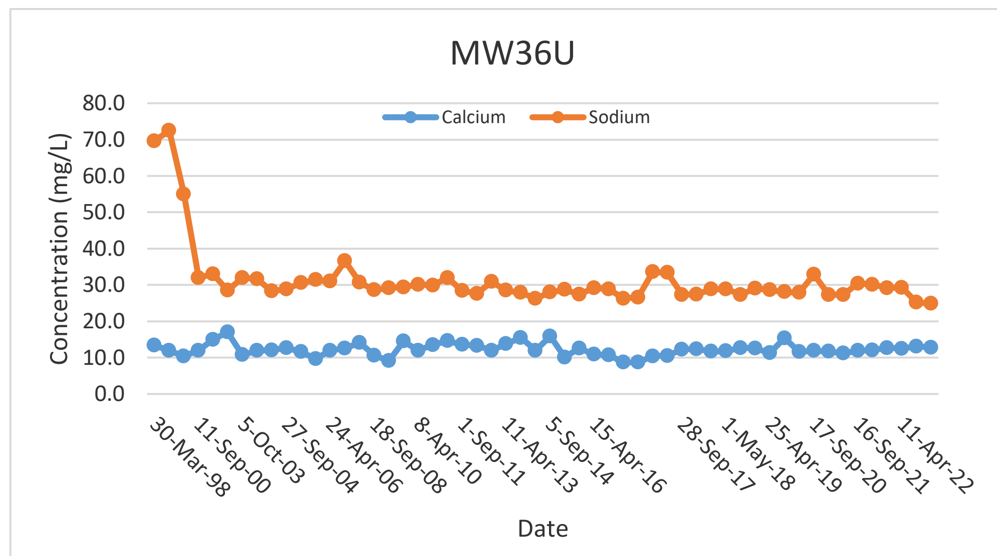
Appendix J:
Trend Graphs MW36U
1997 - 2022

Client: Fundy Regional Services Commission
Project Number: 4662.09









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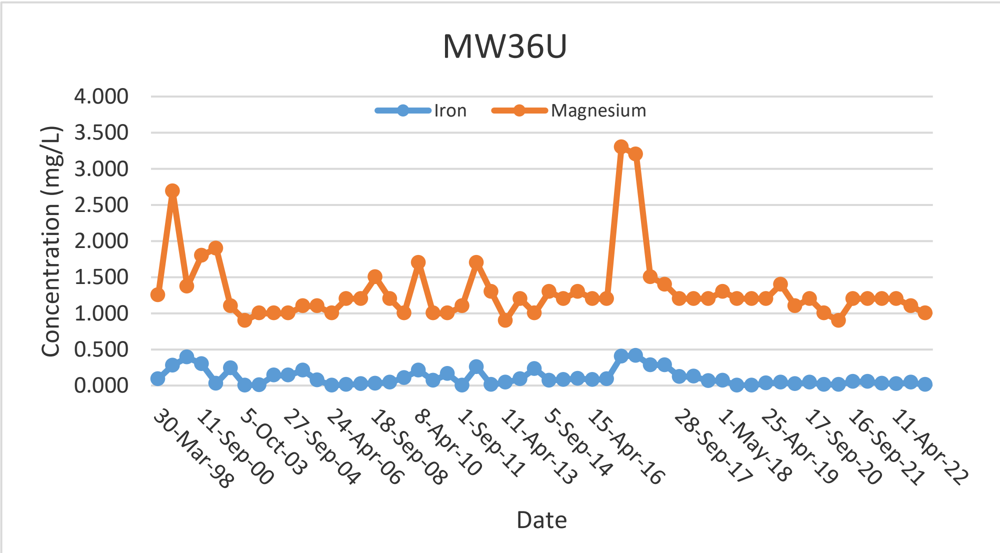
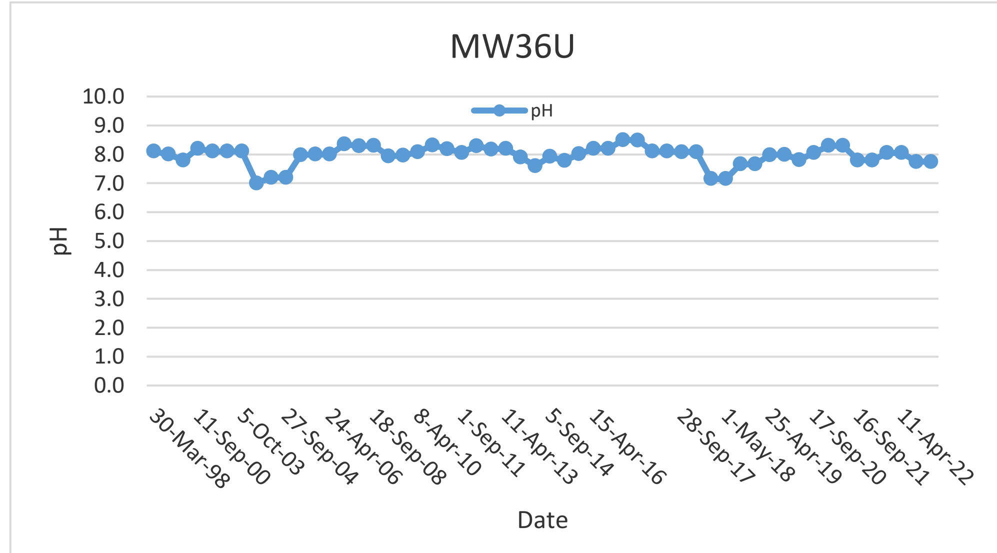
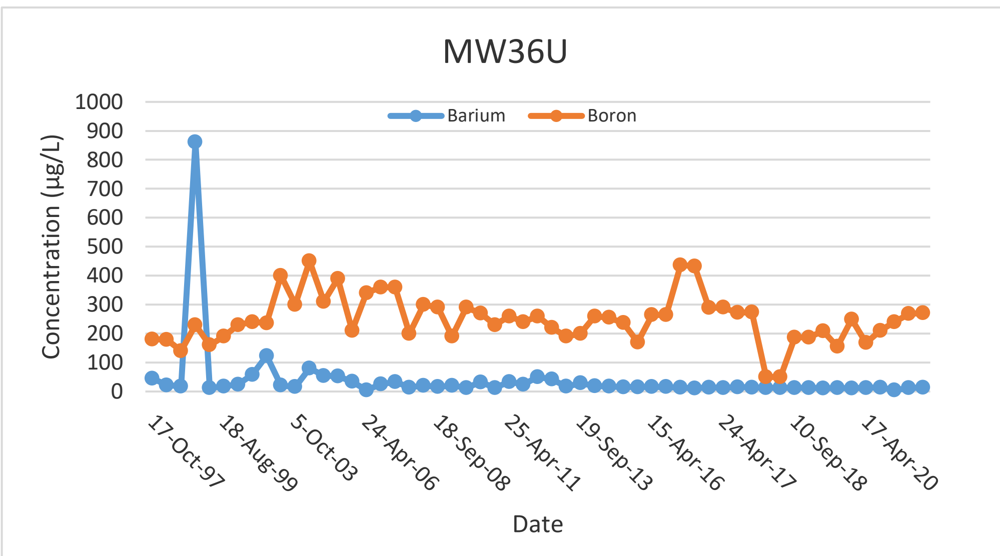
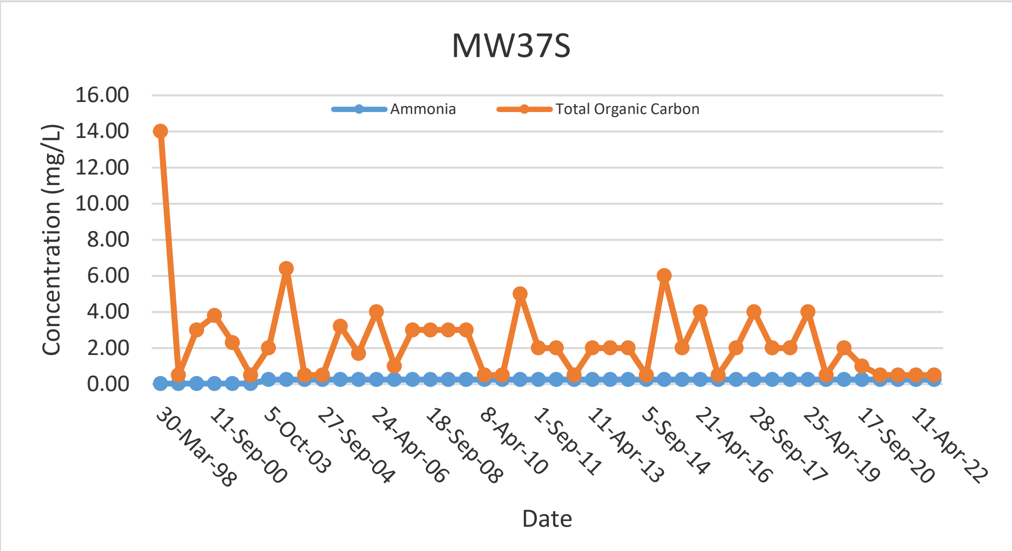
Appendix J:
Trend Graphs MW36U
1997 - 2022

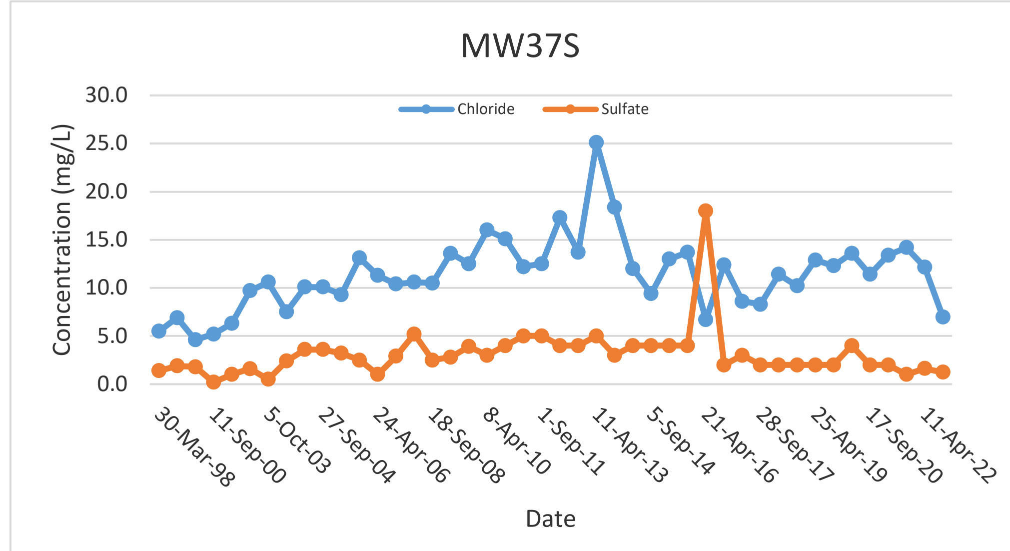
Client: Fundy Regional Services Commission
Project Number: 4662.09

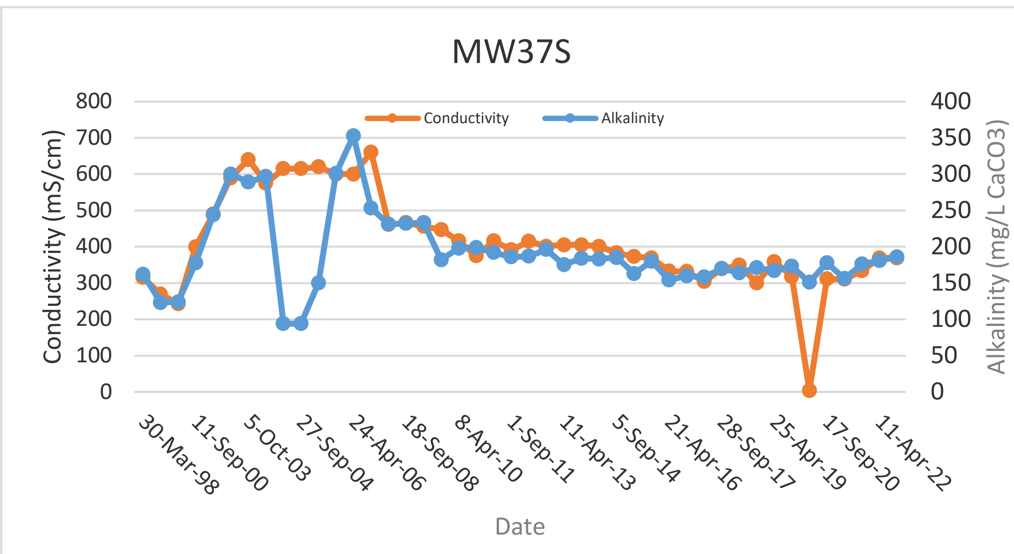


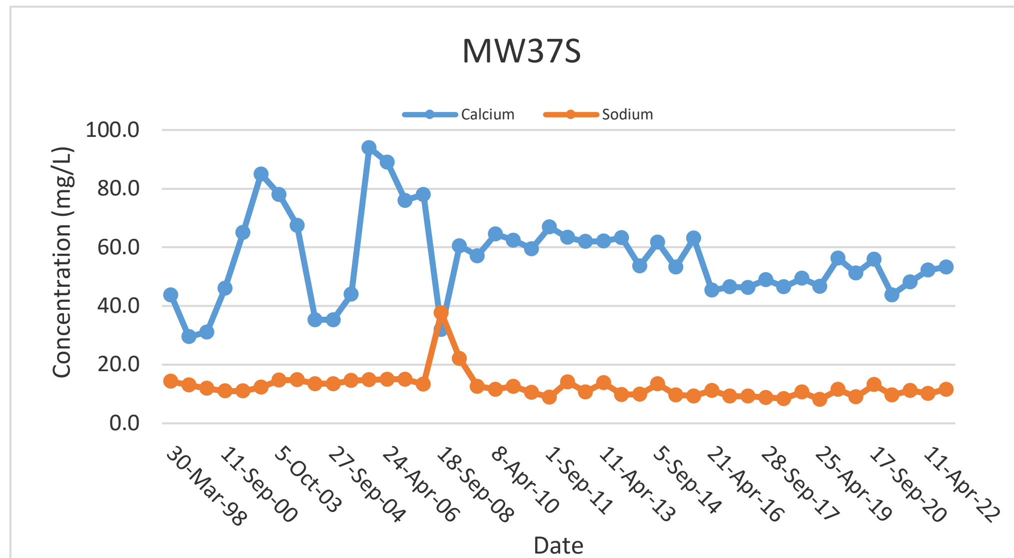





MW37S
Ammonia
Total Organic Carbon
Concentration (mg/L)
Date


MW37S
Chloride
Sulfate
Concentration (mg/L)
Date


MW37S
Conductivity
Alkalinity
Conductivity (mS/cm)
Alkalinity (mg/L CaCO3)
Date


MW37S
Calcium
Sodium
Concentration (mg/L)
Date

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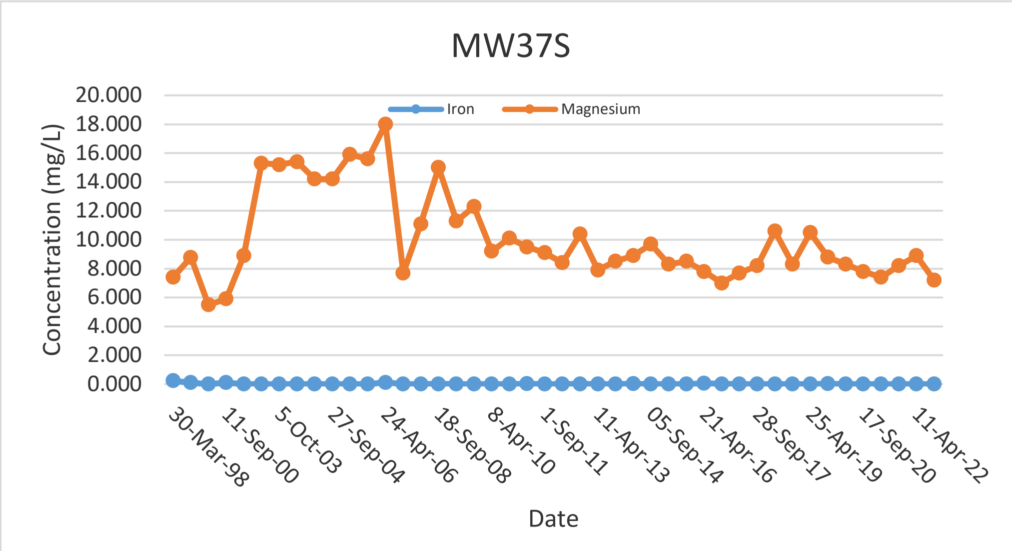
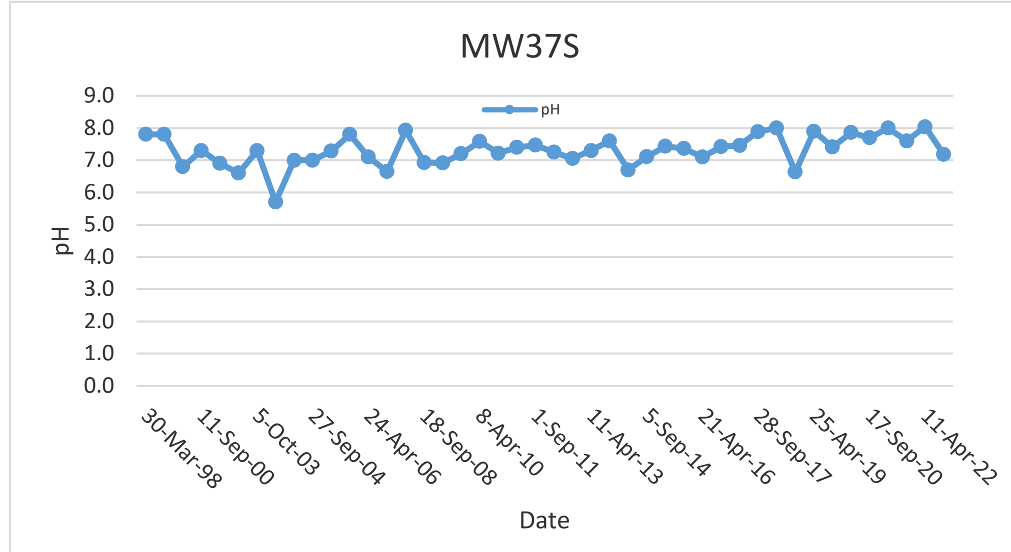
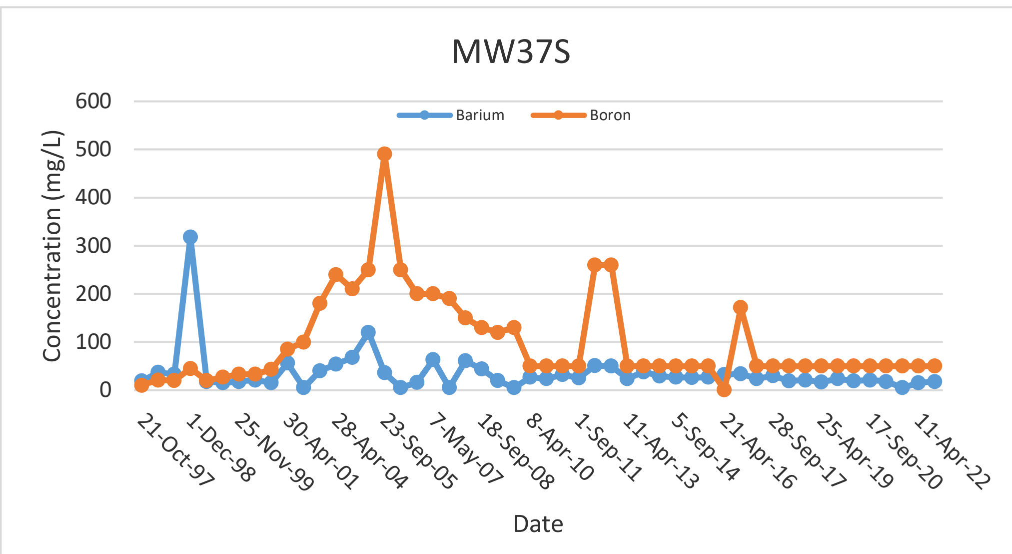
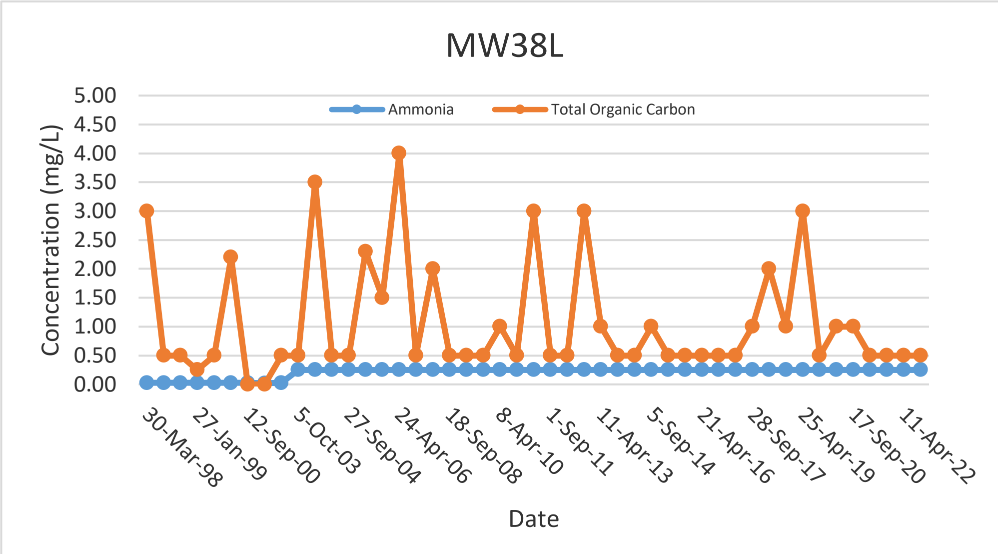
Appendix J:
Trend Graphs MW37S
1997 - 2022

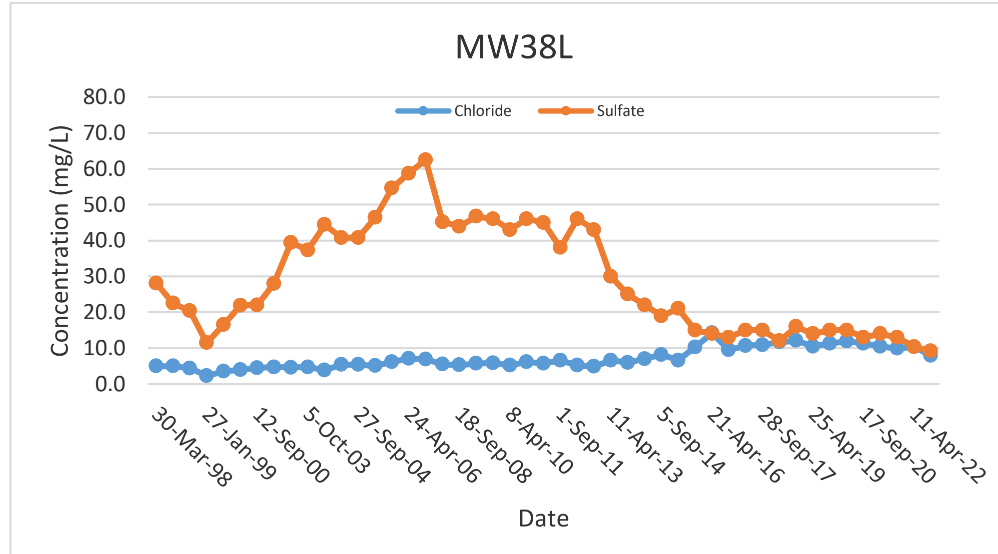
Client: Fundy Regional Services Commission
Project Number: 4662.09

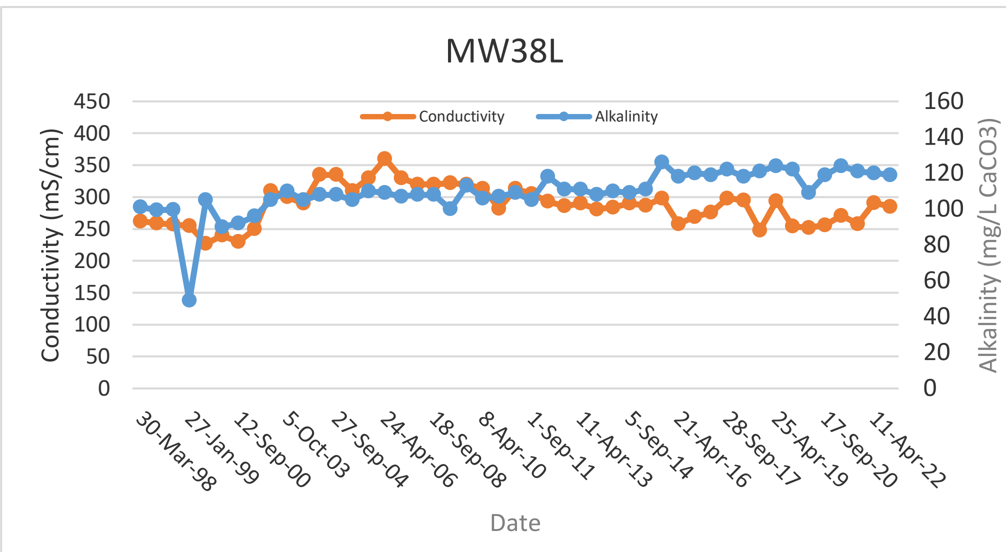


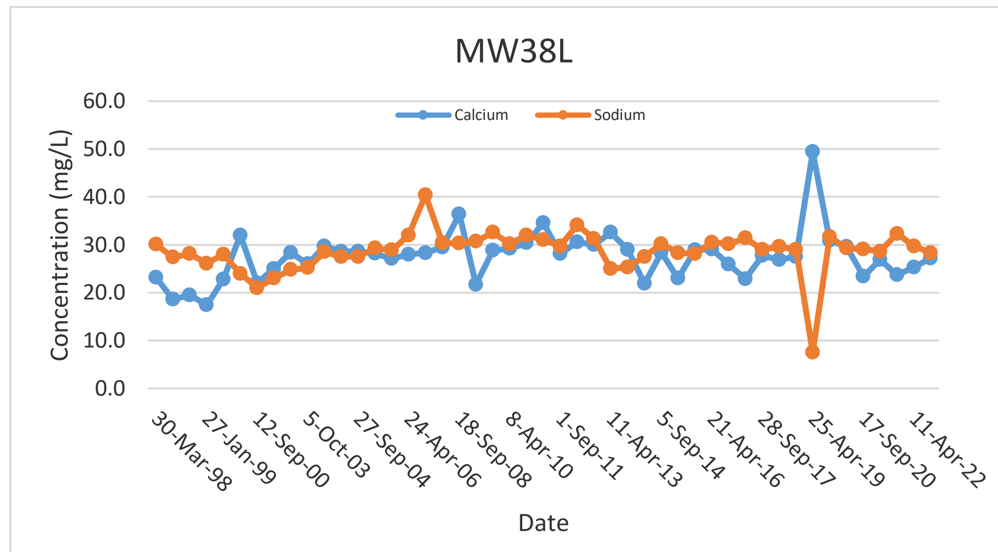


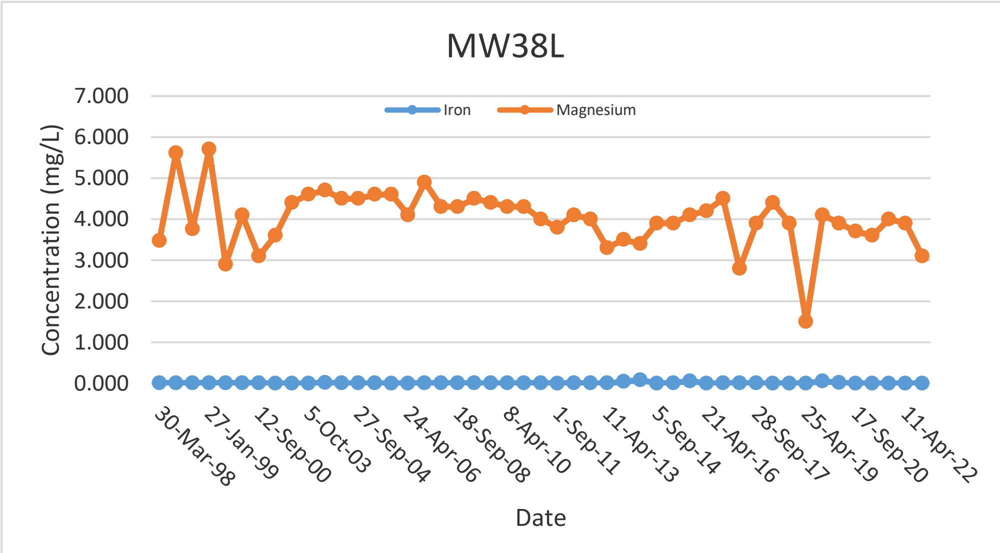


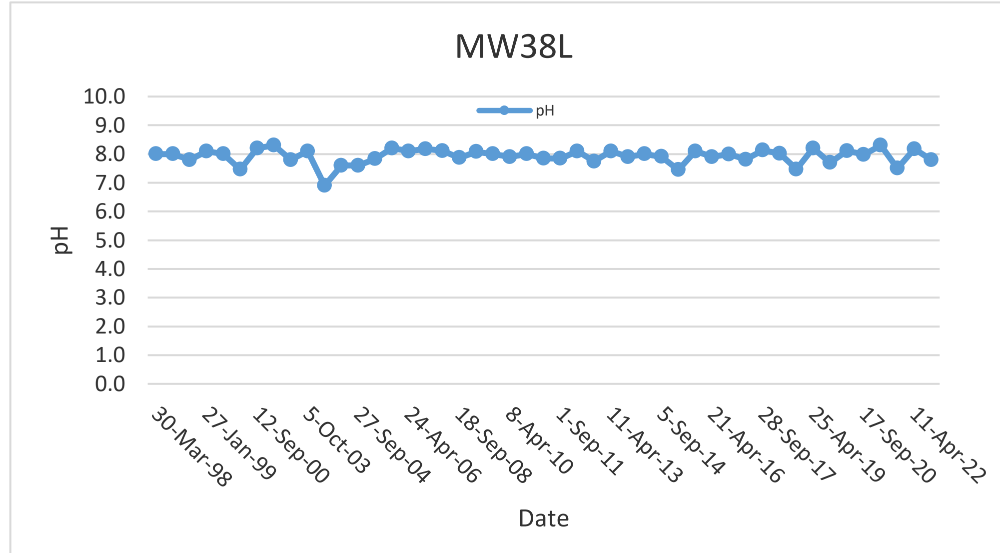

MW38L
Ammonia
Total Organic Carbon
Concentration (mg/L)
5.00
4.50
4.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
30-Mar-98
27-Jan-99
12-Sep-00
5-Oct-03
27-Sep-04
24-Apr-06
18-Sep-08
8-Apr-10
1-Sep-11
11-Apr-13
5-Sep-14
21-Apr-16
28-Sep-17
25-Apr-19
17-Sep-20
11-Apr-22
Date

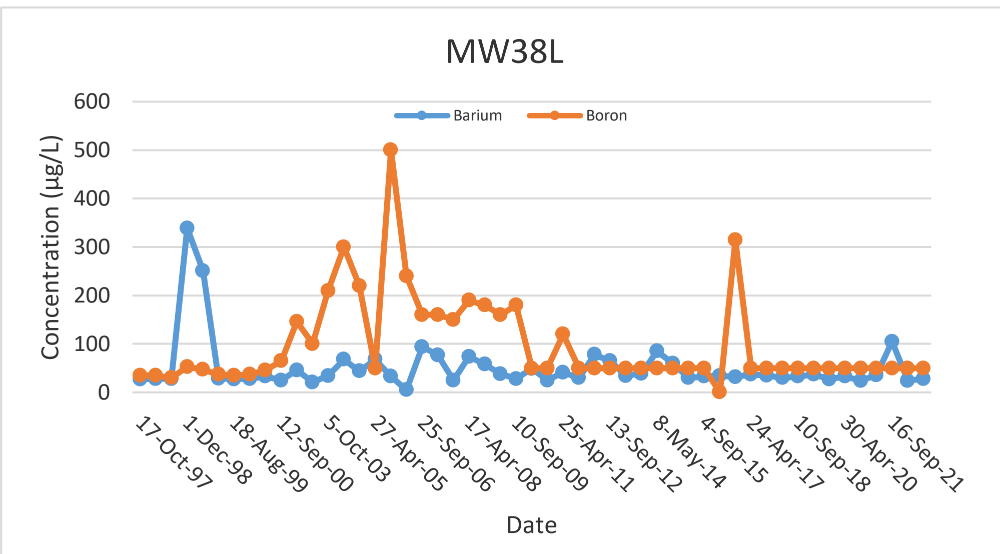

MW38L
Chloride
Sulfate
Concentration (mg/L)
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0.0
30-Mar-98
27-Jan-99
12-Sep-00
5-Oct-03
27-Sep-04
24-Apr-06
18-Sep-08
8-Apr-10
1-Sep-11
11-Apr-13
5-Sep-14
21-Apr-16
28-Sep-17
25-Apr-19
17-Sep-20
11-Apr-22
Date


MW38L
Conductivity
Alkalinity
Conductivity (mS/cm)
450
400
350
300
250
200
150
100
50
0
Alkalinity (mg/L CaCO3)
160
140
120
100
80
60
40
20
0
30-Mar-98
27-Jan-99
12-Sep-00
5-Oct-03
27-Sep-04
24-Apr-06
18-Sep-08
8-Apr-10
1-Sep-11
11-Apr-13
5-Sep-14
21-Apr-16
28-Sep-17
25-Apr-19
17-Sep-20
11-Apr-22
Date


MW38L
Calcium
Sodium
Concentration (mg/L)
60.0
50.0
40.0
30.0
20.0
10.0
0.0
30-Mar-98
27-Jan-99
12-Sep-00
5-Oct-03
27-Sep-04
24-Apr-06
18-Sep-08
8-Apr-10
1-Sep-11
11-Apr-13
5-Sep-14
21-Apr-16
28-Sep-17
25-Apr-19
17-Sep-20
11-Apr-22
Date


MW38L
Iron
Magnesium
Concentration (mg/L)
7.000
6.000
5.000
4.000
3.000
2.000
1.000
0.000
30-Mar-98
27-Jan-99
12-Sep-00
5-Oct-03
27-Sep-04
24-Apr-06
18-Sep-08
8-Apr-10
1-Sep-11
11-Apr-13
5-Sep-14
21-Apr-16
28-Sep-17
25-Apr-19
17-Sep-20
11-Apr-22
Date


MW38L
pH
pH
10.0
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
30-Mar-98
27-Jan-99
12-Sep-00
5-Oct-03
27-Sep-04
24-Apr-06
18-Sep-08
8-Apr-10
1-Sep-11
11-Apr-13
5-Sep-14
21-Apr-16
28-Sep-17
25-Apr-19
17-Sep-20
11-Apr-22
Date


MW38L
Barium
Boron
Concentration (µg/L)
600
500
400
300
200
100
0
17-Oct-97
1-Dec-98
18-Aug-99
12-Sep-00
5-Oct-03
27-Apr-05
25-Sep-06
17-Apr-08
10-Sep-09
25-Apr-11
13-Sep-12
8-May-14
4-Sep-15
24-Apr-17
10-Sep-18
30-Apr-20
16-Sep-21
Date

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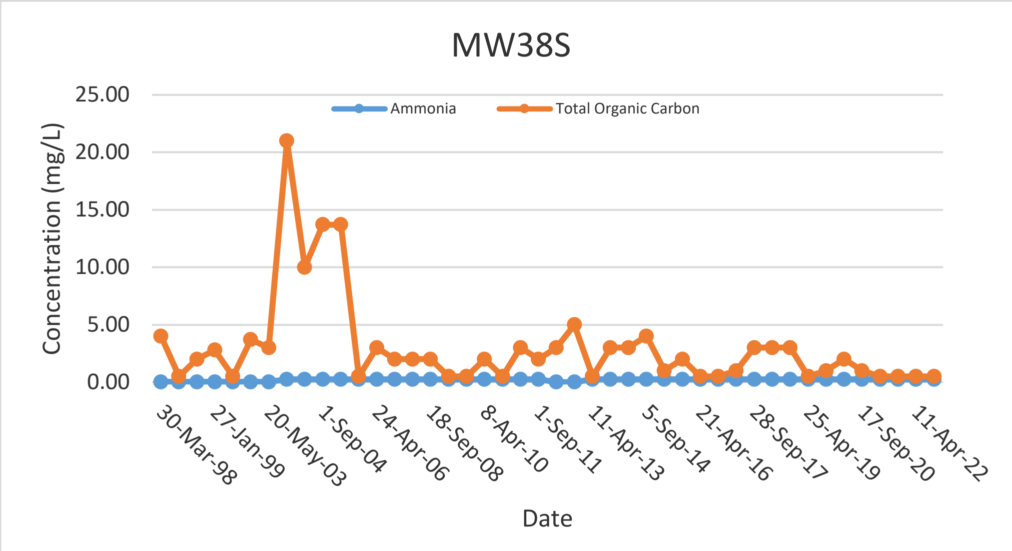
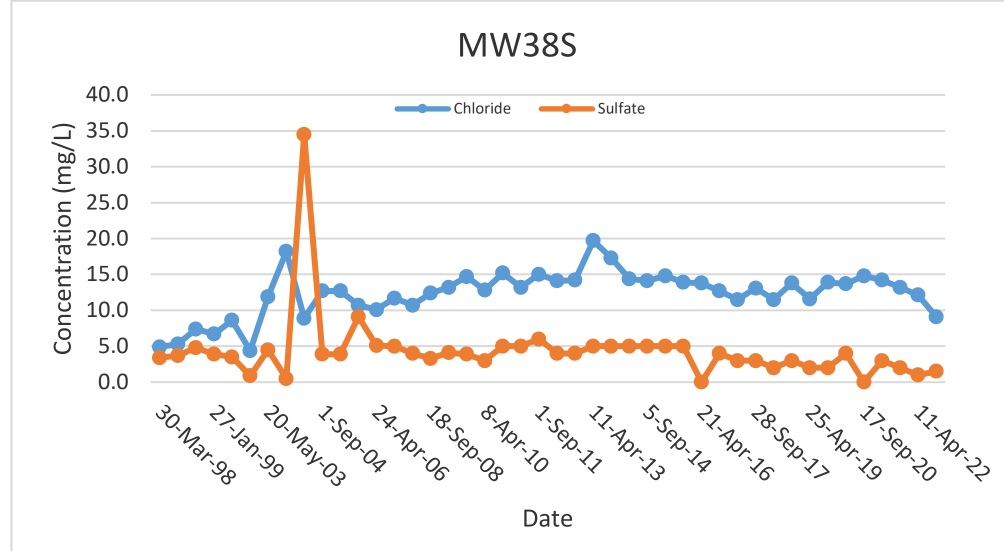
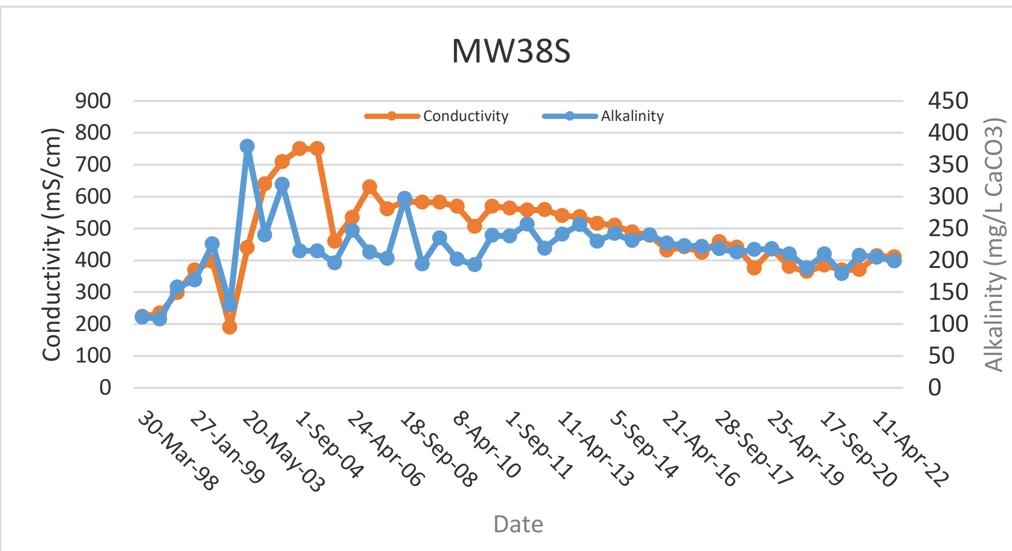
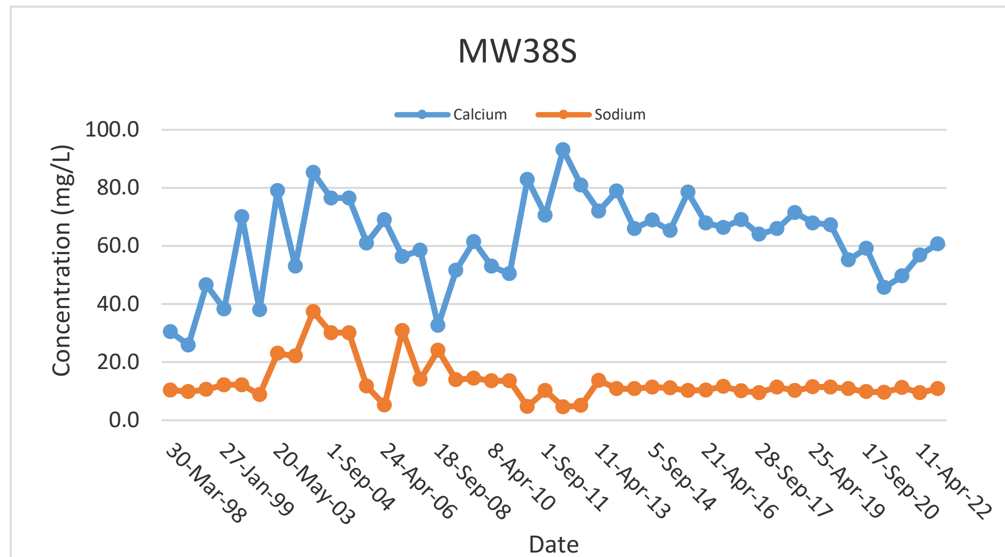
Appendix J:
Trend Graphs MW38S
1997 - 2022

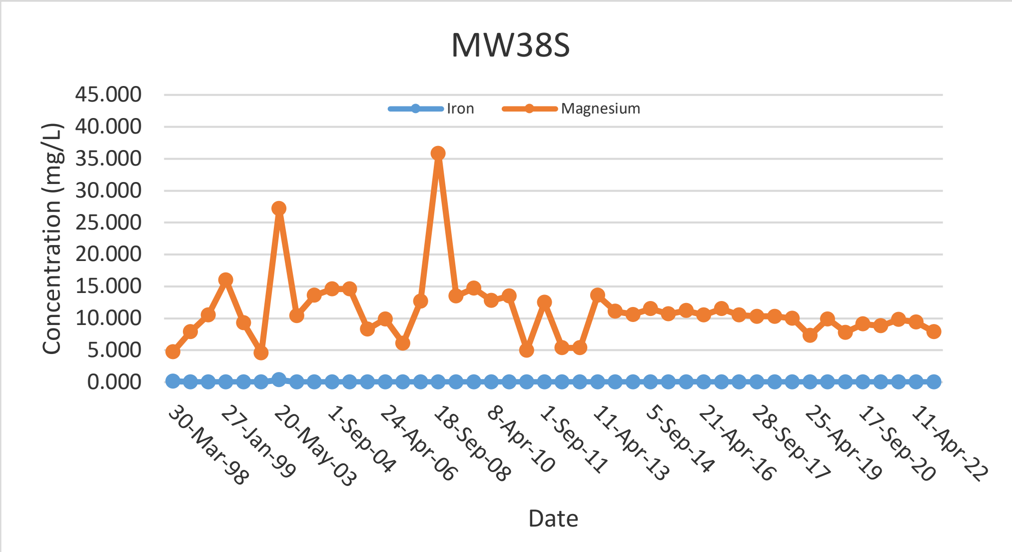
Client: Fundy Regional Services Commission
Project Number: 4662.09

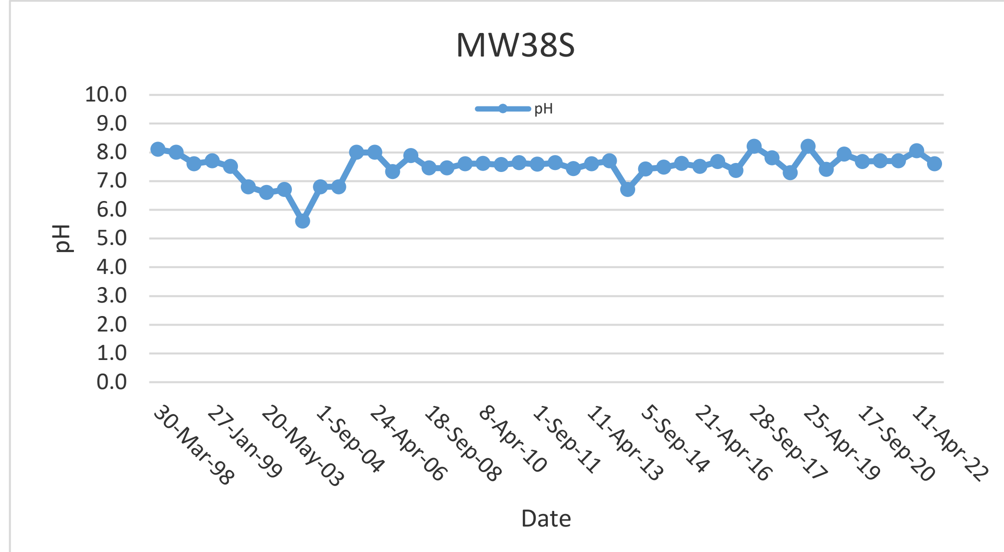


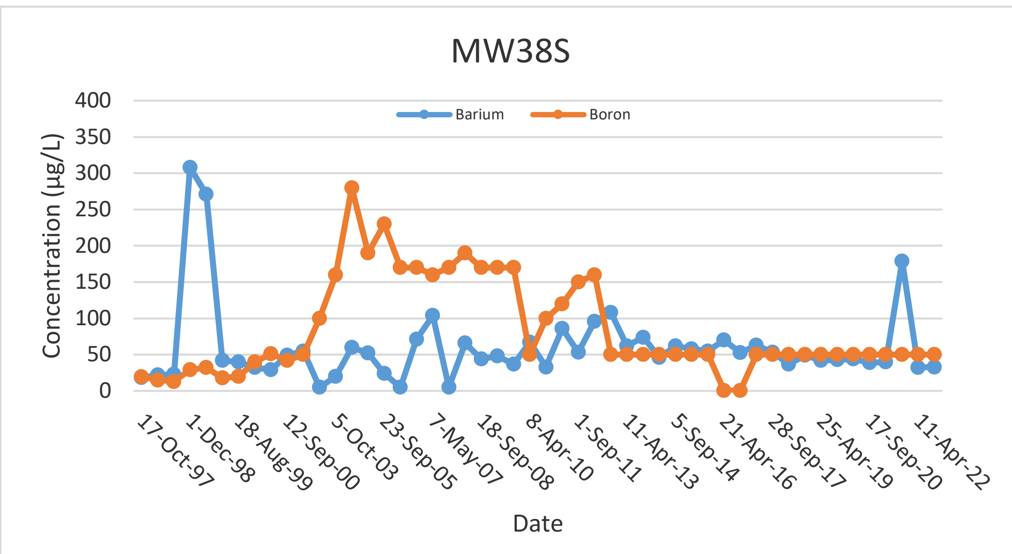







MW38S
Iron
Magnesium
Concentration (mg/L)
45.000
40.000
35.000
30.000
25.000
20.000
15.000
10.000
5.000
0.000
30-Mar-98
27-Jan-99
20-May-03
1-Sep-04
24-Apr-06
18-Sep-08
8-Apr-10
1-Sep-11
11-Apr-13
5-Sep-14
21-Apr-16
28-Sep-17
25-Apr-19
17-Sep-20
11-Apr-22
Date


MW38S
pH
pH
10.0
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
30-Mar-98
27-Jan-99
20-May-03
1-Sep-04
24-Apr-06
18-Sep-08
8-Apr-10
1-Sep-11
11-Apr-13
5-Sep-14
21-Apr-16
28-Sep-17
25-Apr-19
17-Sep-20
11-Apr-22
Date


MW38S
Barium
Boron
Concentration (µg/L)
400
350
300
250
200
150
100
50
0
17-Oct-97
1-Dec-98
18-Aug-99
12-Sep-00
5-Oct-03
23-Sep-05
7-May-07
18-Sep-08
8-Apr-10
1-Sep-11
11-Apr-13
5-Sep-14
21-Apr-16
28-Sep-17
25-Apr-19
17-Sep-20
11-Apr-22
Date

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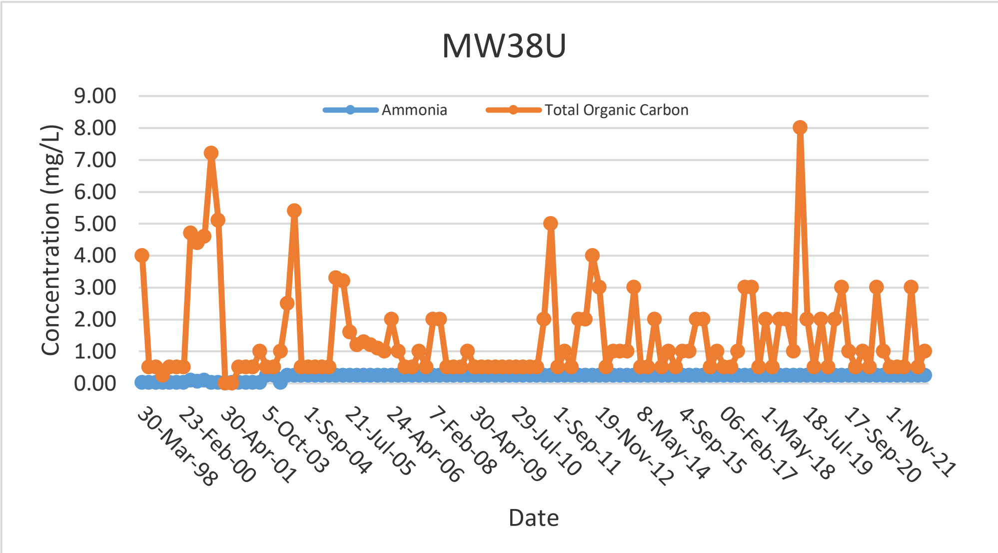
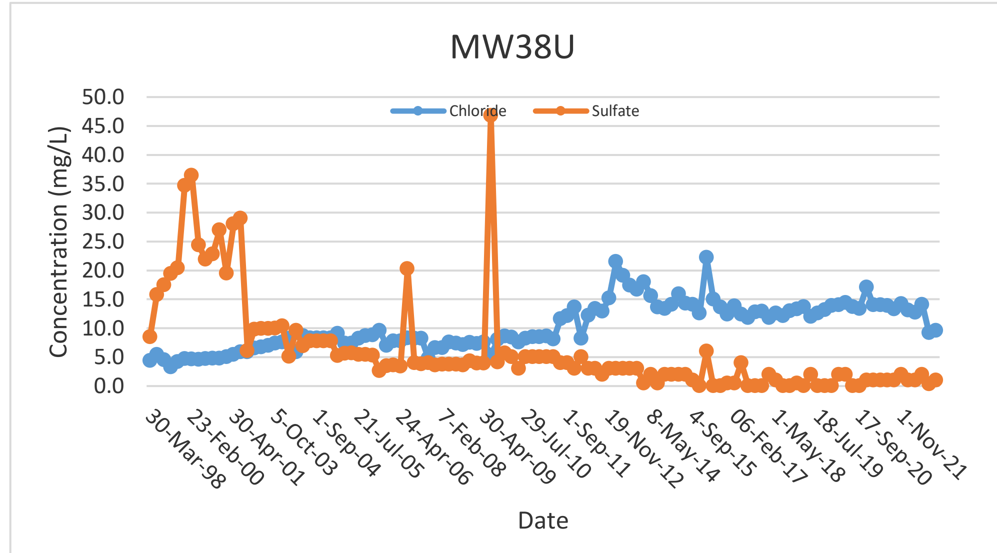
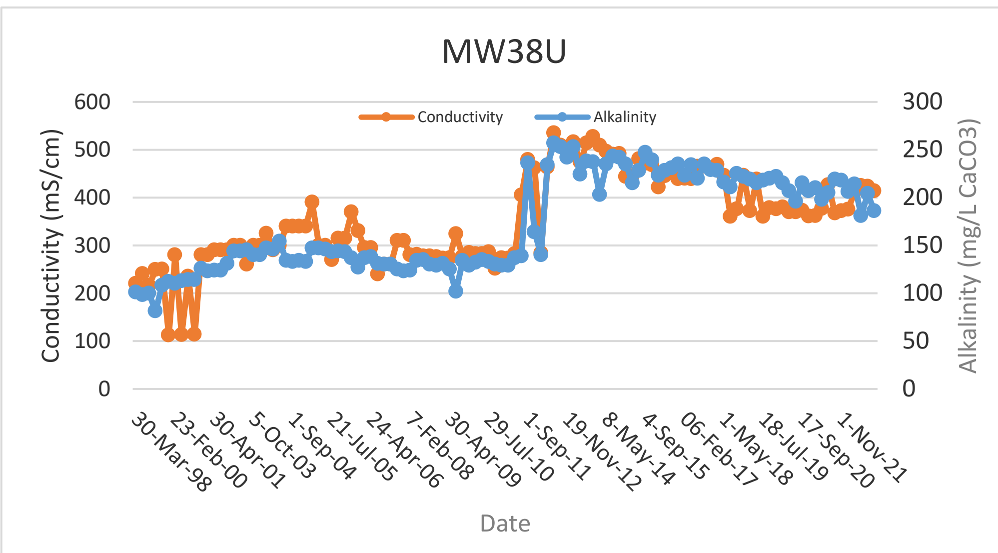
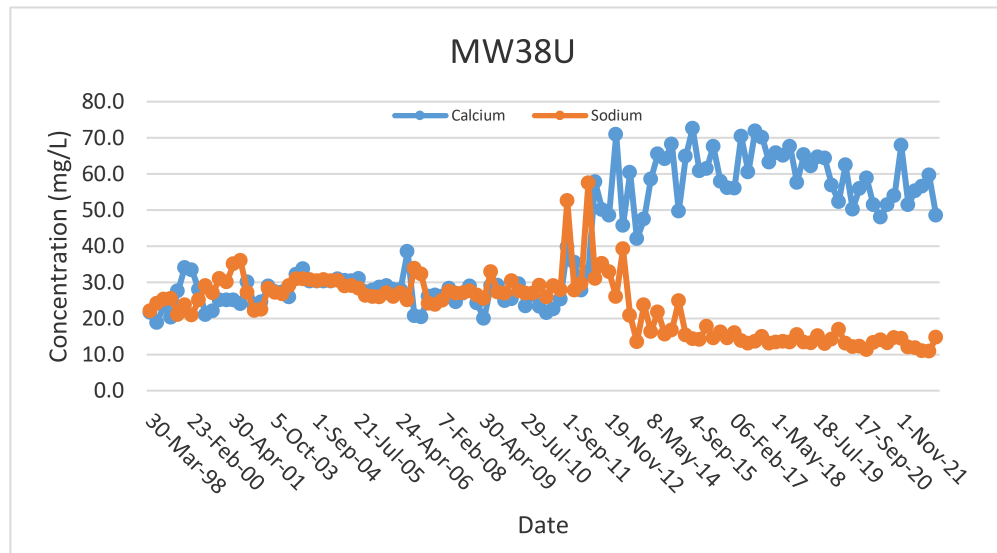
Appendix J:
Trend Graphs MW38U
1997 - 2022

Client: Fundy Regional Services Commission
Project Number: 4662.09



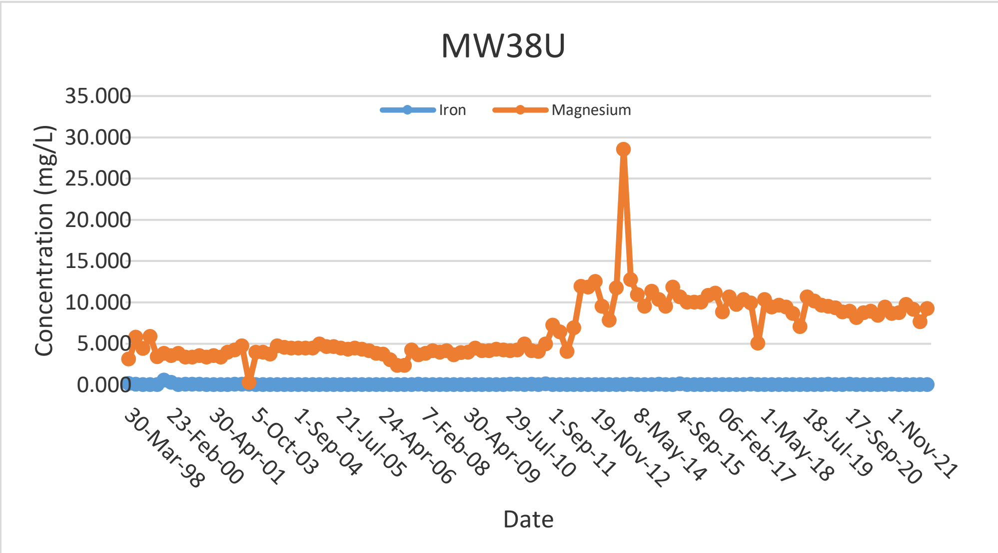


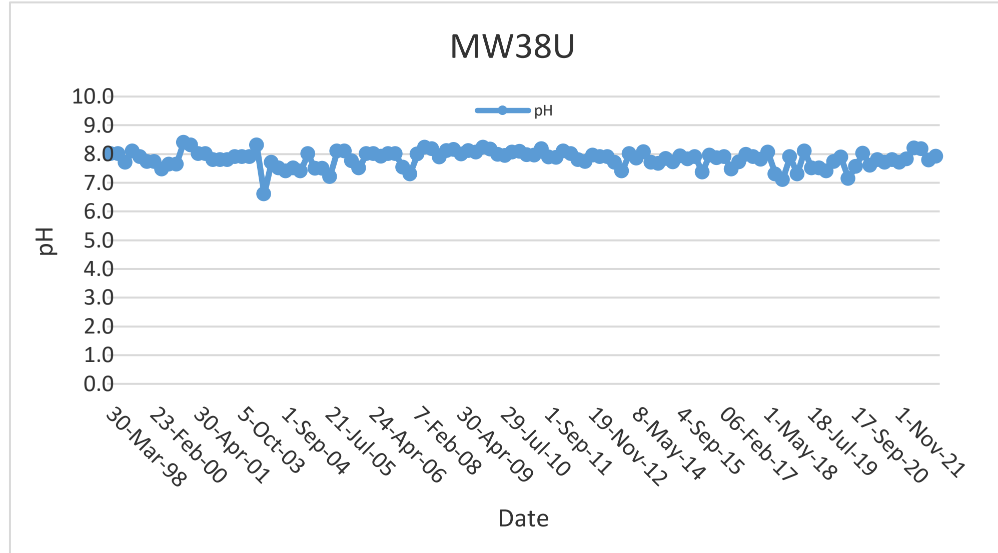


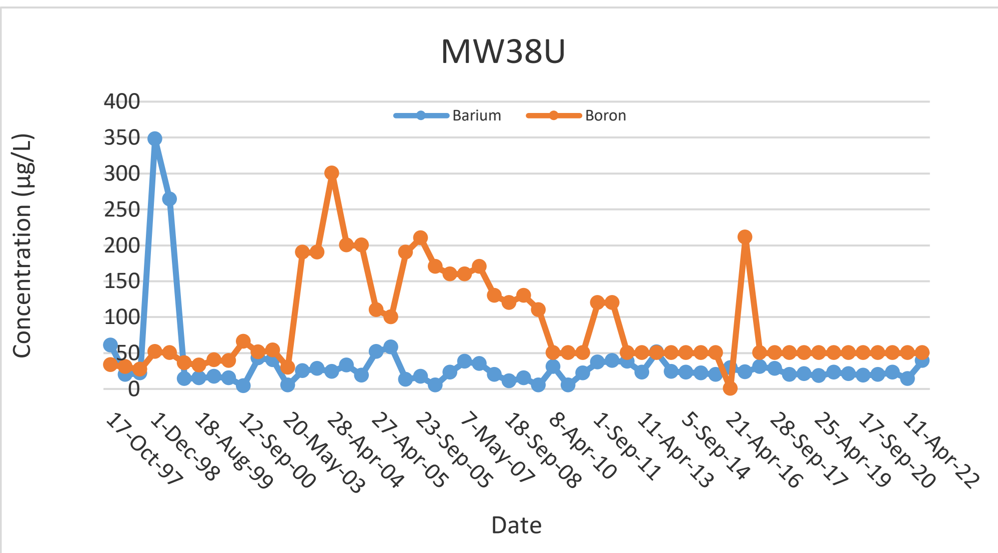


Appendix J:
Trend Graphs MW38U
1997 - 2022

Client: Fundy Regional Services Commission
Project Number: 4662.09







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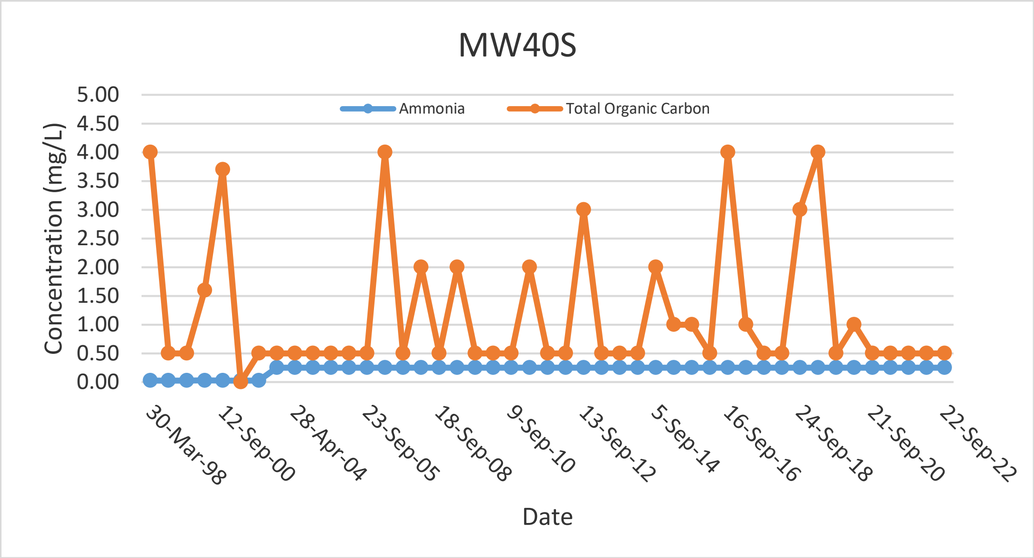
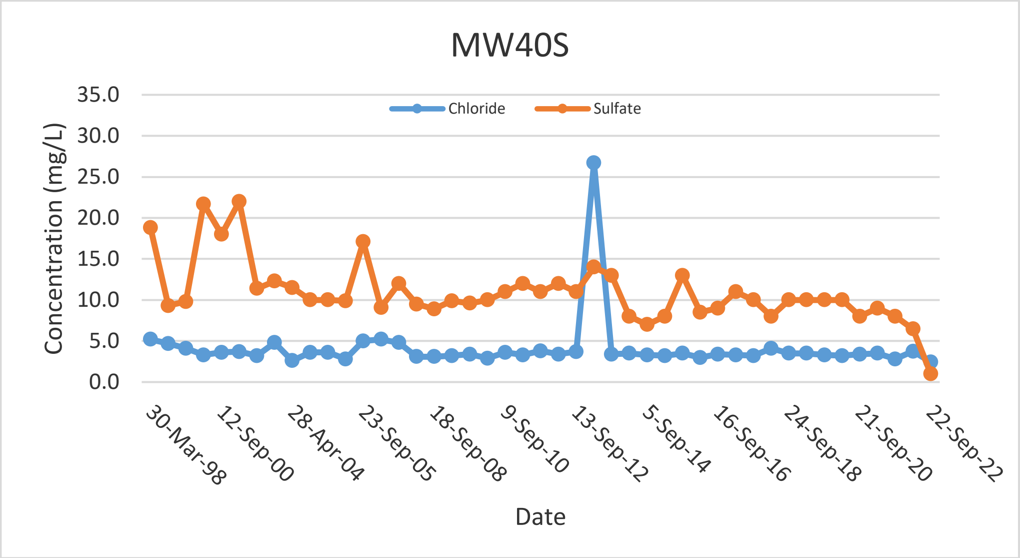
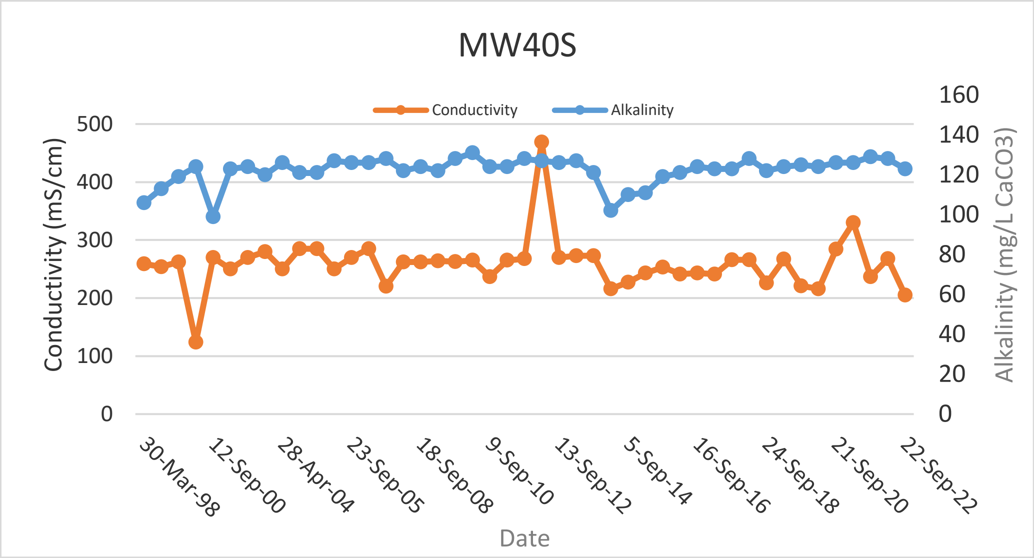
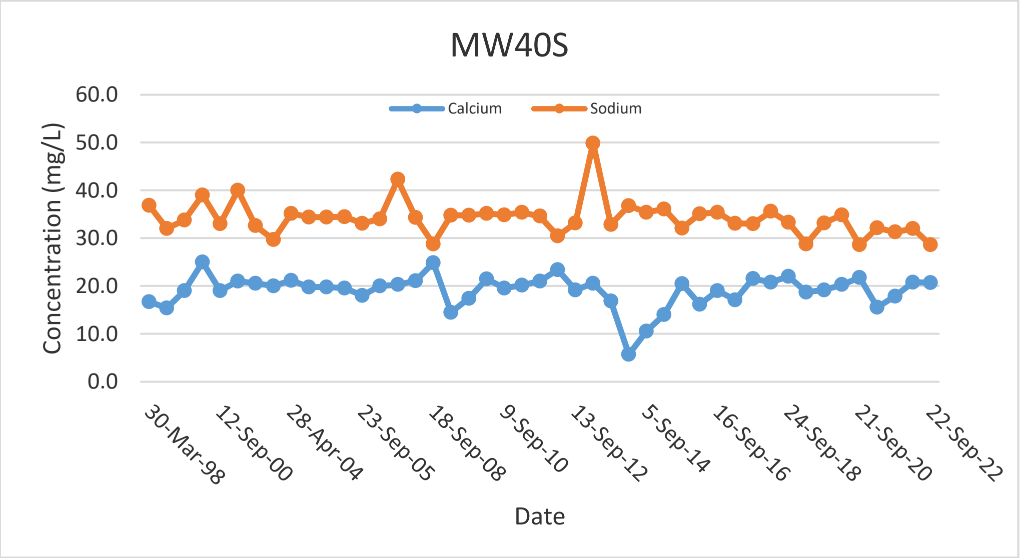
Appendix J:
Trend Graphs MW40S
1997 - 2022

Client: Fundy Regional Services Commission
Project Number: 4662.09



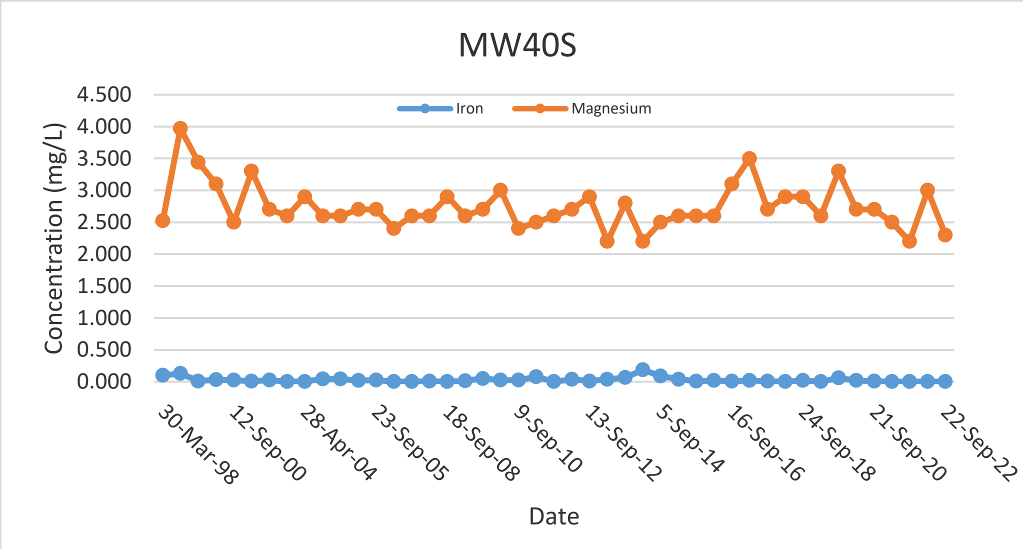


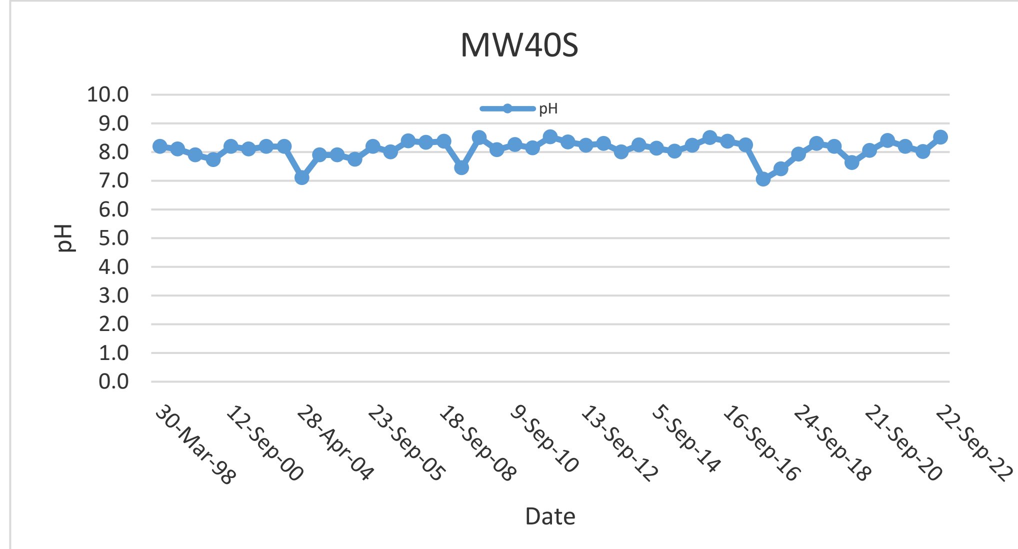


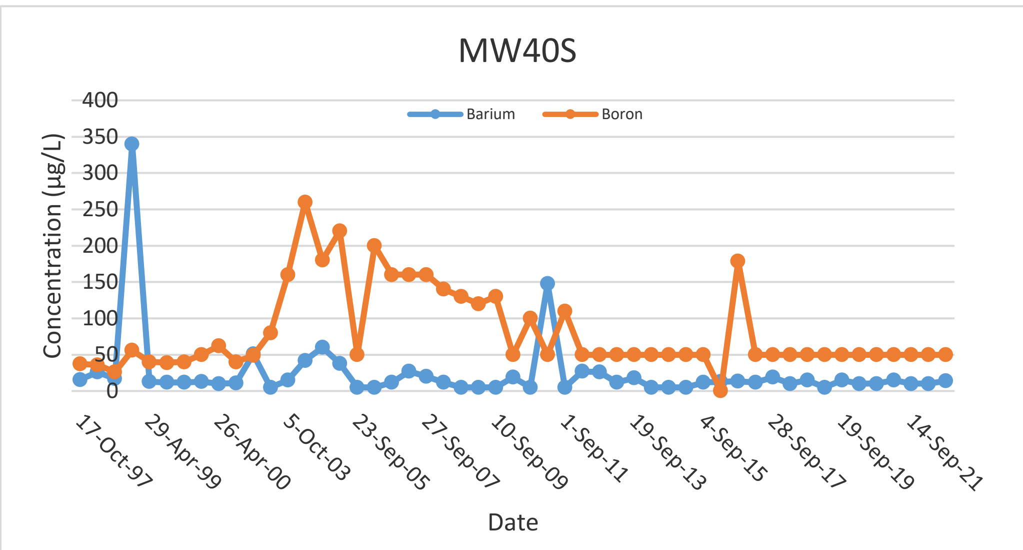


Appendix J:
Trend Graphs MW40S
1997 - 2022

Client: Fundy Regional Services Commission
Project Number: 4662.09







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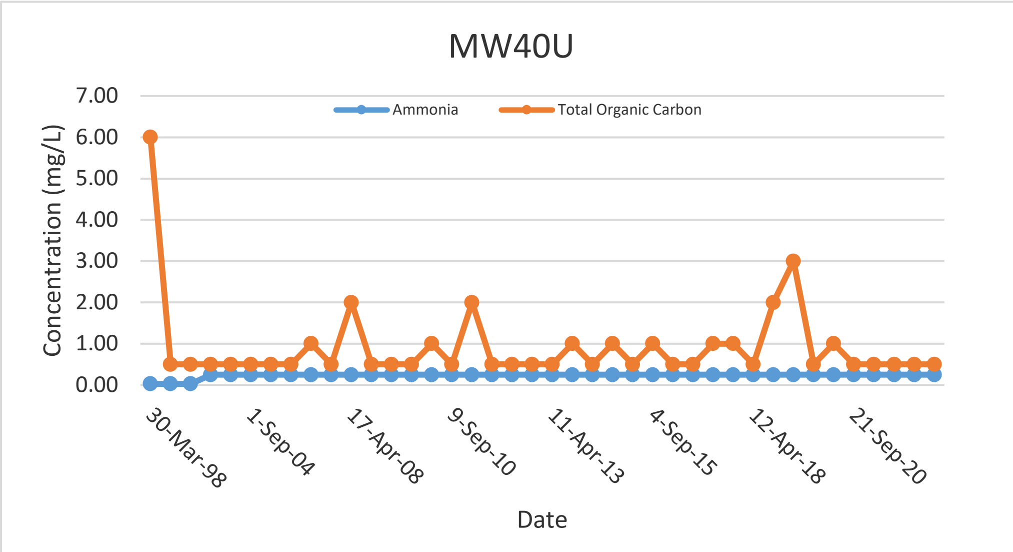
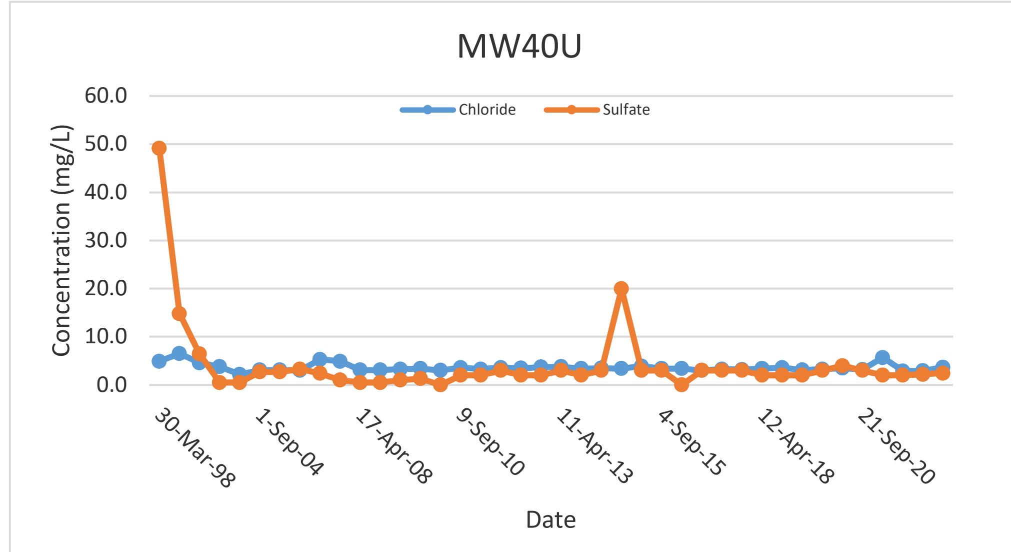
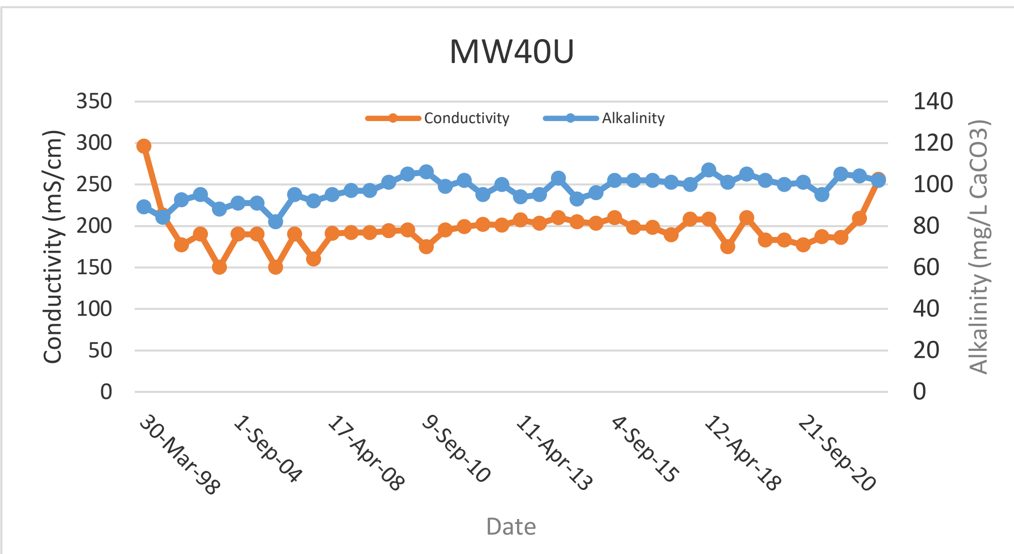
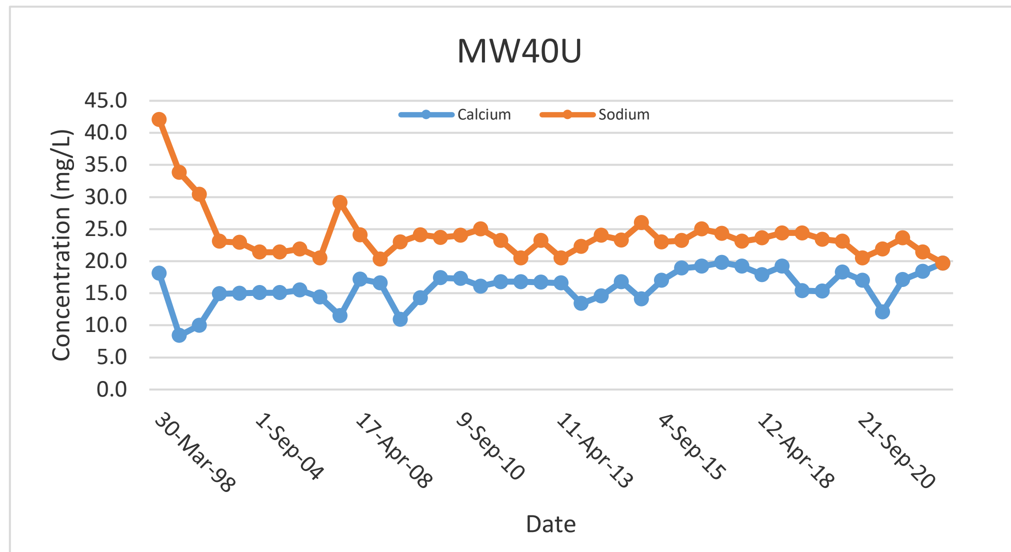
Appendix J:
Trend Graphs MW40U
1997 - 2022

Client: Fundy Regional Services Commission
Project Number: 4662.09









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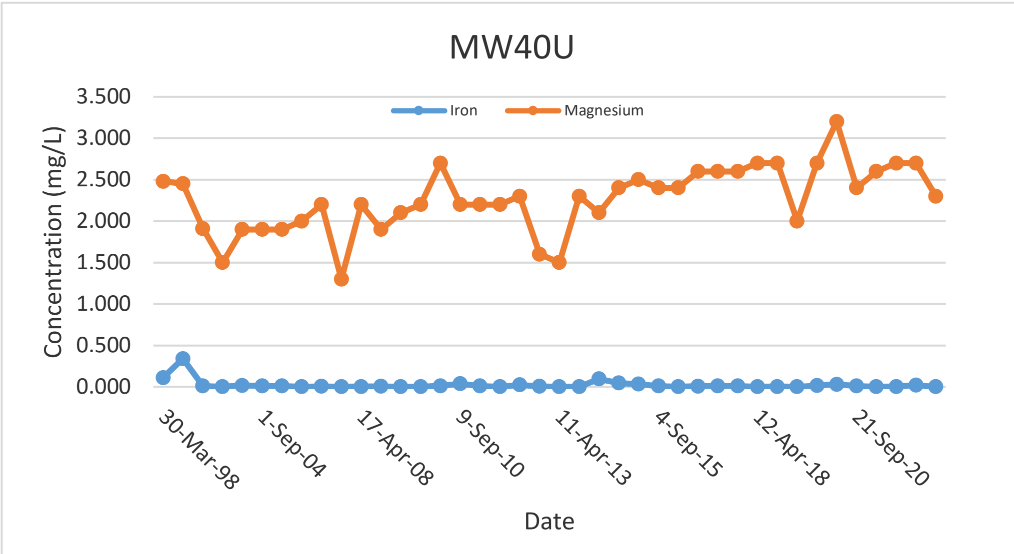
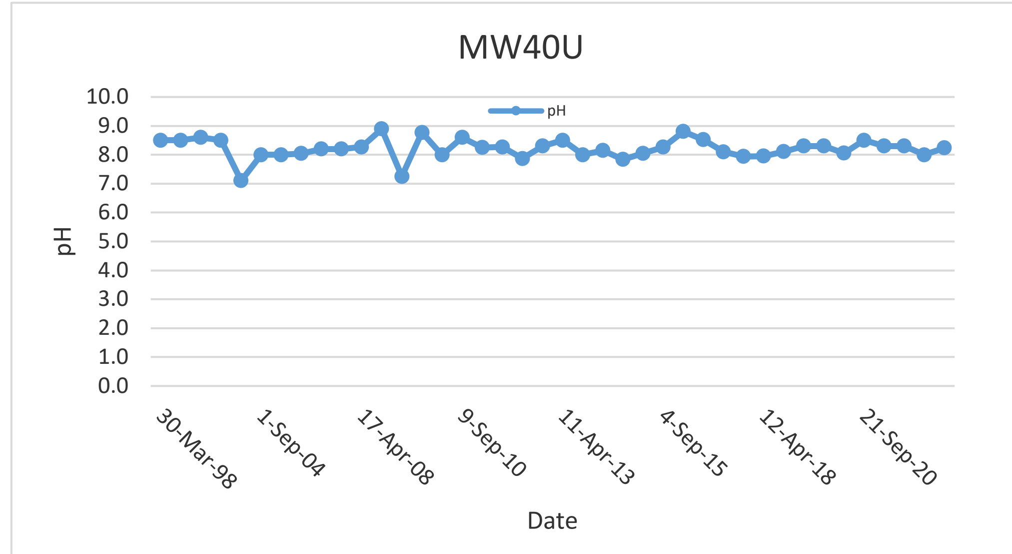
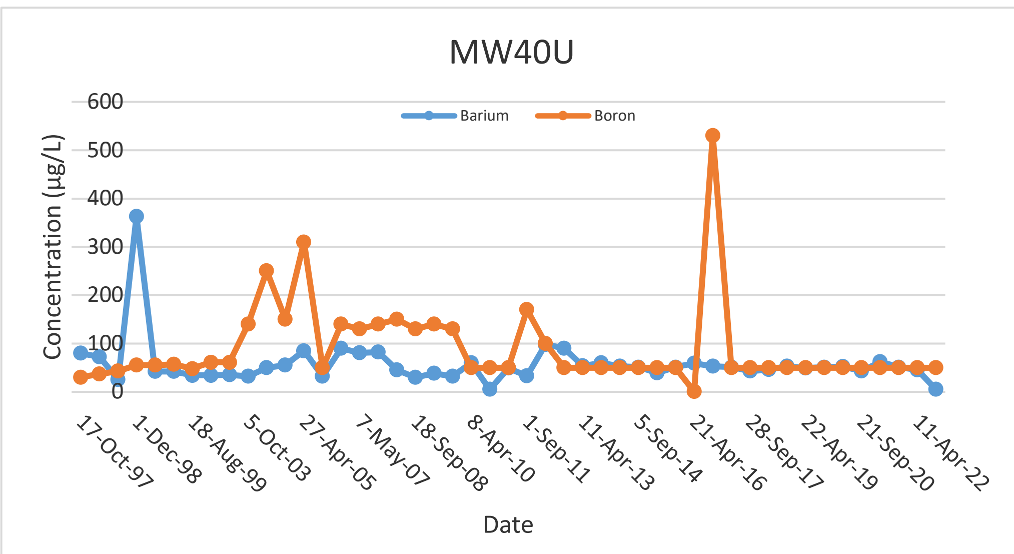
Appendix J:
Trend Graphs MW40U
1997 - 2022

Client: Fundy Regional Services Commission
Project Number: 4662.09

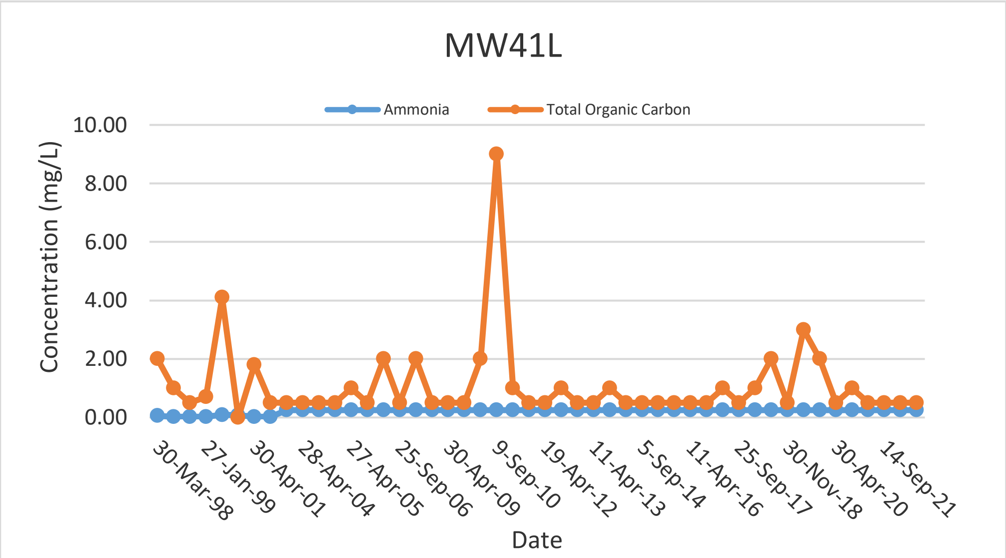


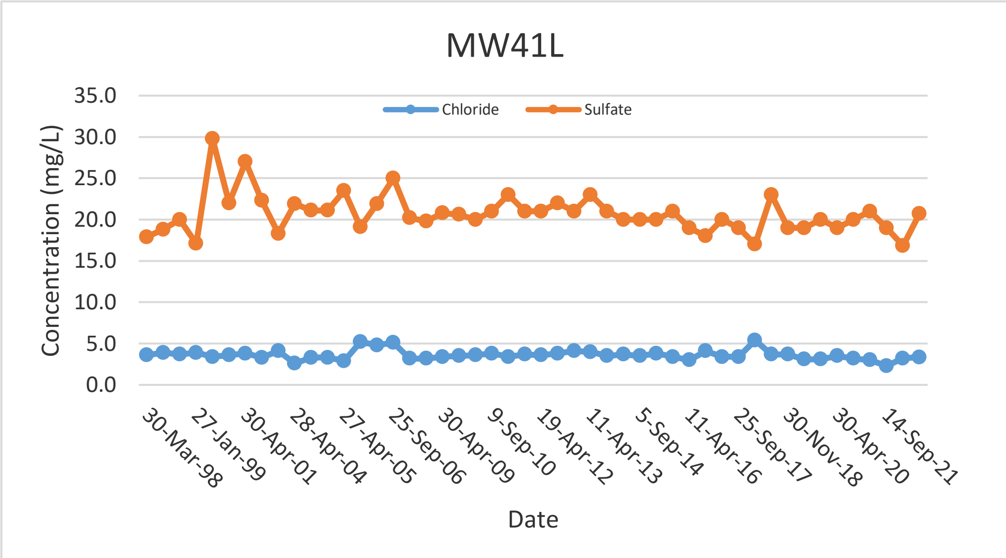


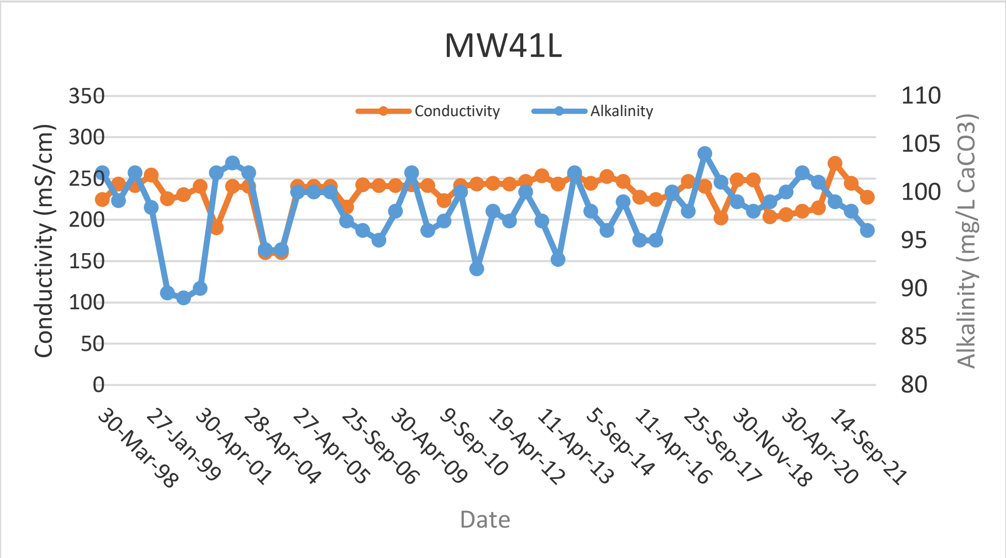


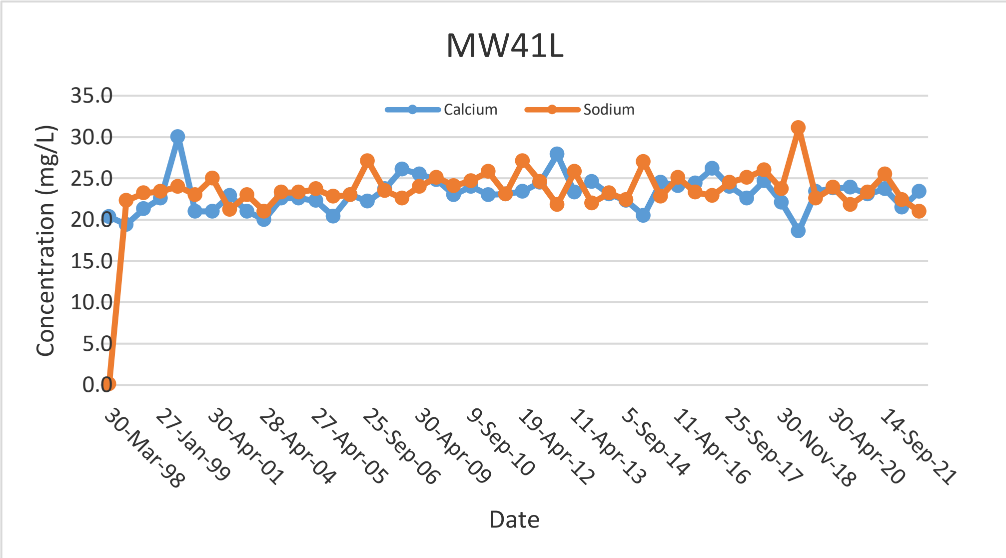
Appendix J:
Trend Graphs MW41L
1997 - 2022

Client: Fundy Regional Services Commission
Project Number: 4662.09



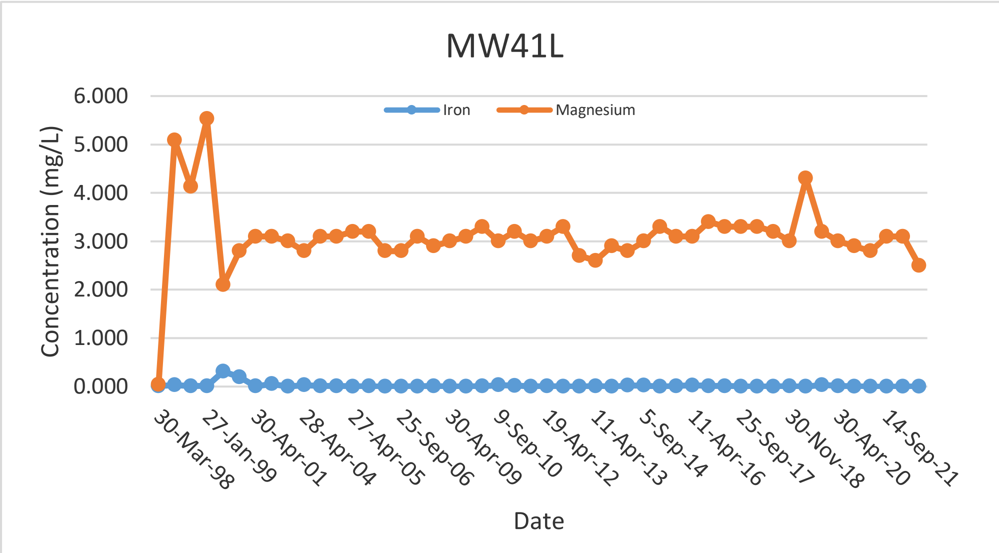


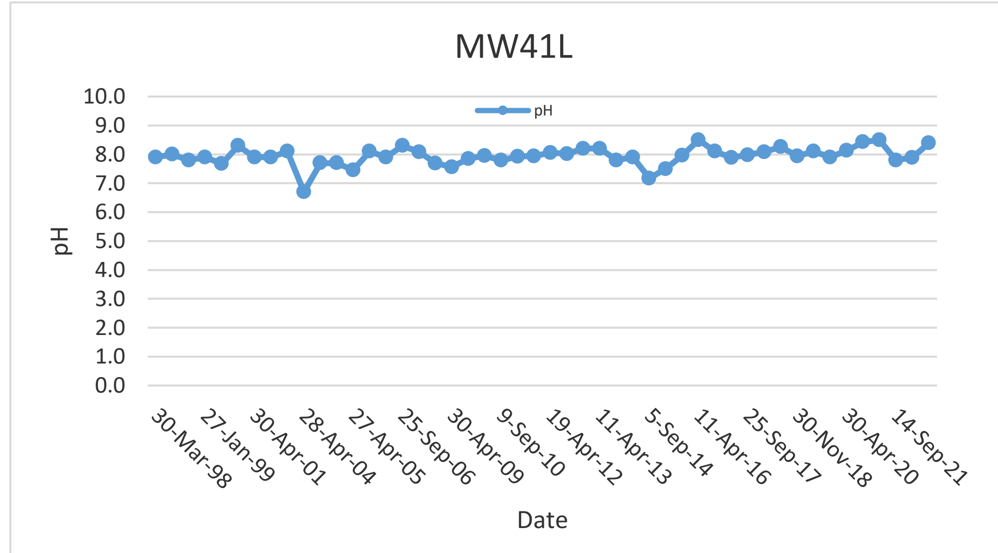


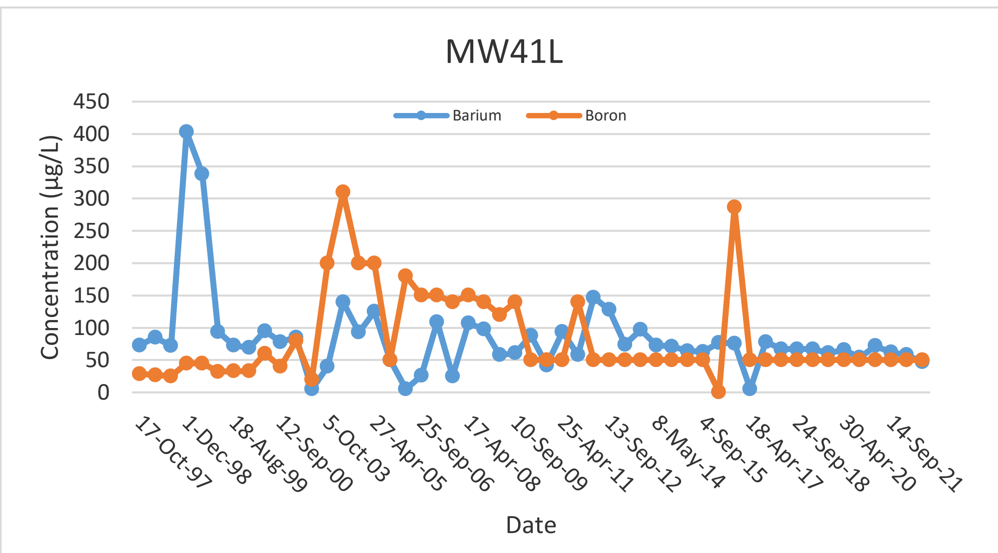


Appendix J:
Trend Graphs MW41L
1997 - 2022

Client: Fundy Regional Services Commission
Project Number: 4662.09







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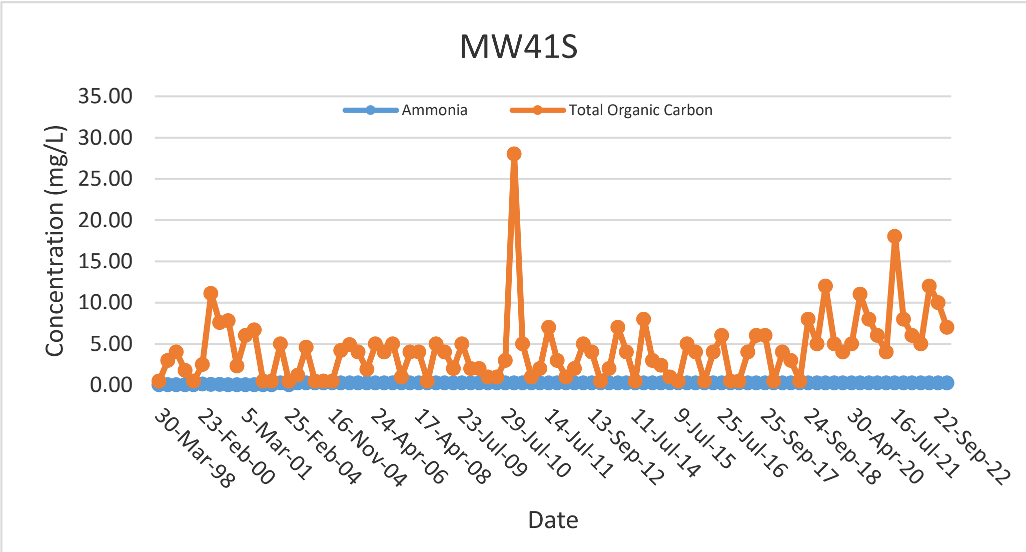
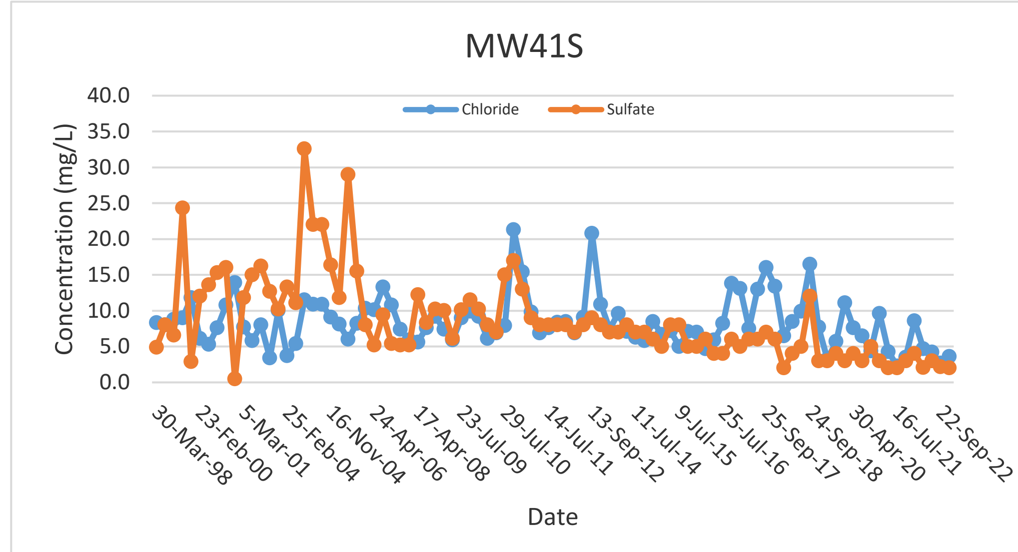
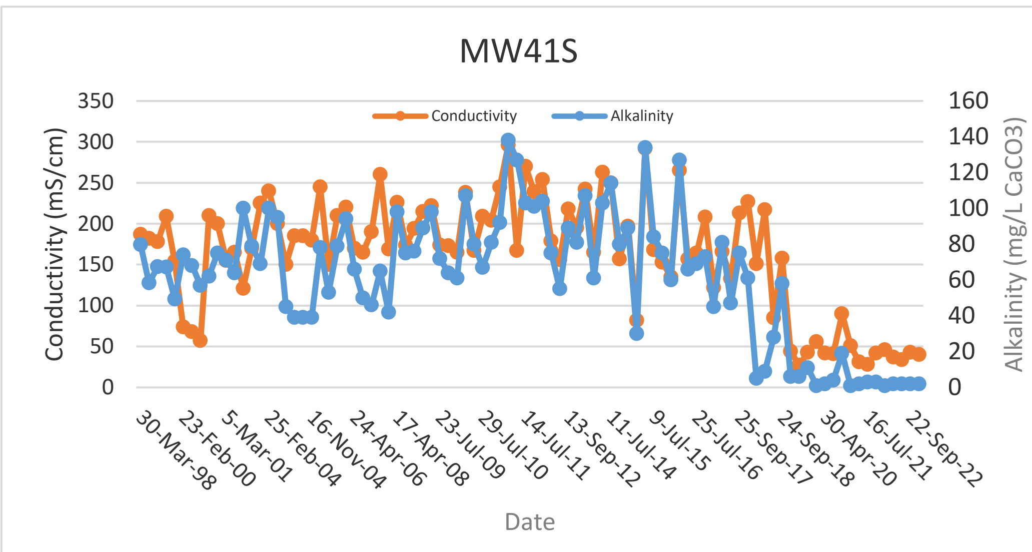
Consulting Engineers and Scientists

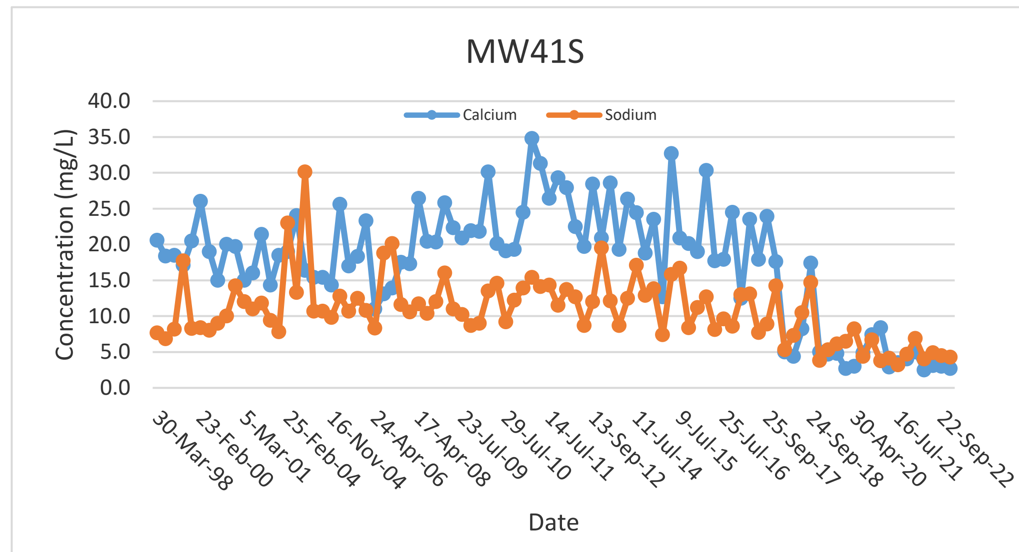
Appendix J:
Trend Graphs MW41S
1997 - 2022

Client: Fundy Regional Services Commission
Project Number: 4662.09









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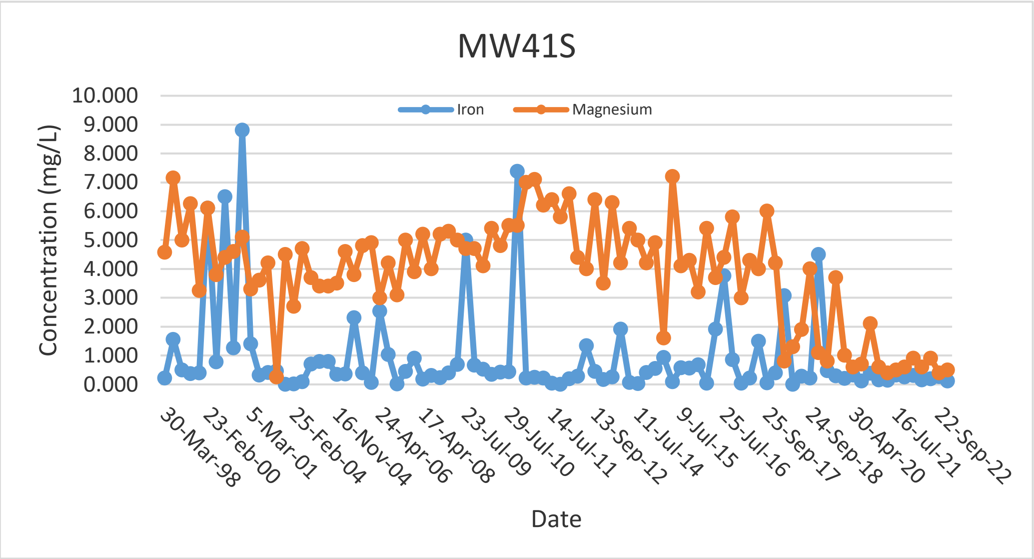
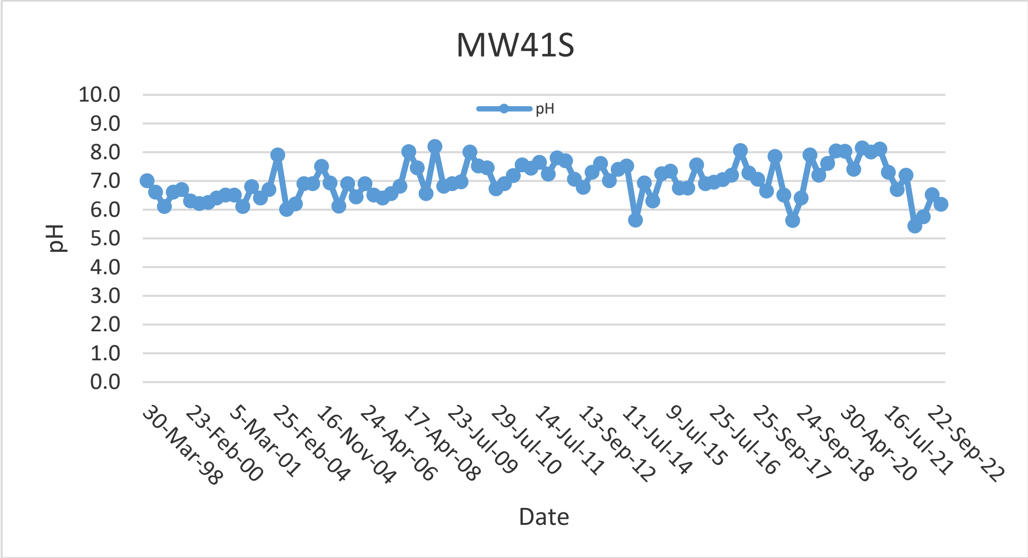
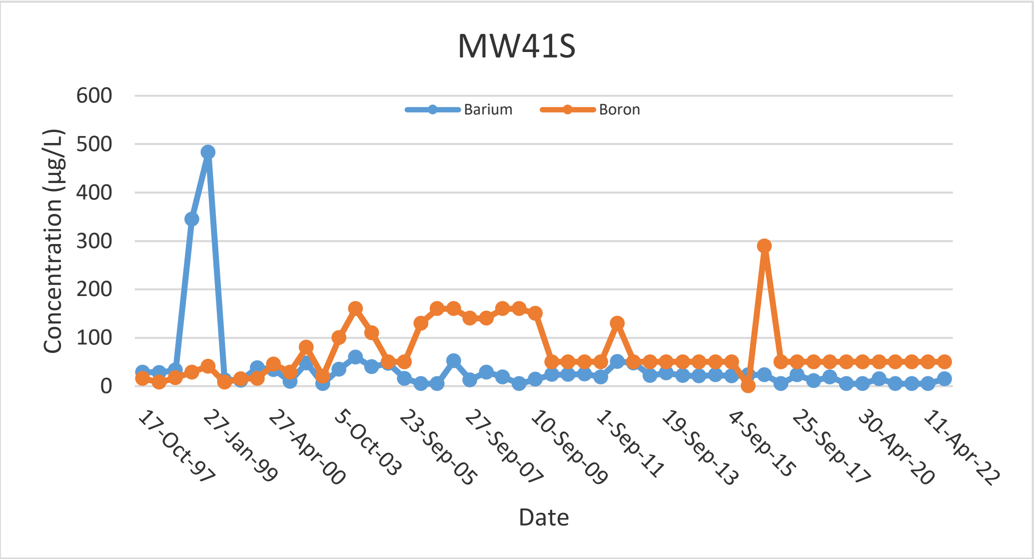
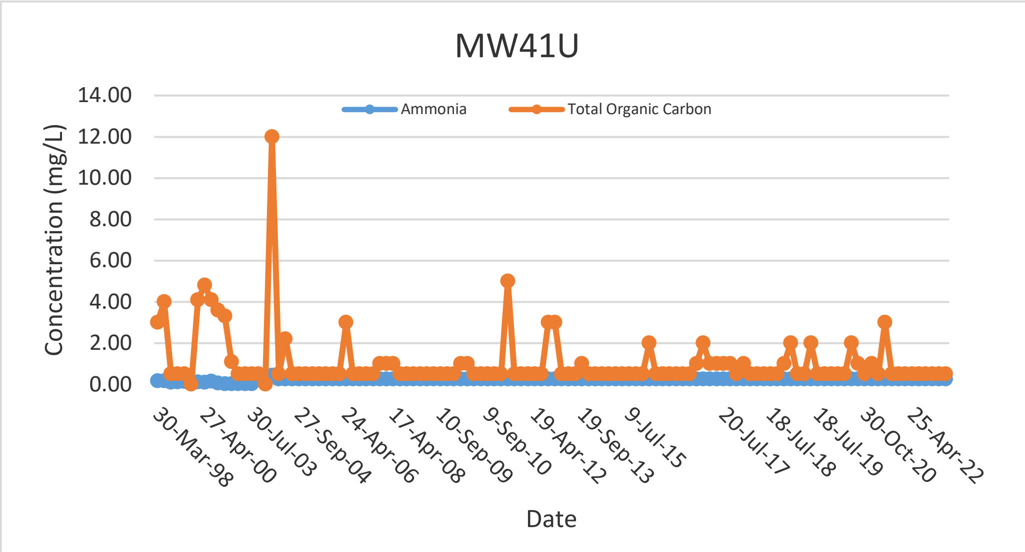
Appendix J:
Trend Graphs MW41S
1997 - 2022

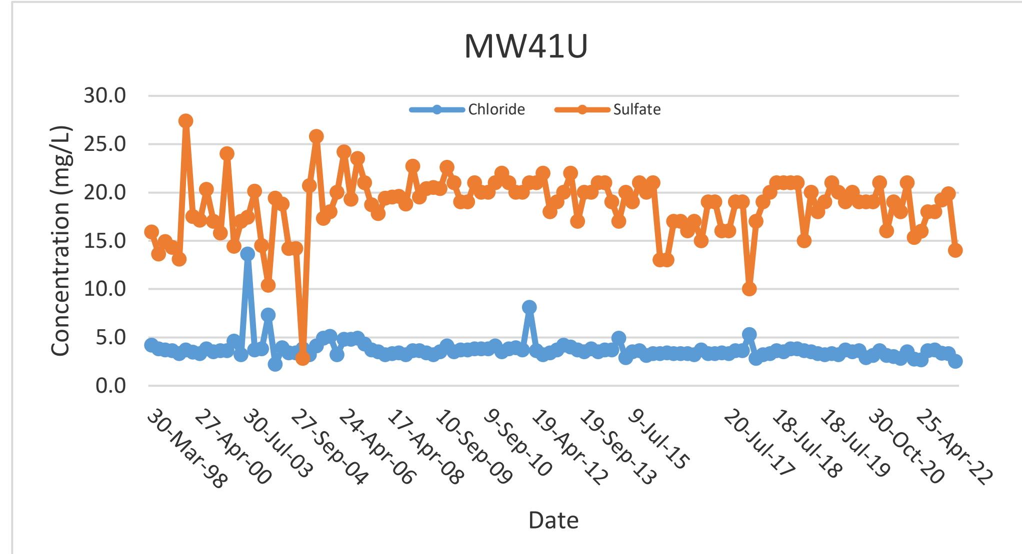
Client: Fundy Regional Services Commission
Project Number: 4662.09

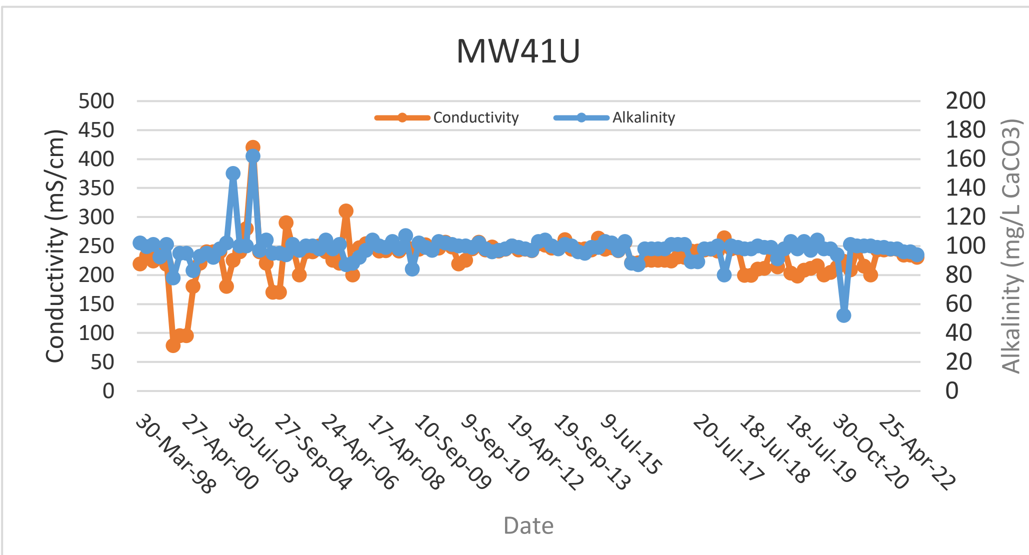


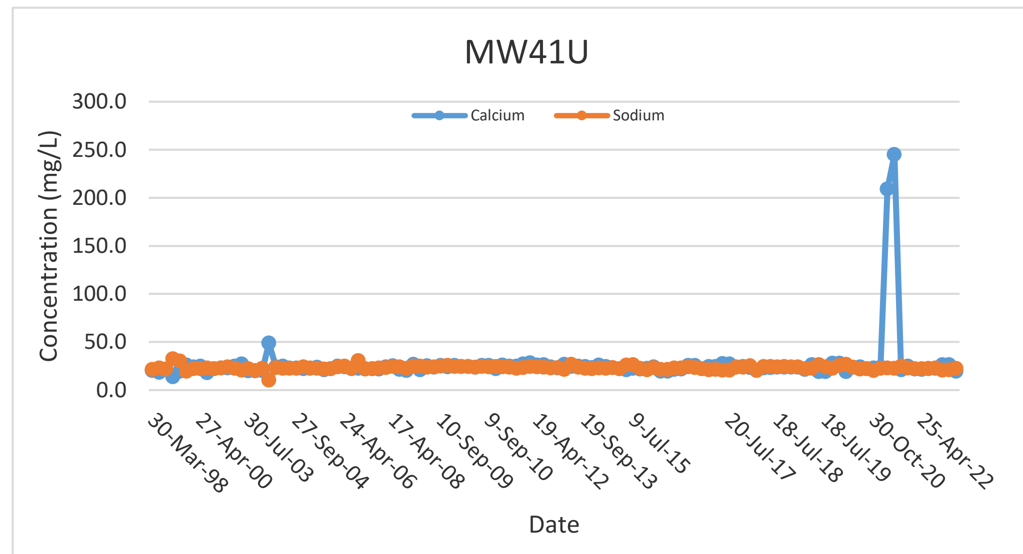





MW41U
Ammonia
Total Organic Carbon
Concentration (mg/L)
Date


MW41U
Chloride
Sulfate
Concentration (mg/L)
Date


MW41U
Conductivity
Alkalinity
Conductivity (mS/cm)
Alkalinity (mg/L CaCO3)
Date


MW41U
Calcium
Sodium
Concentration (mg/L)
Date

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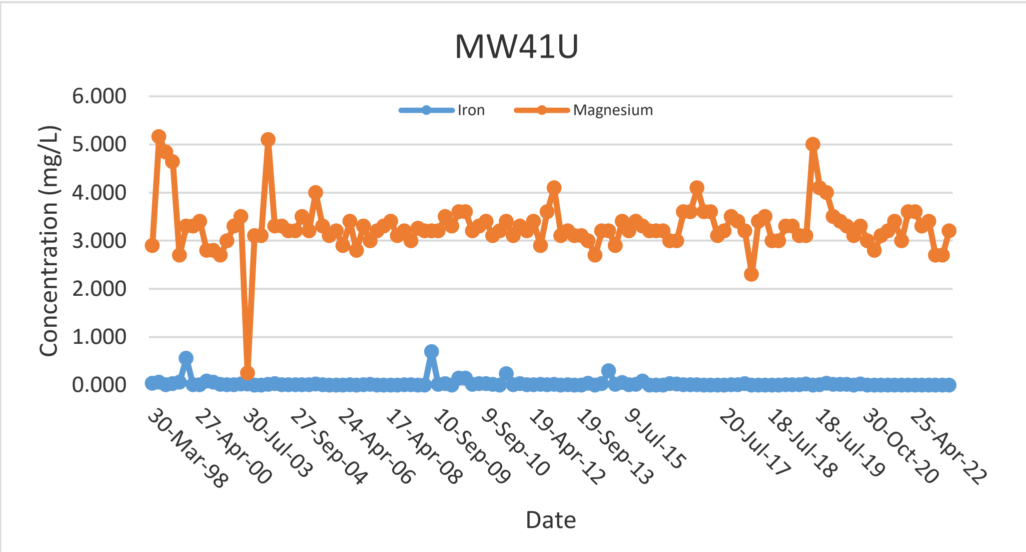
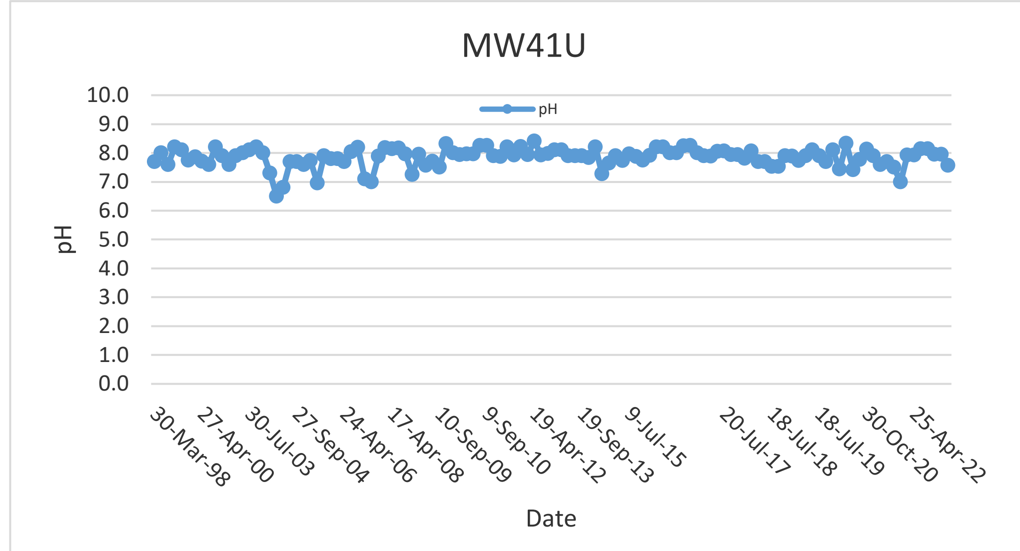
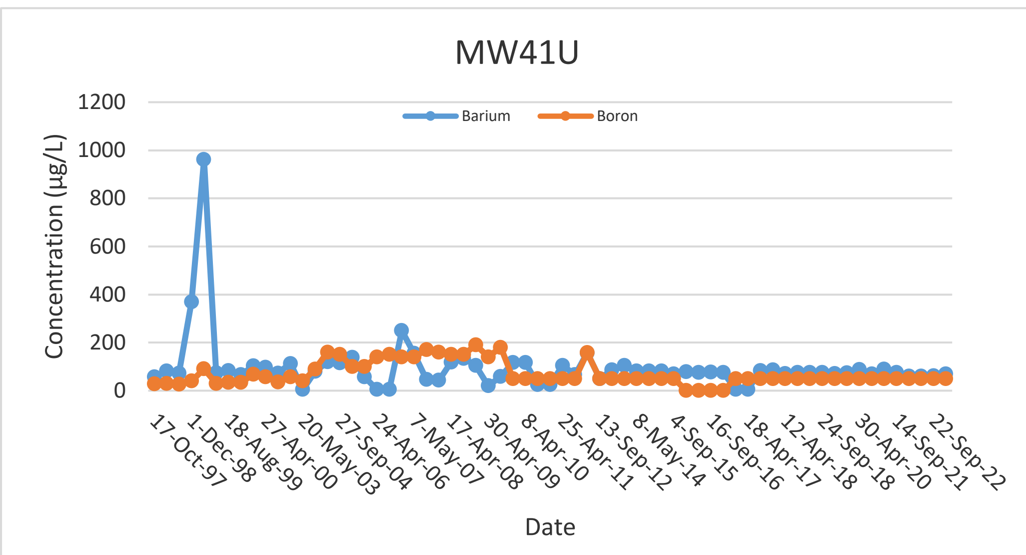
Consulting Engineers and Scientists

Appendix J:
Trend Graphs MW41U
1997 - 2022

Client: Fundy Regional Services Commission
Project Number: 4662.09







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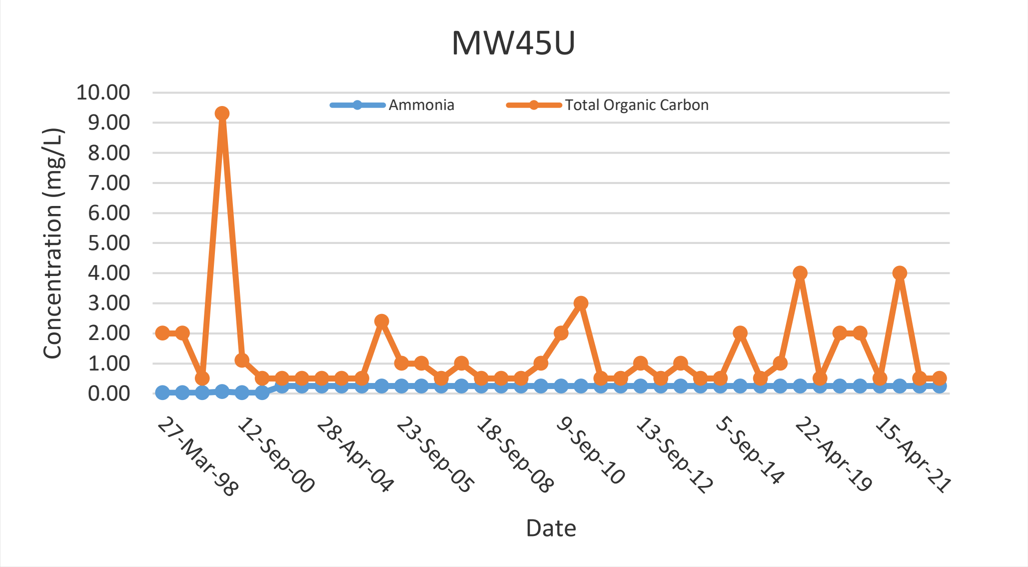
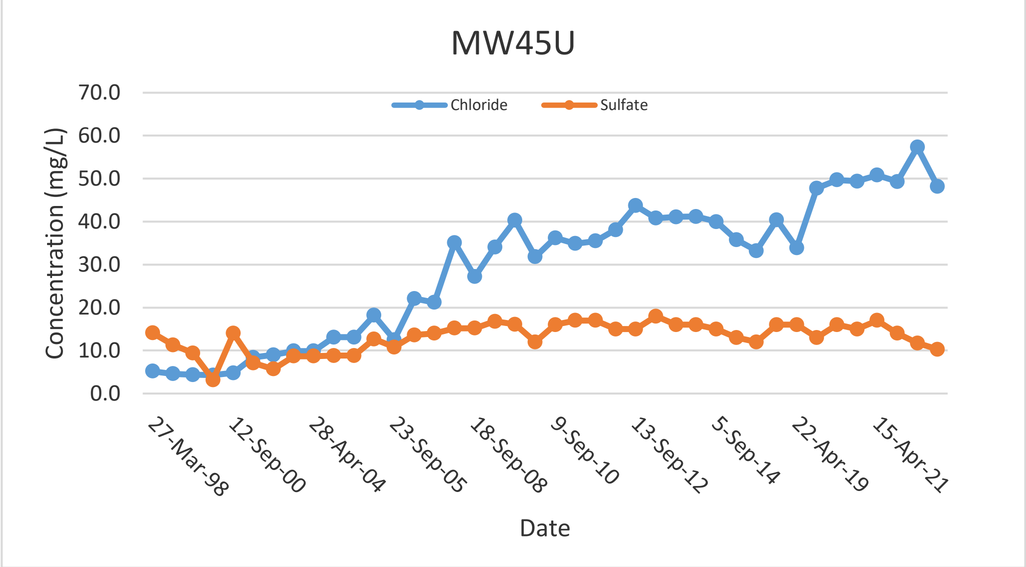
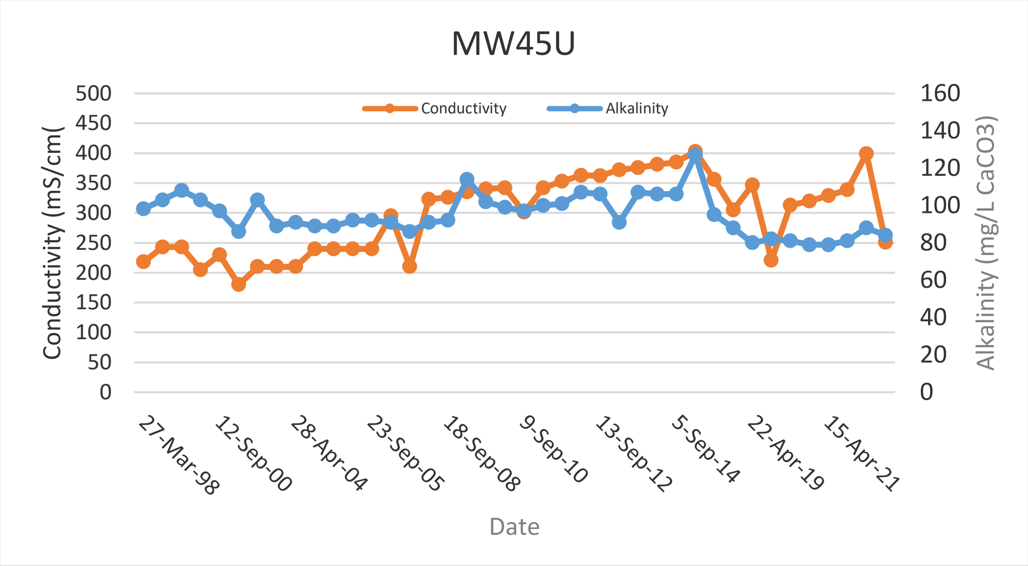
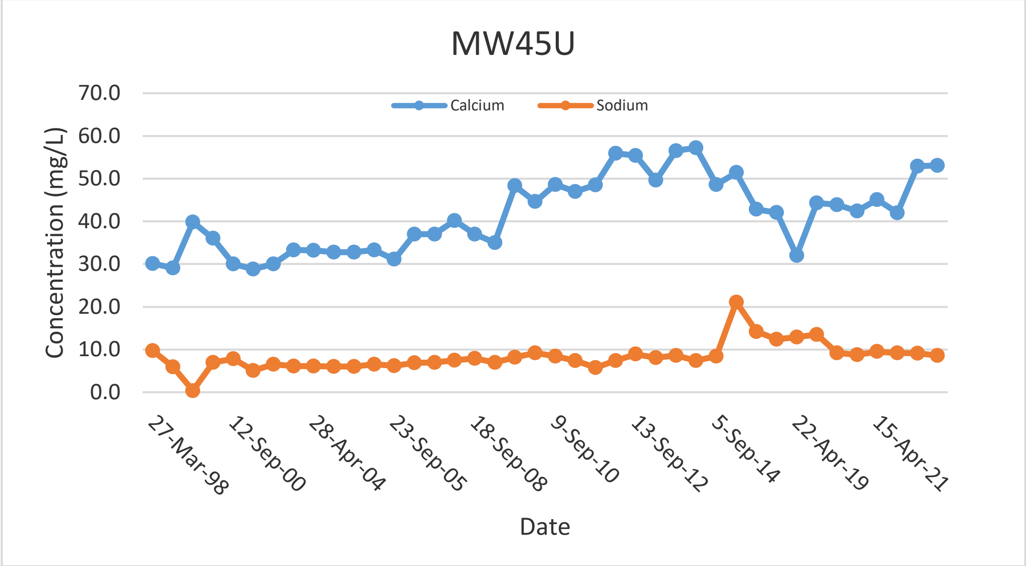
Appendix J:
Trend Graphs MW45U
1997 - 2022

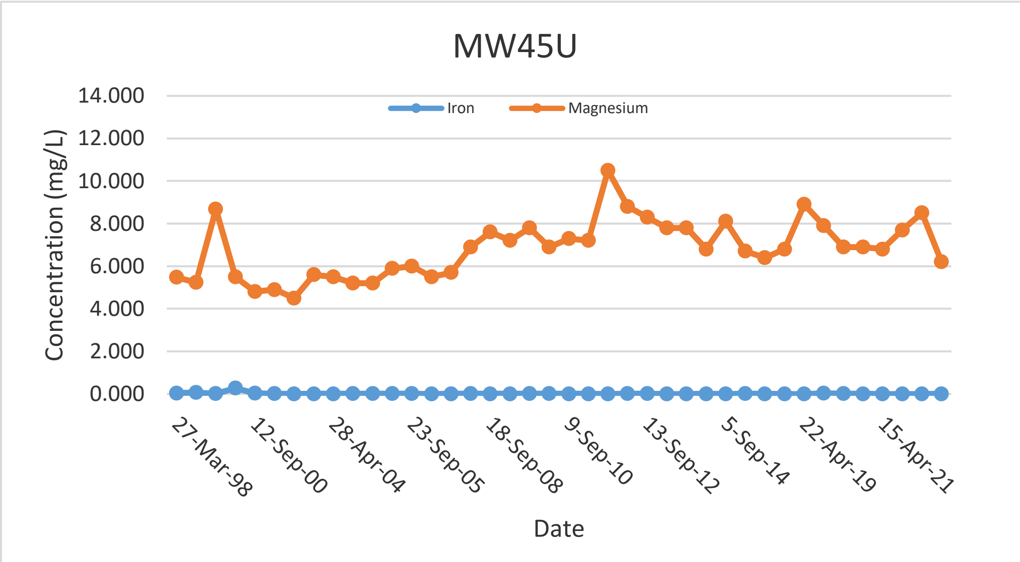
Client: Fundy Regional Services Commission
Project Number: 4662.09

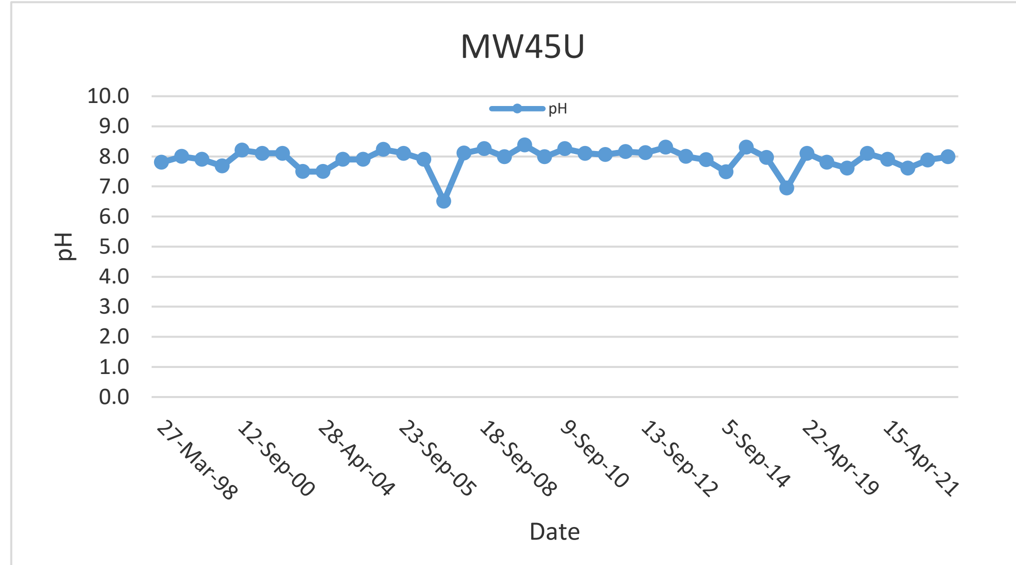


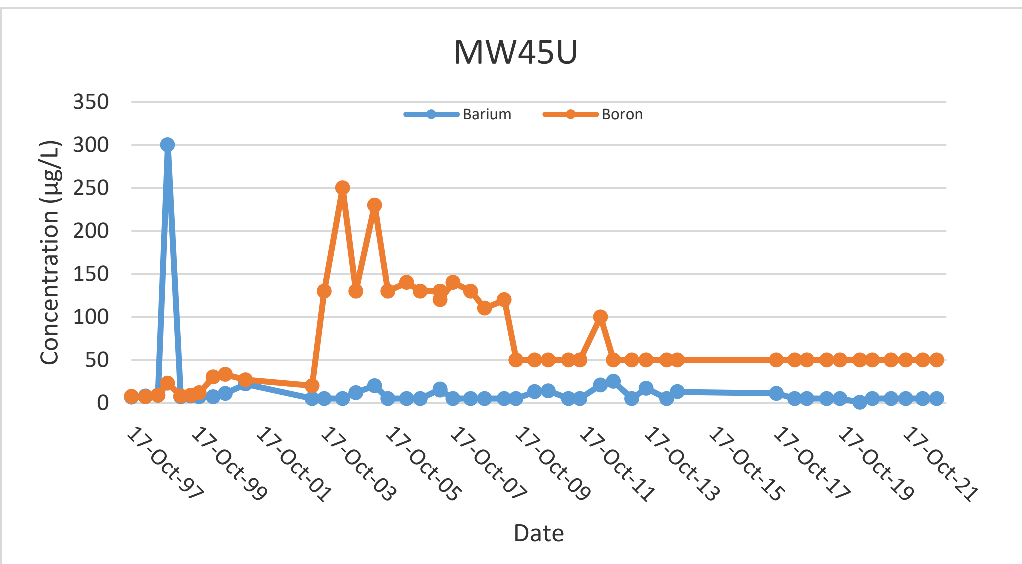






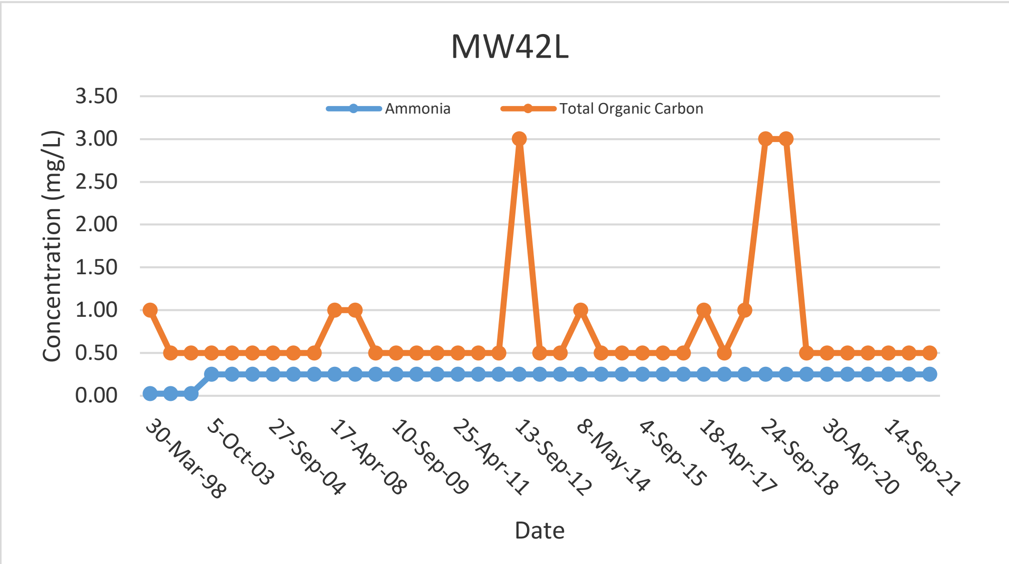

MW45U
Iron
Magnesium
Concentration (mg/L)
14.000
12.000
10.000
8.000
6.000
4.000
2.000
0.000
27-Mar-98
12-Sep-00
28-Apr-04
23-Sep-05
18-Sep-08
9-Sep-10
13-Sep-12
5-Sep-14
22-Apr-19
15-Apr-21
Date

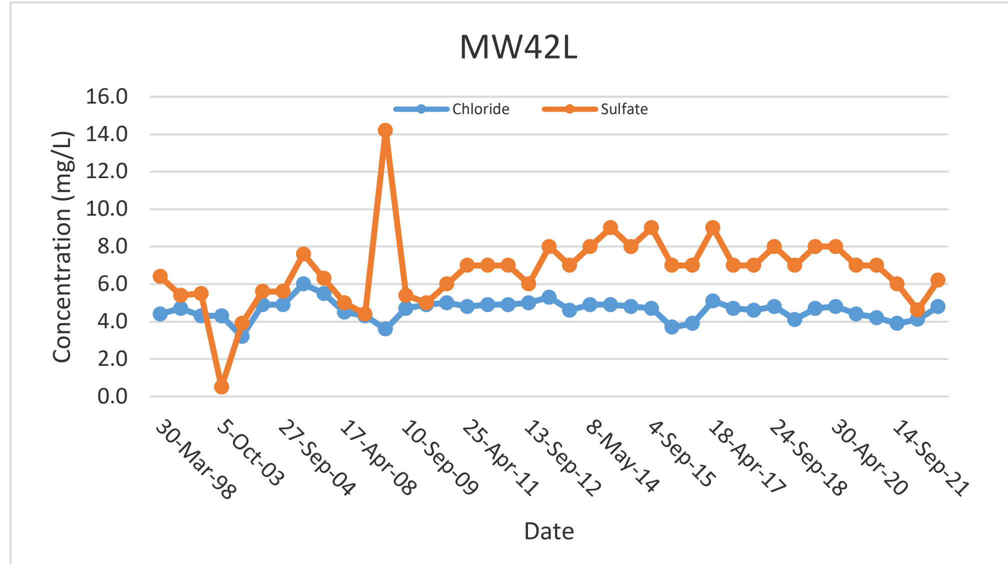

MW45U
pH
pH
10.0
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
27-Mar-98
12-Sep-00
28-Apr-04
23-Sep-05
18-Sep-08
9-Sep-10
13-Sep-12
5-Sep-14
22-Apr-19
15-Apr-21
Date

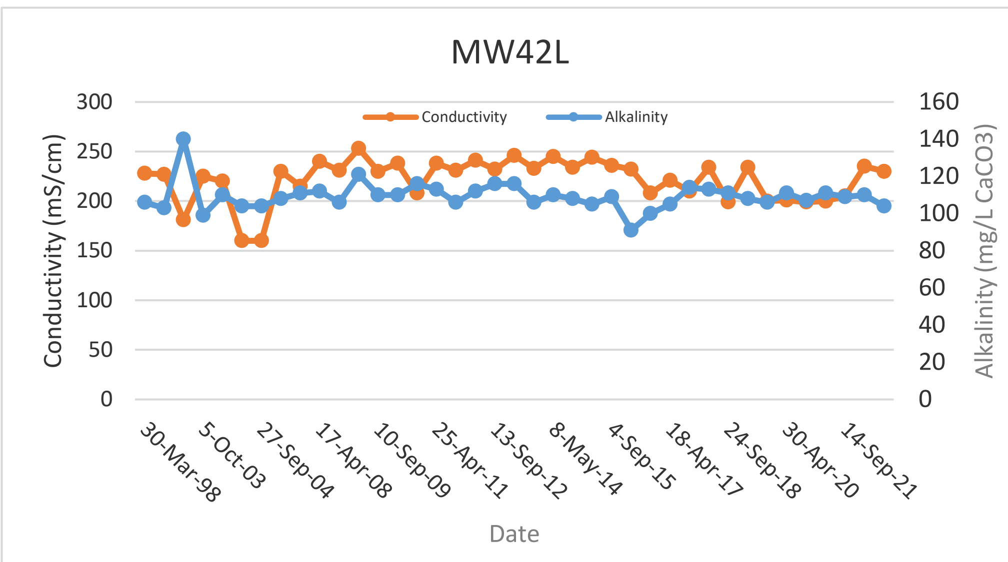

MW45U
Barium
Boron
Concentration (µg/L)
350
300
250
200
150
100
50
0
17-Oct-97
17-Oct-99
17-Oct-01
17-Oct-03
17-Oct-05
17-Oct-07
17-Oct-09
17-Oct-11
17-Oct-13
17-Oct-15
17-Oct-17
17-Oct-19
17-Oct-21
Date

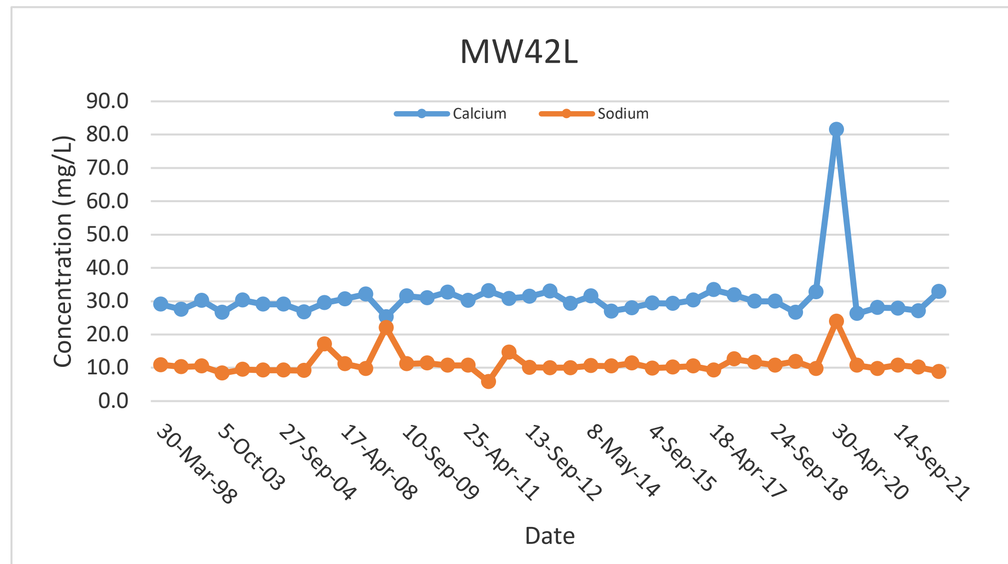
Appendix J:
Trend Graphs MW42L
1997 - 2022

Client: Fundy Regional Services Commission
Project Number: 4662.09









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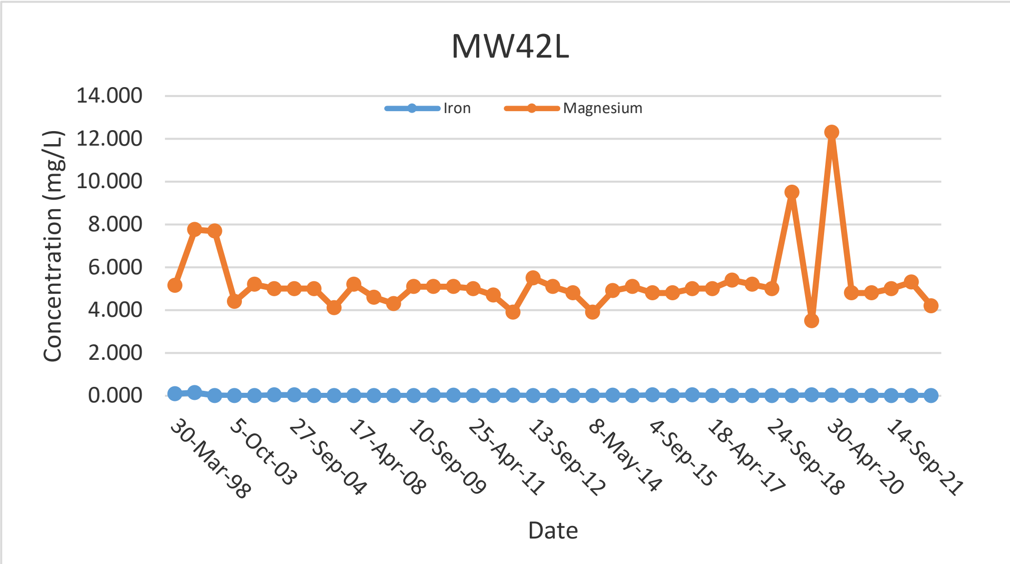
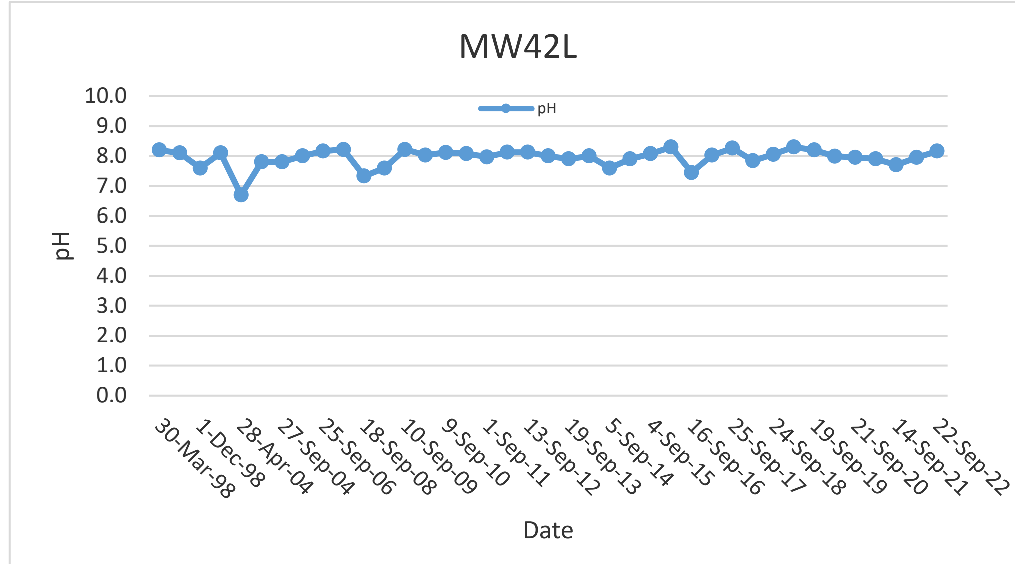
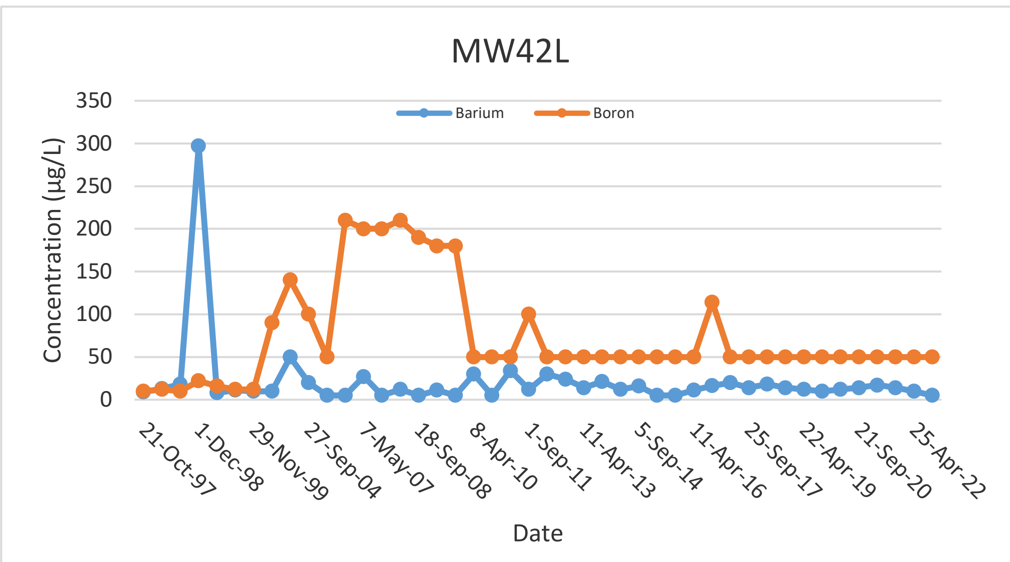
Appendix J:
Trend Graphs MW42L
1997 - 2022

Client: Fundy Regional Services Commission
Project Number: 4662.09

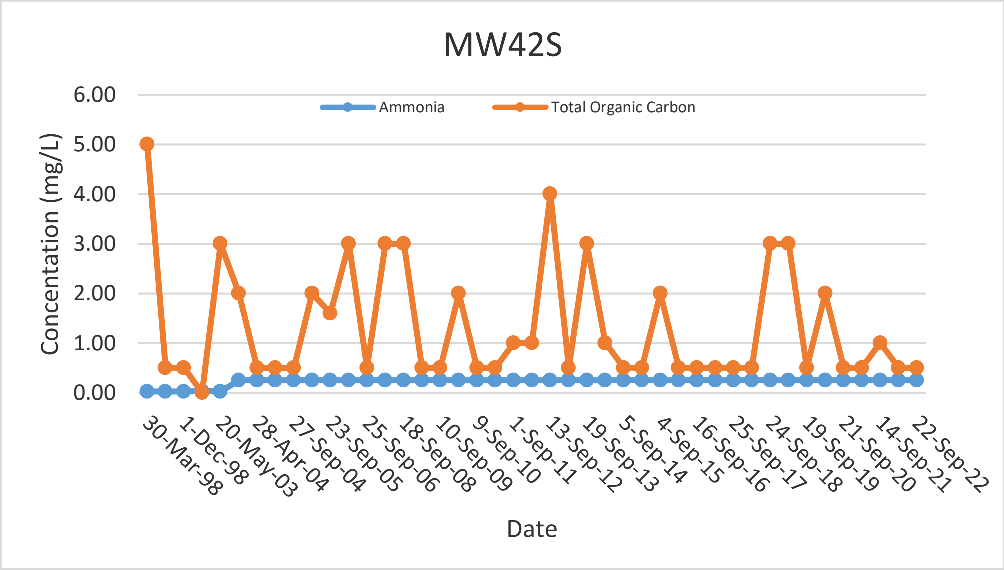


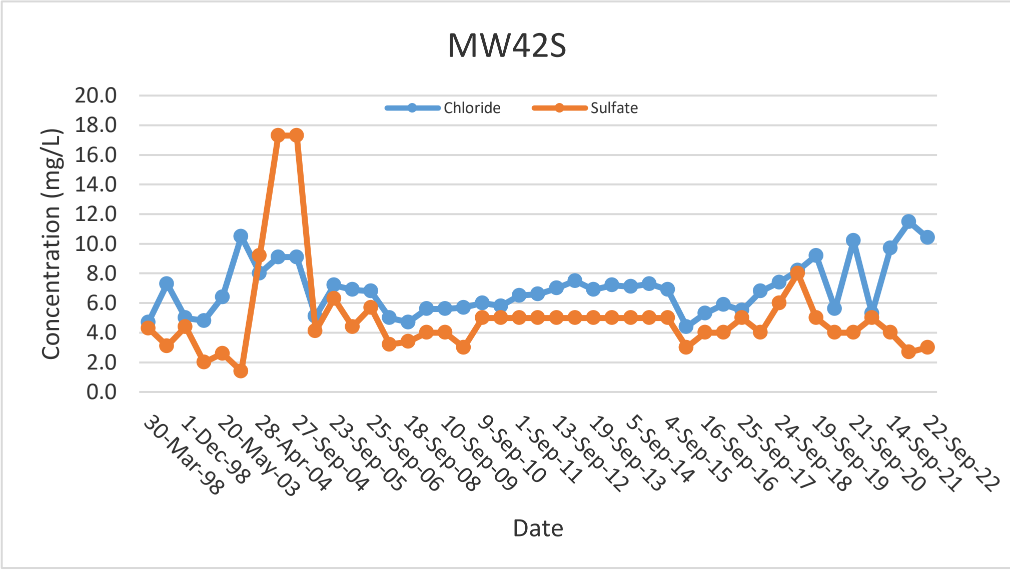


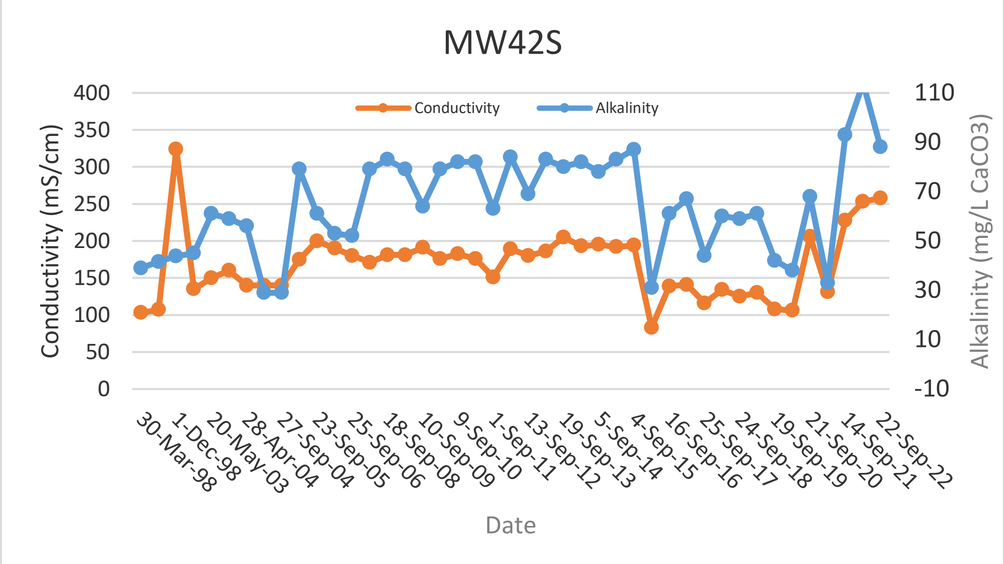


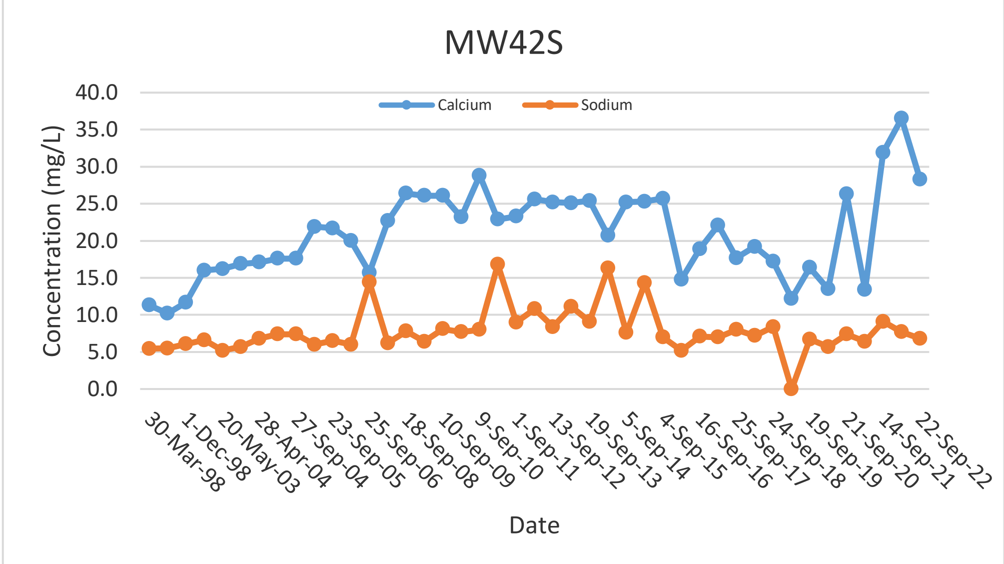
Appendix J:
Trend Graphs MW42S
1997 - 2022

Client: Fundy Regional Services Commission
Project Number: 4662.09









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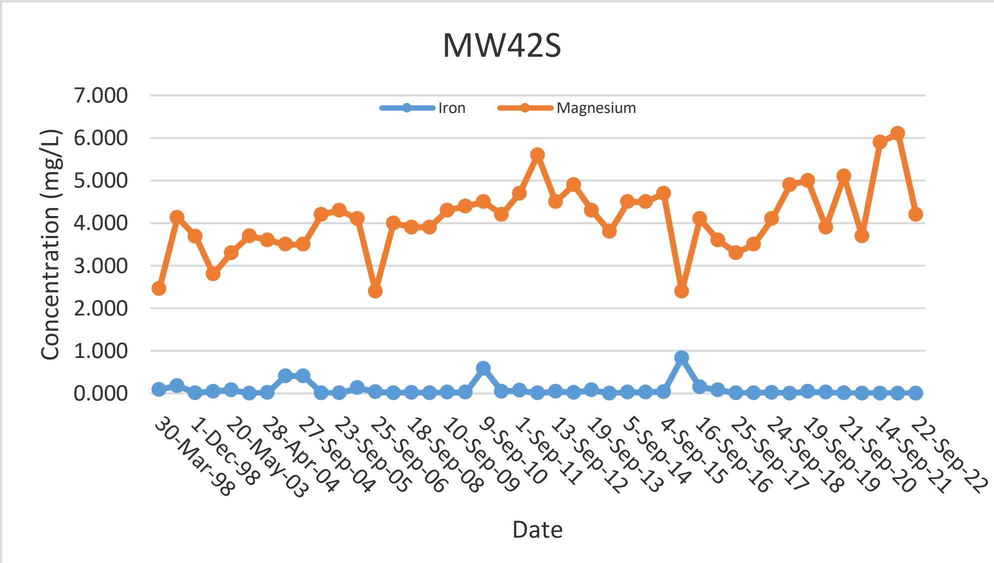
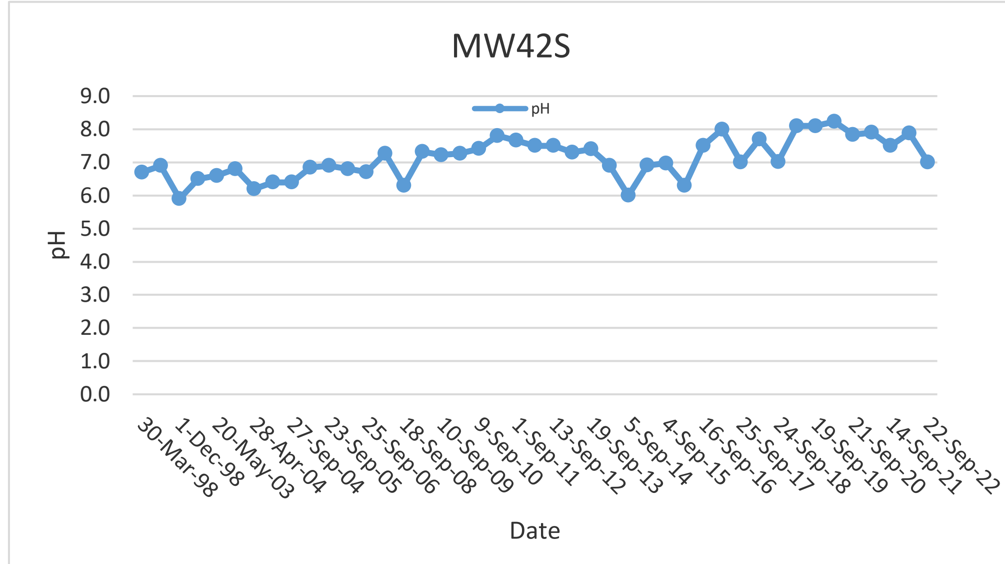
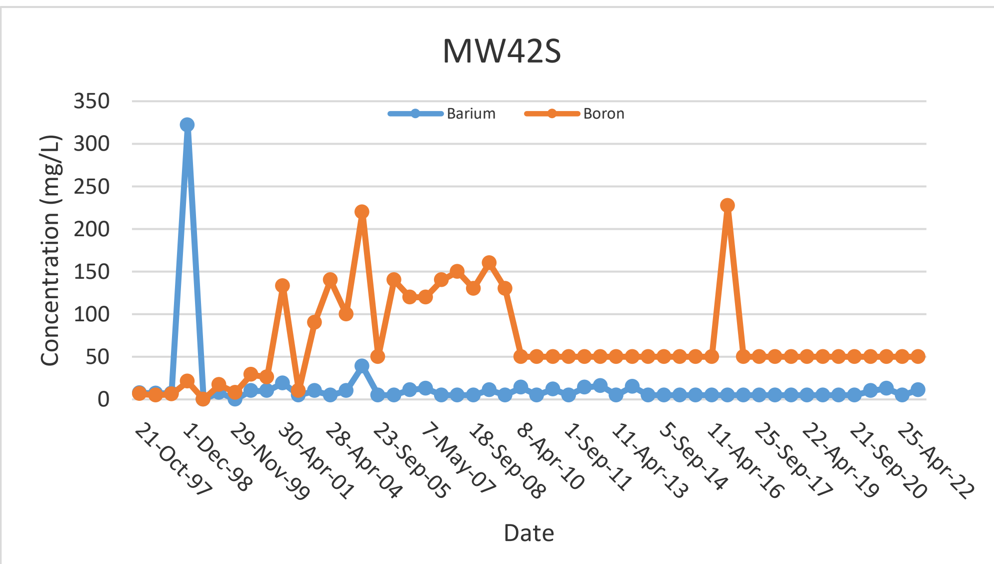
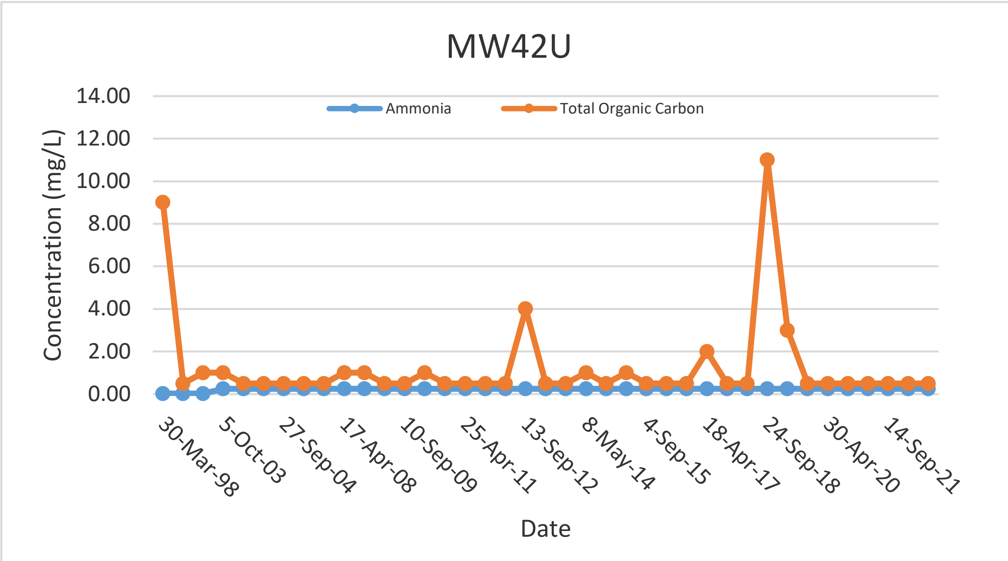
Appendix J:
Trend Graphs MW42S
1997 - 2022

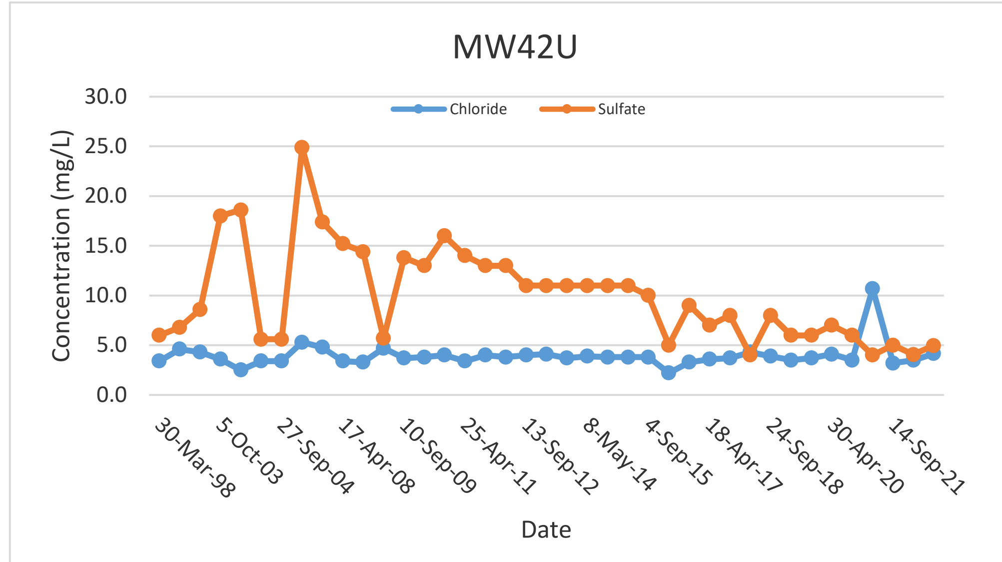
Client: Fundy Regional Services Commission
Project Number: 4662.09

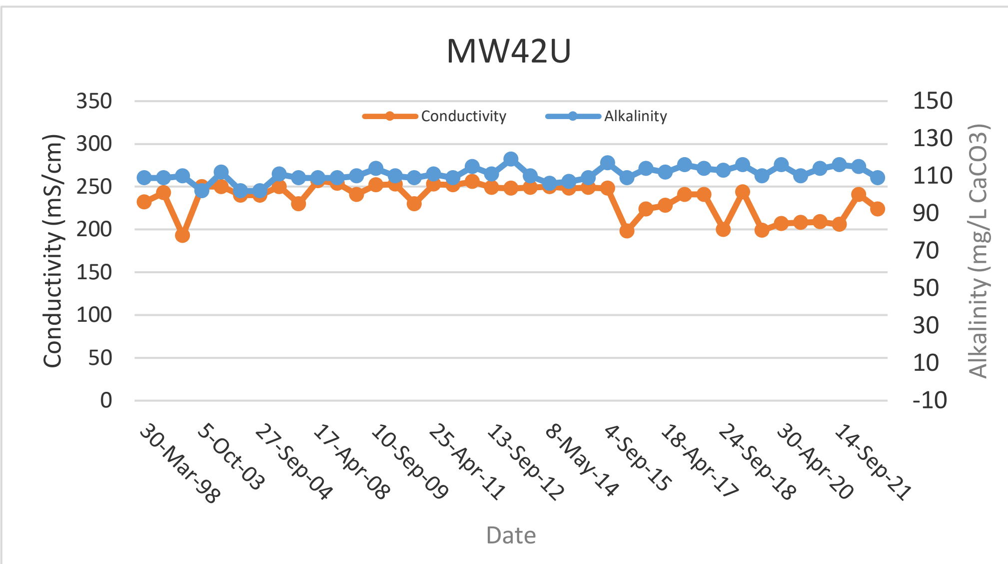


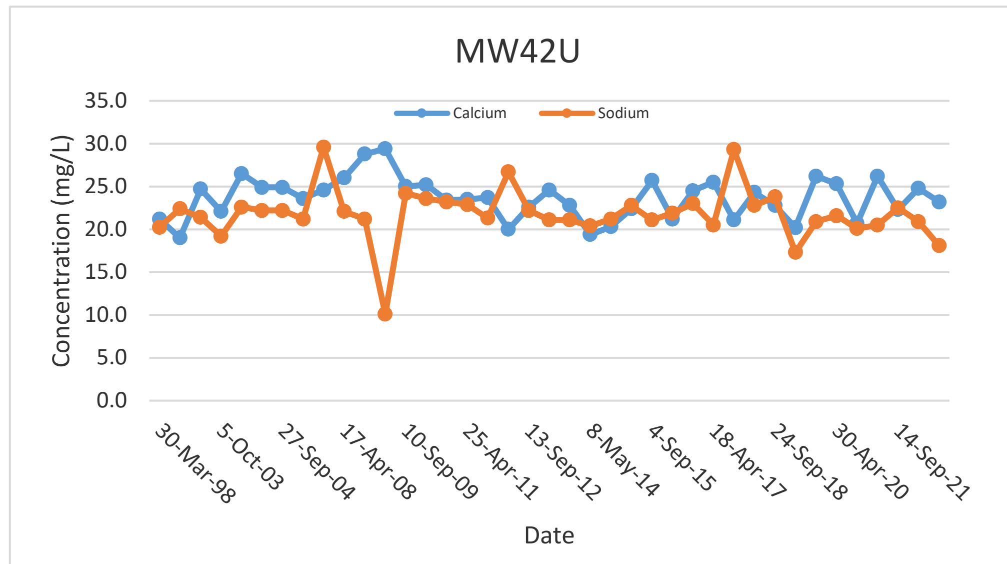


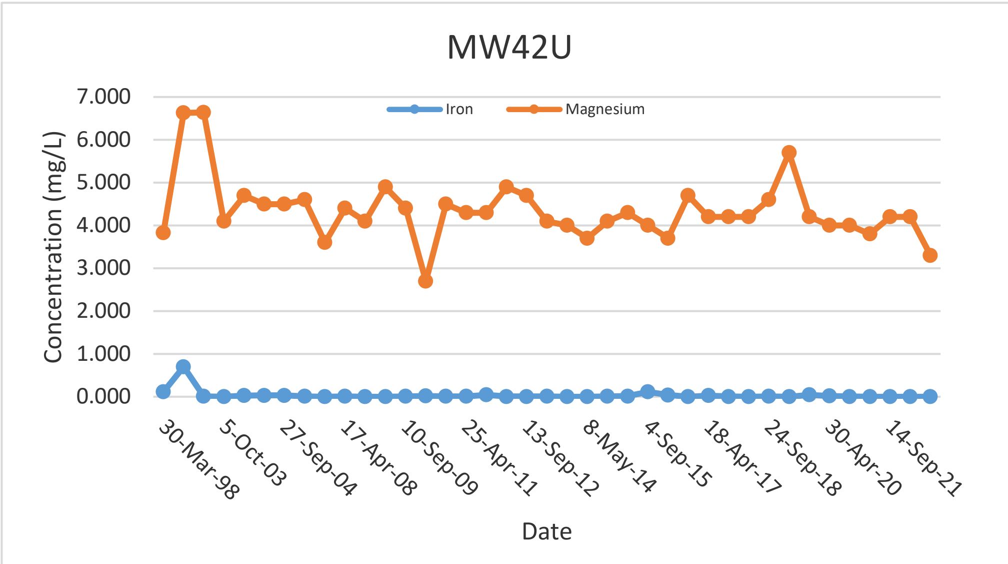


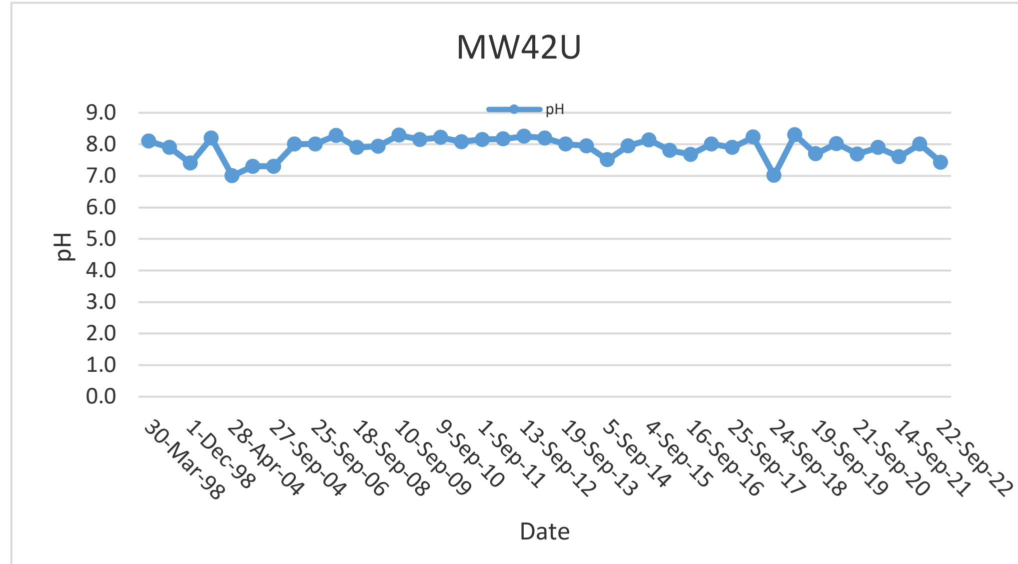

MW42U
Ammonia
Total Organic Carbon
Concentration (mg/L)
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
30-Mar-98
5-Oct-03
27-Sep-04
17-Apr-08
10-Sep-09
25-Apr-11
13-Sep-12
8-May-14
4-Sep-15
18-Apr-17
24-Sep-18
30-Apr-20
14-Sep-21
Date

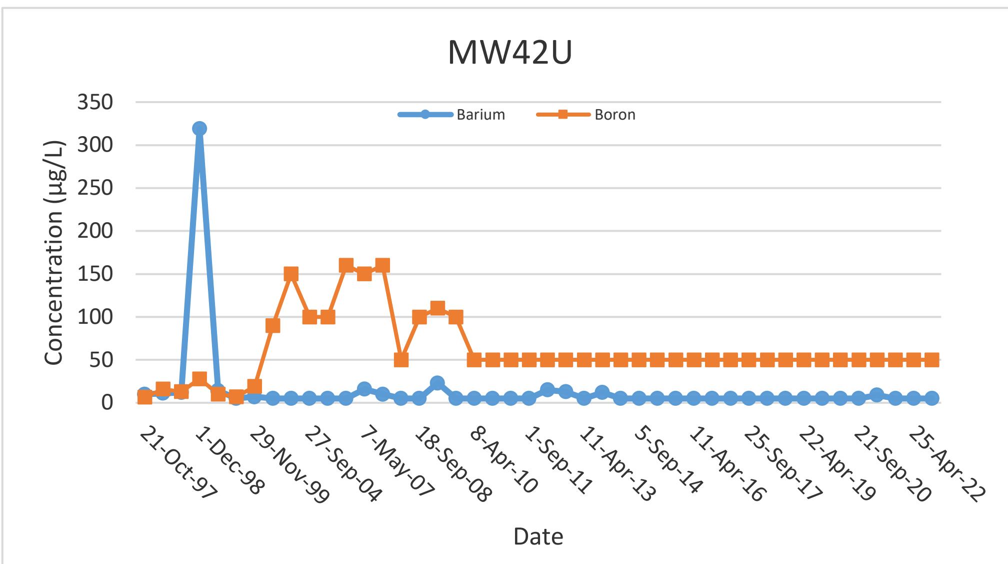

MW42U
Chloride
Sulfate
Concentration (mg/L)
30.0
25.0
20.0
15.0
10.0
5.0
0.0
30-Mar-98
5-Oct-03
27-Sep-04
17-Apr-08
10-Sep-09
25-Apr-11
13-Sep-12
8-May-14
4-Sep-15
18-Apr-17
24-Sep-18
30-Apr-20
14-Sep-21
Date


MW42U
Conductivity
Alkalinity
Conductivity (mS/cm)
350
300
250
200
150
100
50
0
Alkalinity (mg/L CaCO3)
150
130
110
90
70
50
30
10
-10
30-Mar-98
5-Oct-03
27-Sep-04
17-Apr-08
10-Sep-09
25-Apr-11
13-Sep-12
8-May-14
4-Sep-15
18-Apr-17
24-Sep-18
30-Apr-20
14-Sep-21
Date


MW42U
Calcium
Sodium
Concentration (mg/L)
35.0
30.0
25.0
20.0
15.0
10.0
5.0
0.0
30-Mar-98
5-Oct-03
27-Sep-04
17-Apr-08
10-Sep-09
25-Apr-11
13-Sep-12
8-May-14
4-Sep-15
18-Apr-17
24-Sep-18
30-Apr-20
14-Sep-21
Date


MW42U
Iron
Magnesium
Concentration (mg/L)
7.000
6.000
5.000
4.000
3.000
2.000
1.000
0.000
30-Mar-98
5-Oct-03
27-Sep-04
17-Apr-08
10-Sep-09
25-Apr-11
13-Sep-12
8-May-14
4-Sep-15
18-Apr-17
24-Sep-18
30-Apr-20
14-Sep-21
Date


MW42U
pH
pH
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
30-Mar-98
1-Dec-98
28-Apr-04
27-Sep-04
25-Sep-06
18-Sep-08
10-Sep-09
9-Sep-10
1-Sep-11
13-Sep-12
19-Sep-13
5-Sep-14
4-Sep-15
16-Sep-16
25-Sep-17
24-Sep-18
19-Sep-19
21-Sep-20
14-Sep-21
22-Sep-22
Date


MW42U
Barium
Boron
Concentration (µg/L)
350
300
250
200
150
100
50
0
21-Oct-97
1-Dec-98
29-Nov-99
27-Sep-04
7-May-07
18-Sep-08
8-Apr-10
1-Sep-11
11-Apr-13
5-Sep-14
11-Apr-16
25-Sep-17
22-Apr-19
21-Sep-20
25-Apr-22
Date

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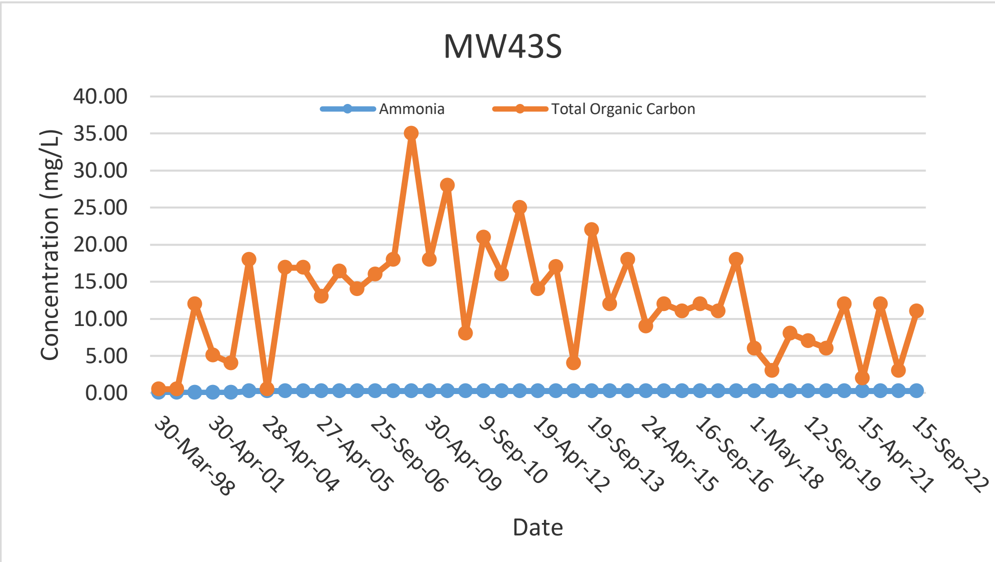
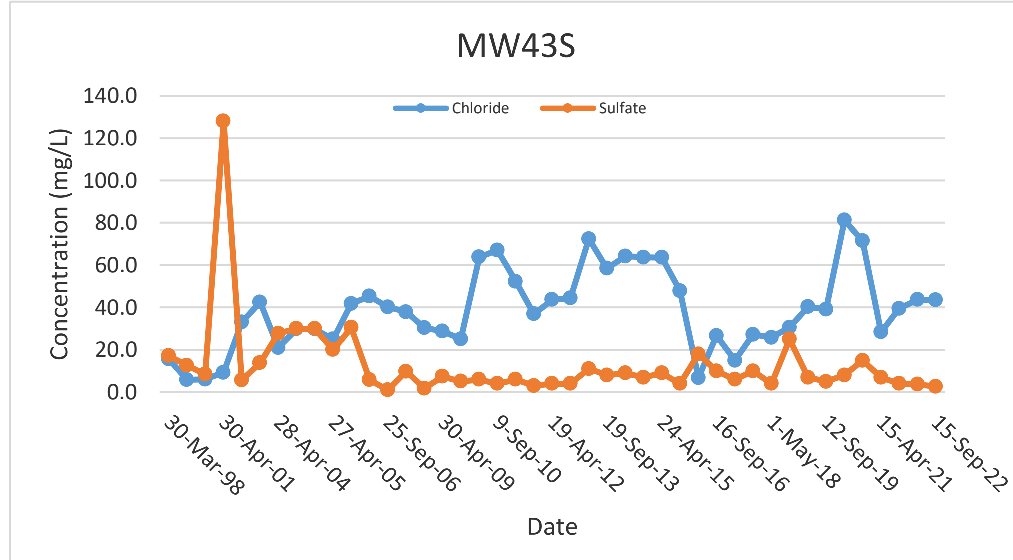
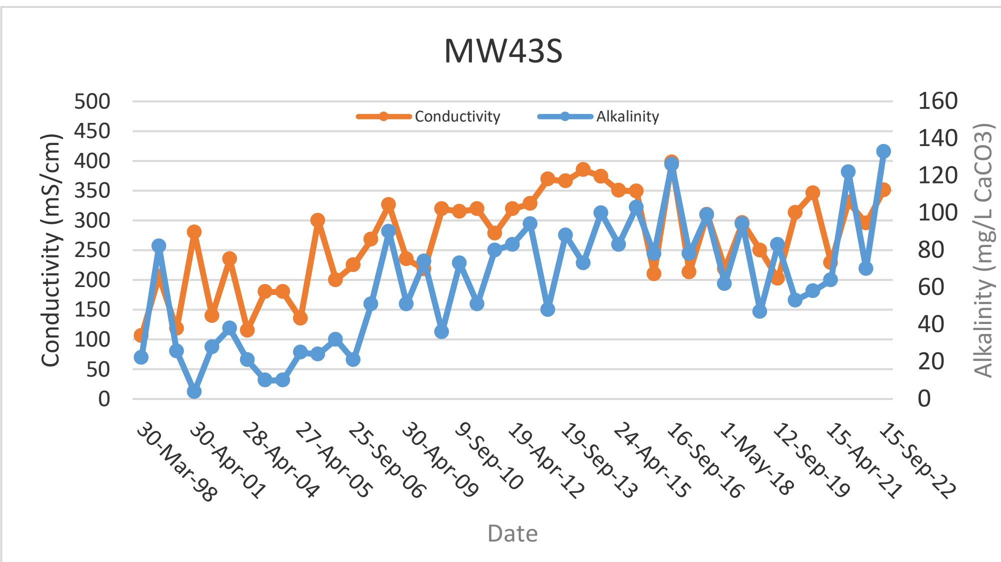
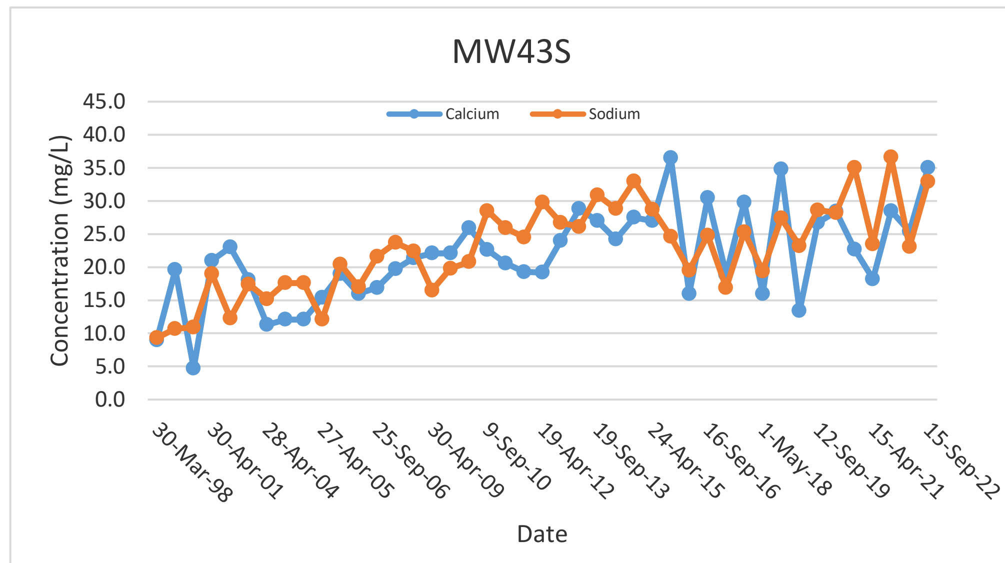
Appendix J:
Trend Graphs MW43S
1997 - 2022

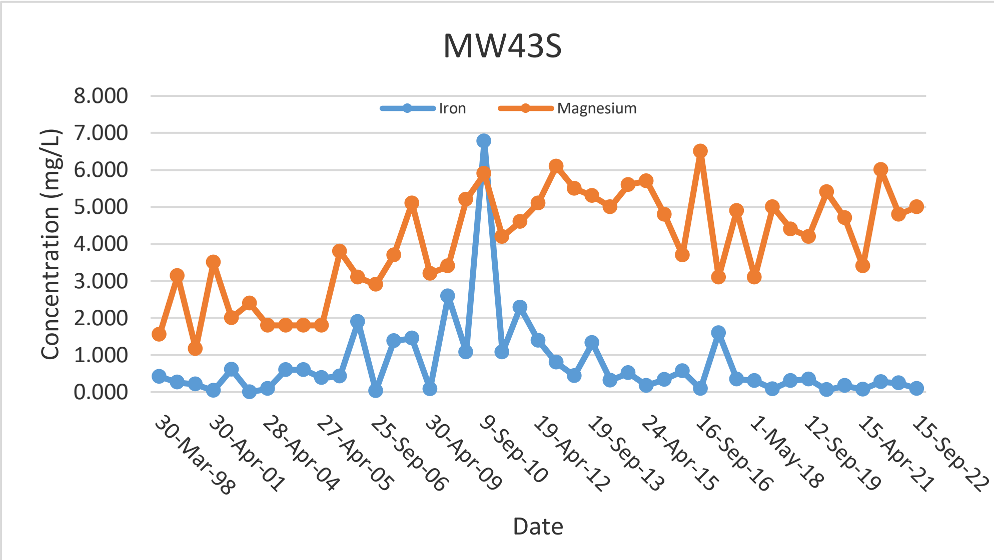
Client: Fundy Regional Services Commission
Project Number: 4662.09

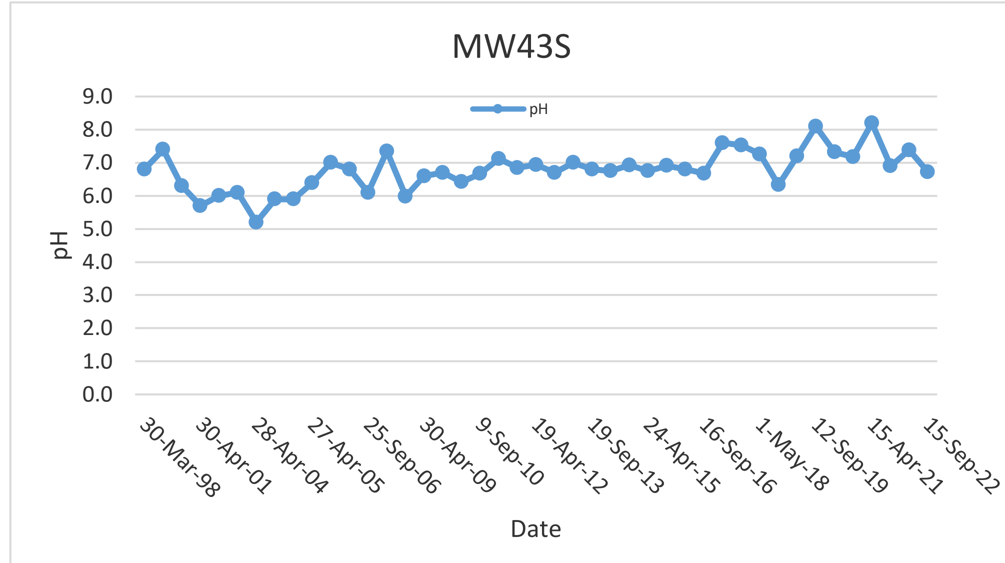


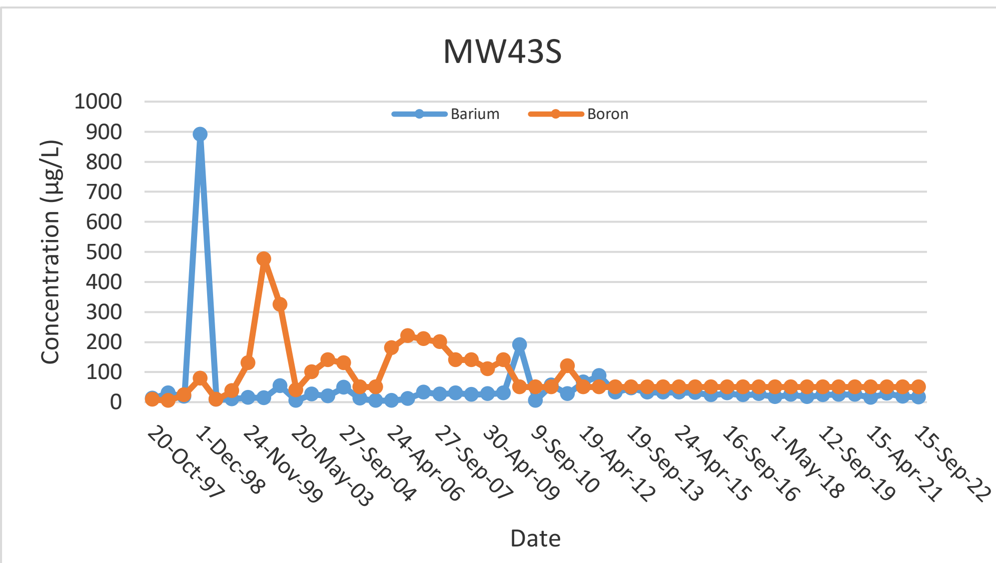


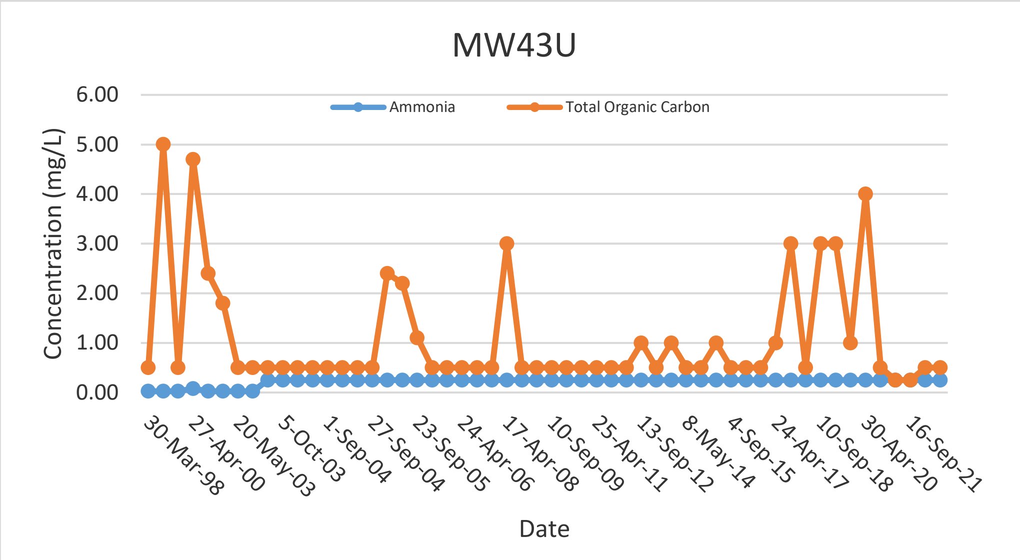


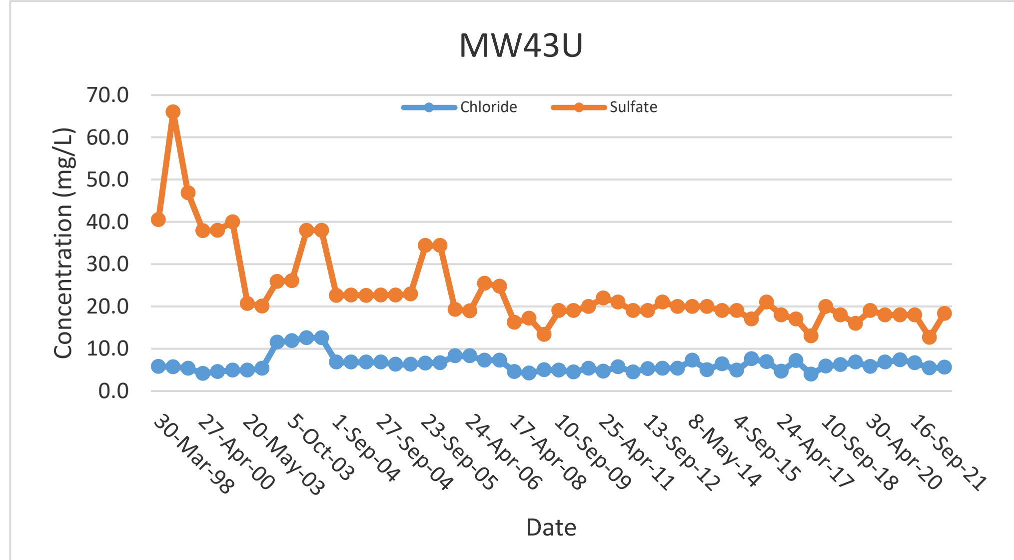


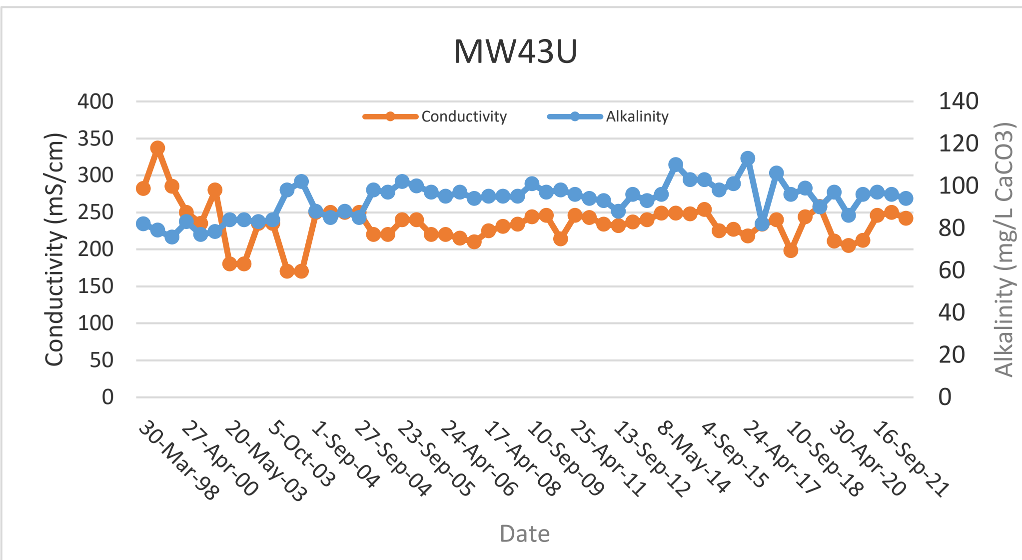

MW43S
Iron
Magnesium
Concentration (mg/L)
8.000
7.000
6.000
5.000
4.000
3.000
2.000
1.000
0.000
30-Mar-98
30-Apr-01
28-Apr-04
27-Apr-05
25-Sep-06
30-Apr-09
9-Sep-10
19-Apr-12
19-Sep-13
24-Apr-15
16-Sep-16
1-May-18
12-Sep-19
15-Apr-21
15-Sep-22
Date

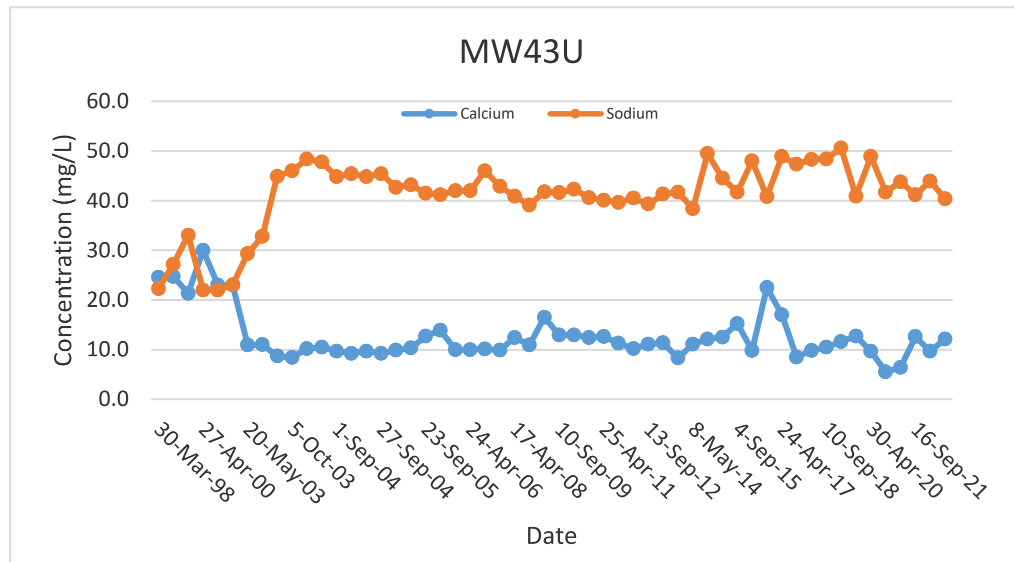

MW43S
pH
pH
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
30-Mar-98
30-Apr-01
28-Apr-04
27-Apr-05
25-Sep-06
30-Apr-09
9-Sep-10
19-Apr-12
19-Sep-13
24-Apr-15
16-Sep-16
1-May-18
12-Sep-19
15-Apr-21
15-Sep-22
Date


MW43S
Barium
Boron
Concentration (µg/L)
1000
900
800
700
600
500
400
300
200
100
0
20-Oct-97
1-Dec-98
24-Nov-99
20-May-03
27-Sep-04
24-Apr-06
27-Sep-07
30-Apr-09
9-Sep-10
19-Apr-12
19-Sep-13
24-Apr-15
16-Sep-16
1-May-18
12-Sep-19
15-Apr-21
15-Sep-22
Date


MW43U
Ammonia
Total Organic Carbon
Concentration (mg/L)
Date


MW43U
Chloride
Sulfate
Concentration (mg/L)
Date


MW43U
Conductivity
Alkalinity
Conductivity (mS/cm)
Alkalinity (mg/L CaCO3)
Date


MW43U
Calcium
Sodium
Concentration (mg/L)
Date

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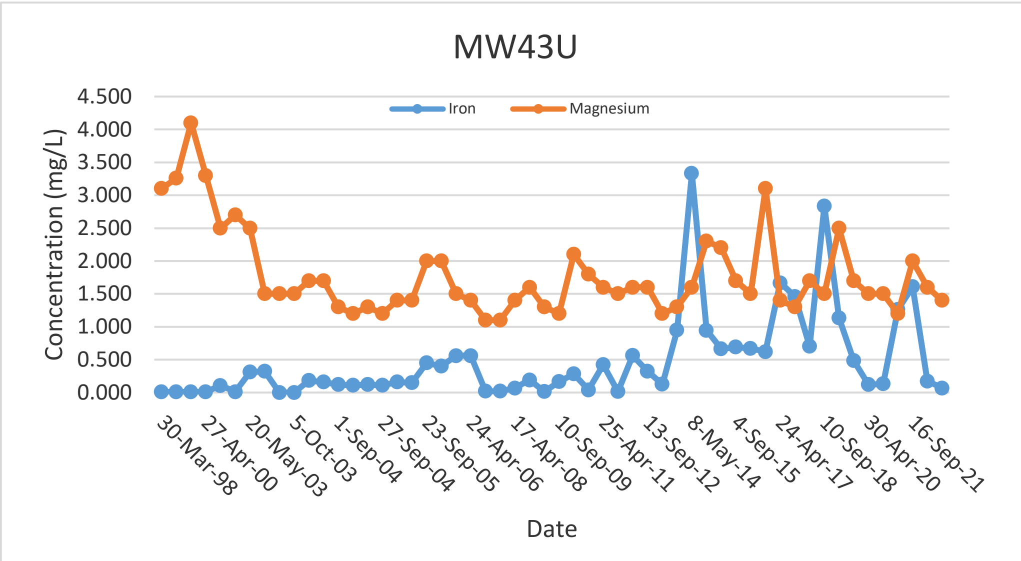
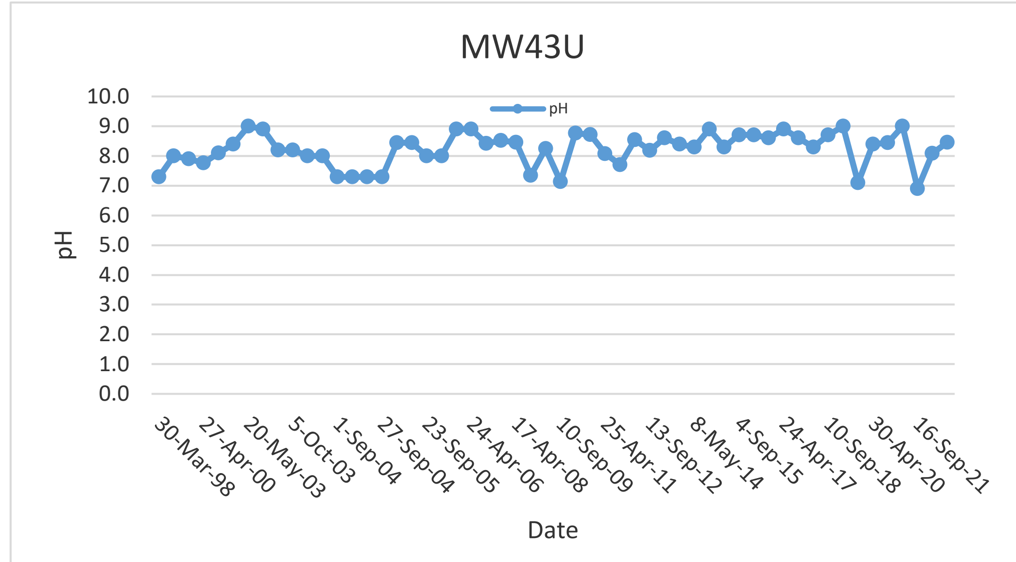
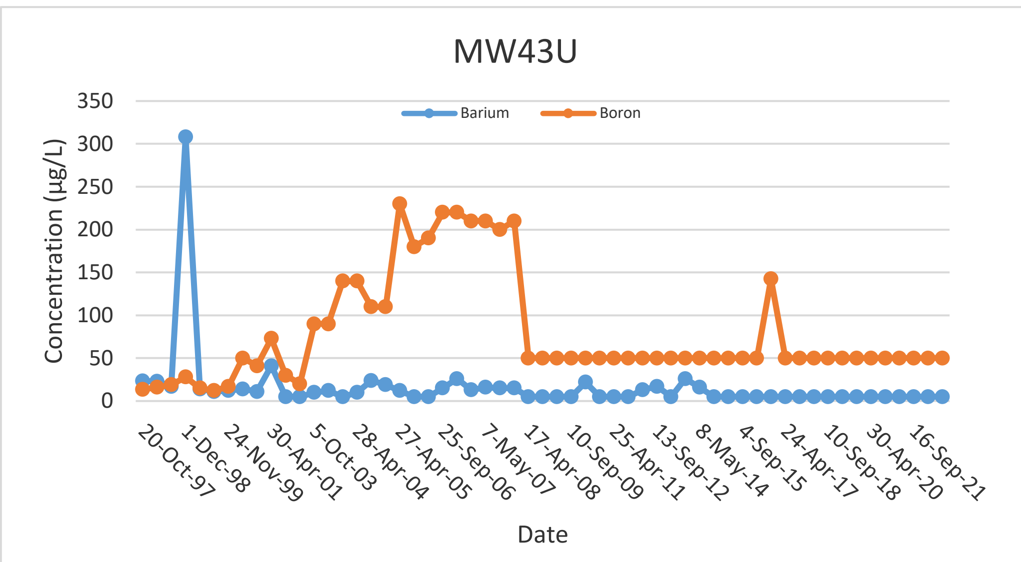
Appendix J:
Trend Graphs MW43U
1997 - 2022

Client: Fundy Regional Services Commission
Project Number: 4662.09

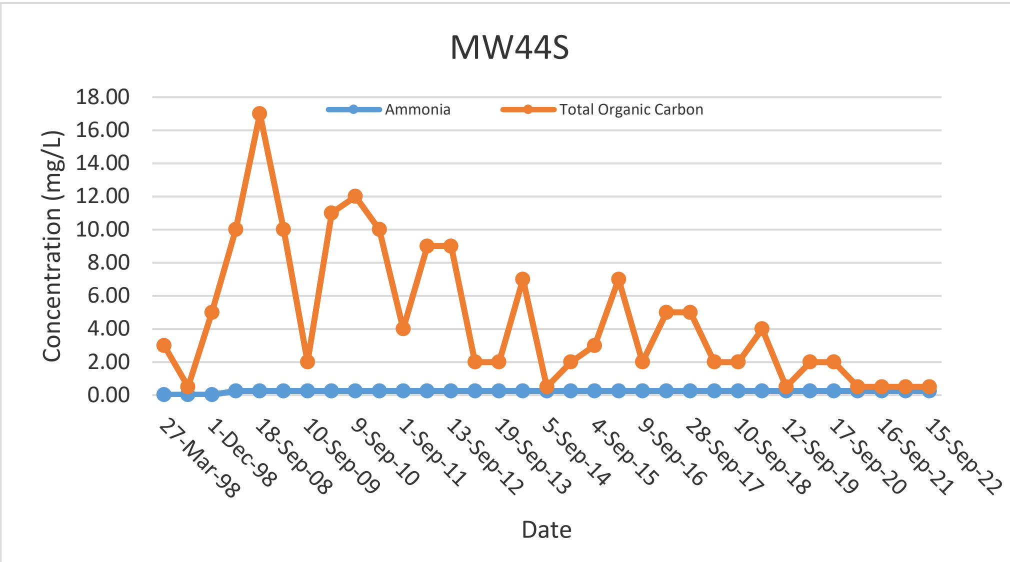


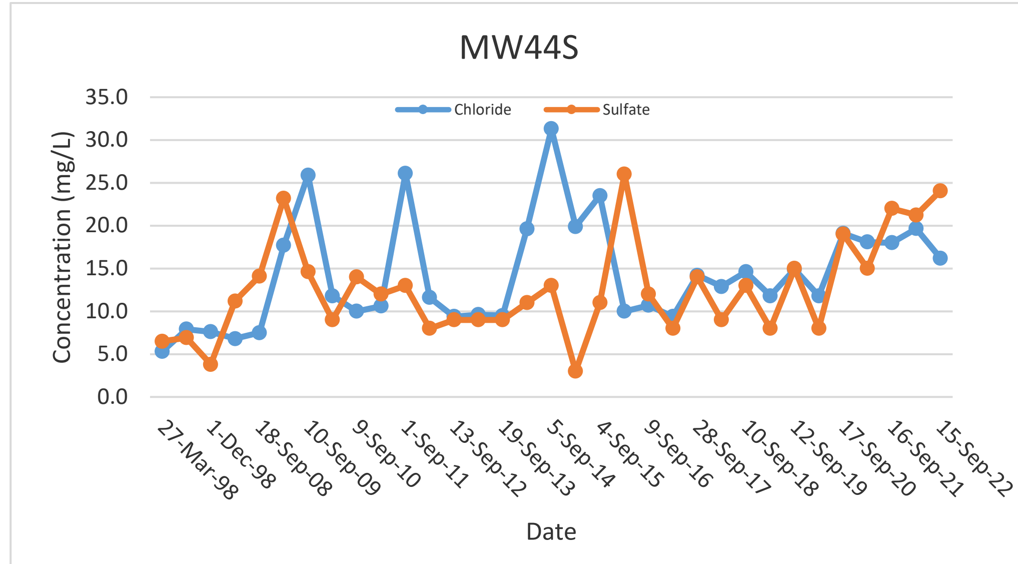


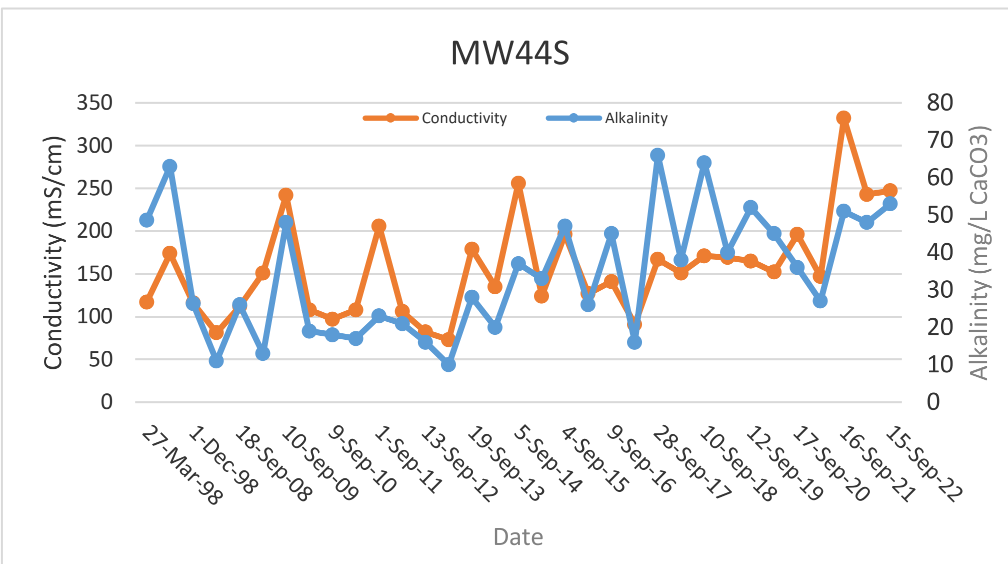


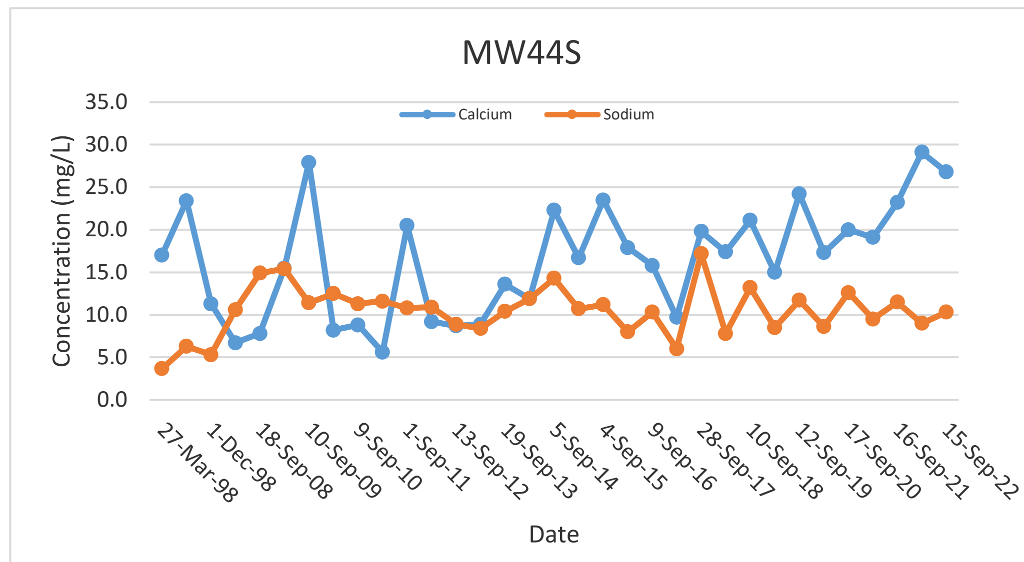
Appendix J:
Trend Graphs MW44S
1997 - 2022

Client: Fundy Regional Services Commission
Project Number: 4662.09









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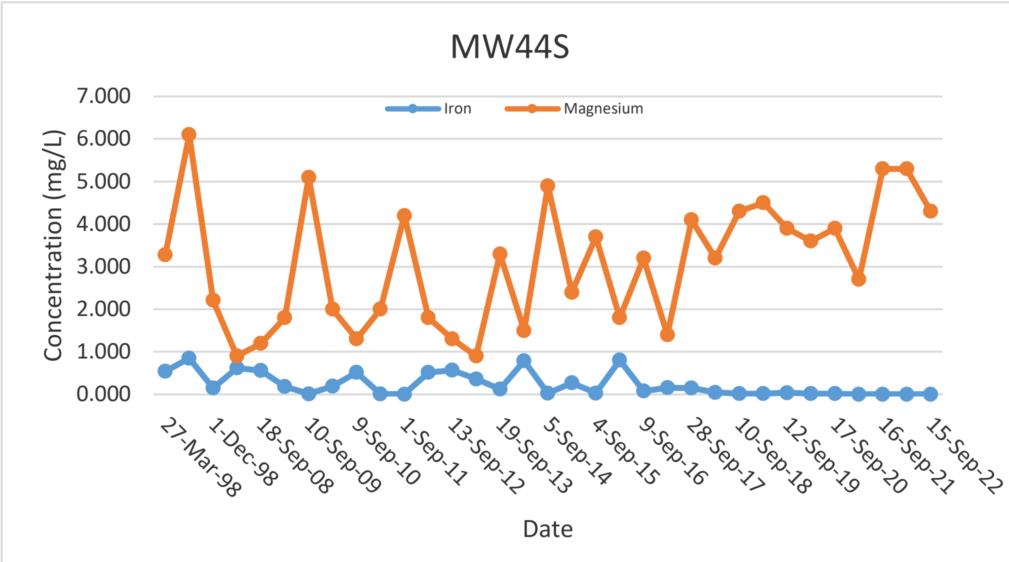
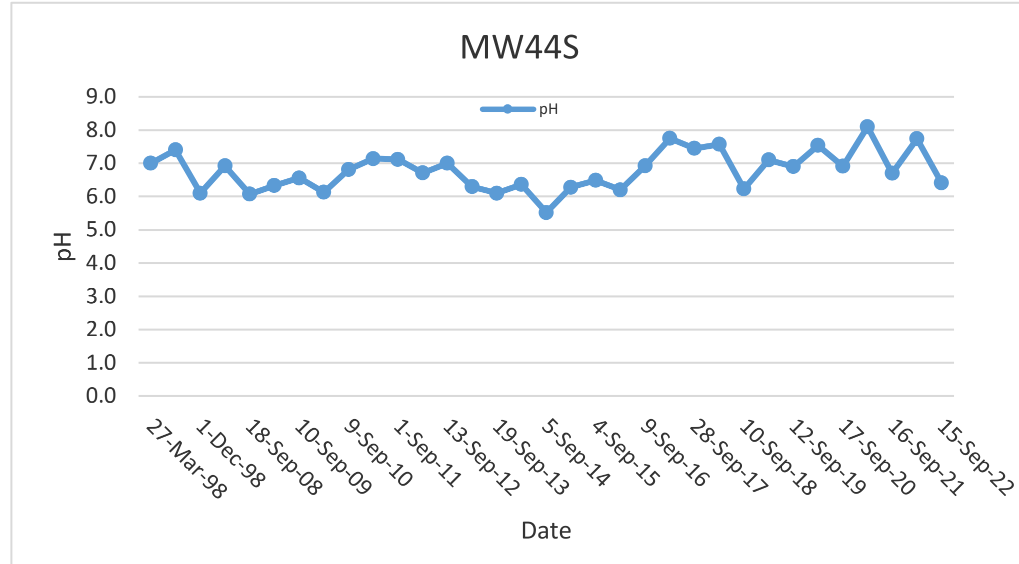
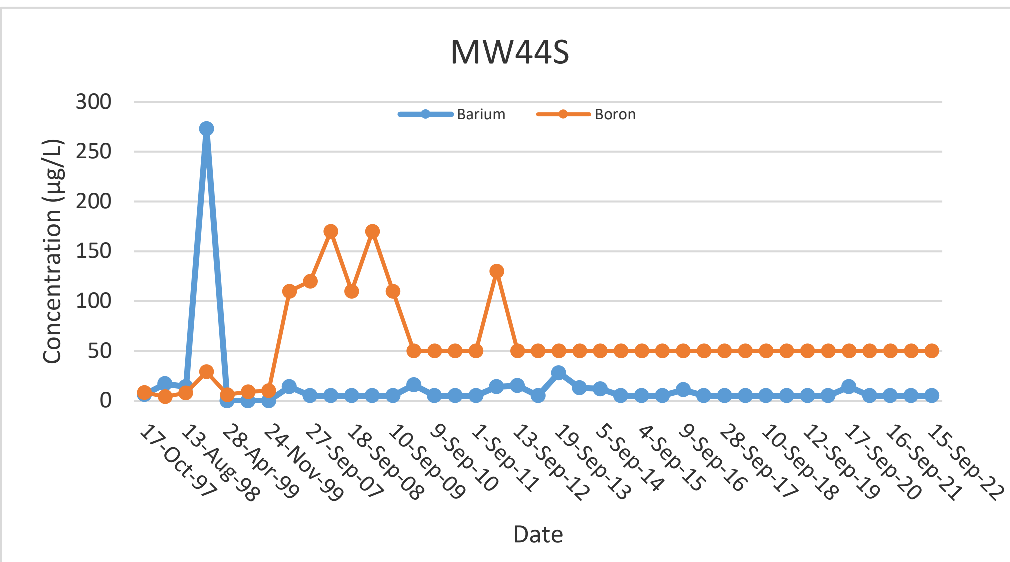
Appendix J:
Trend Graphs MW44S
1997 - 2022

Client: Fundy Regional Services Commission
Project Number: 4662.09

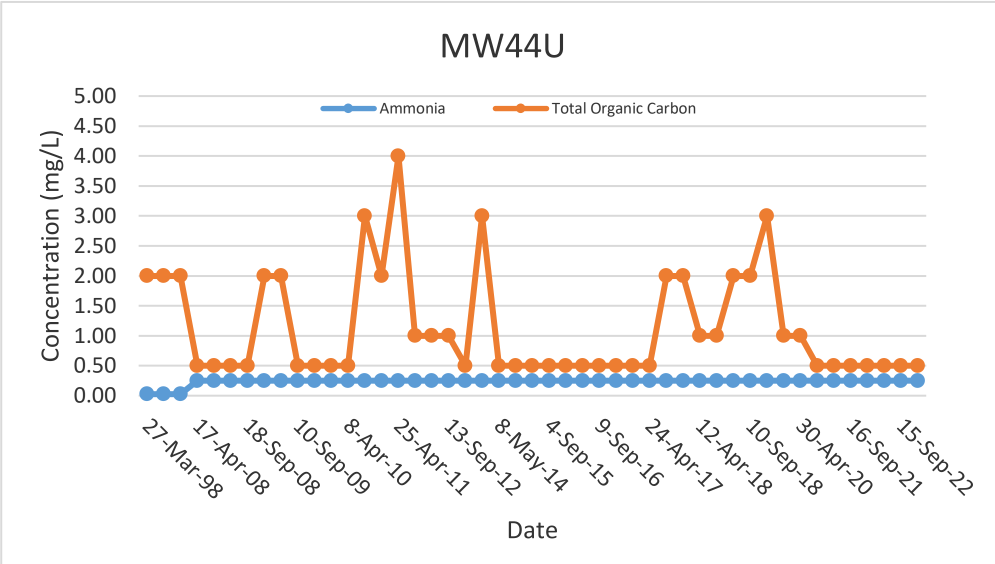


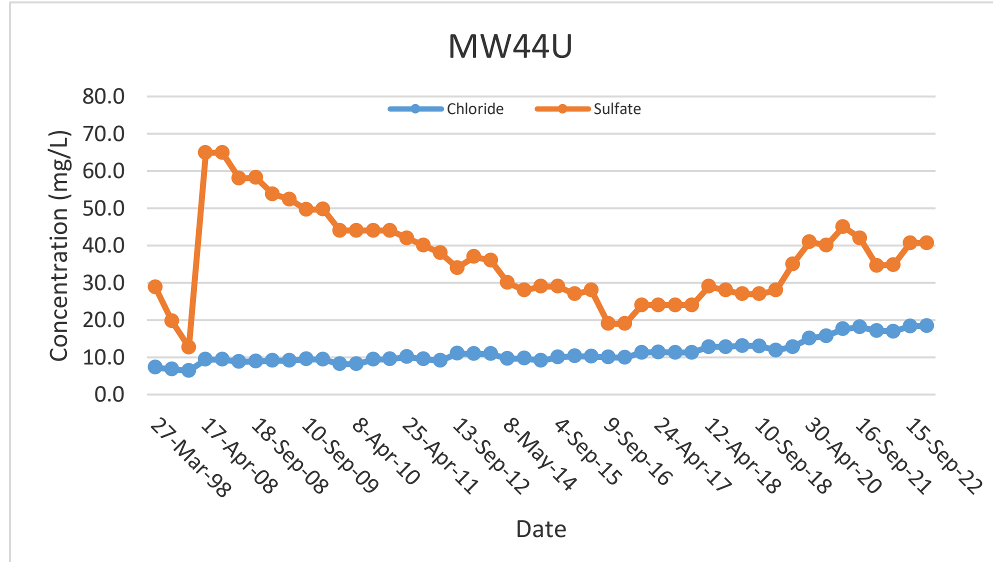


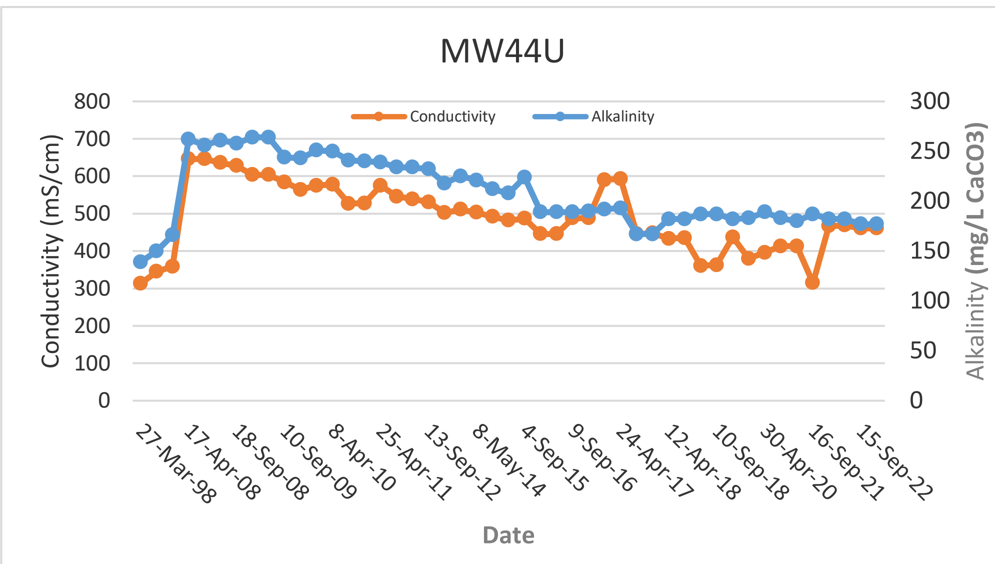


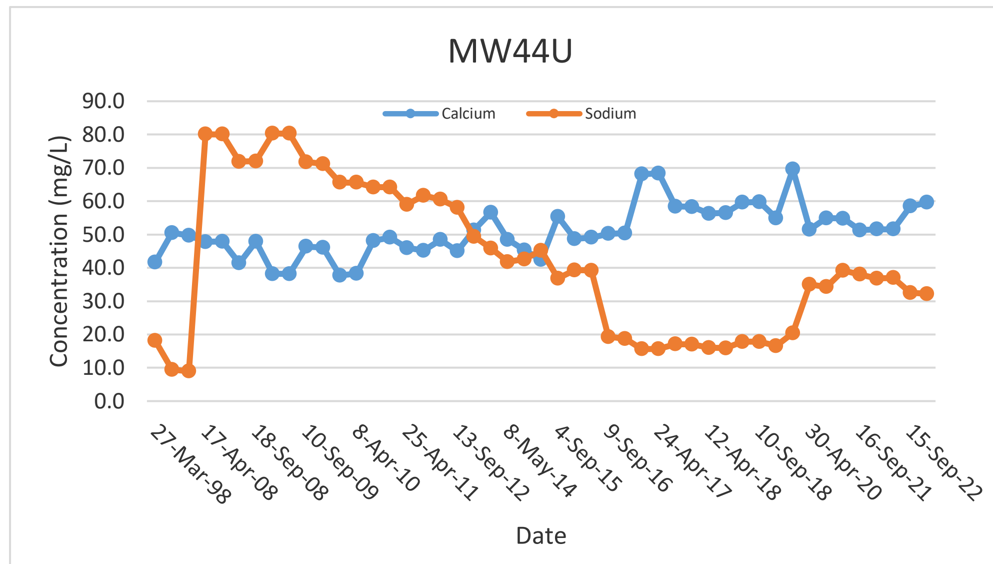
Appendix J:
Trend Graphs MW44U
1997 - 2022

Client: Fundy Regional Services Commission
Project Number: 4662.09



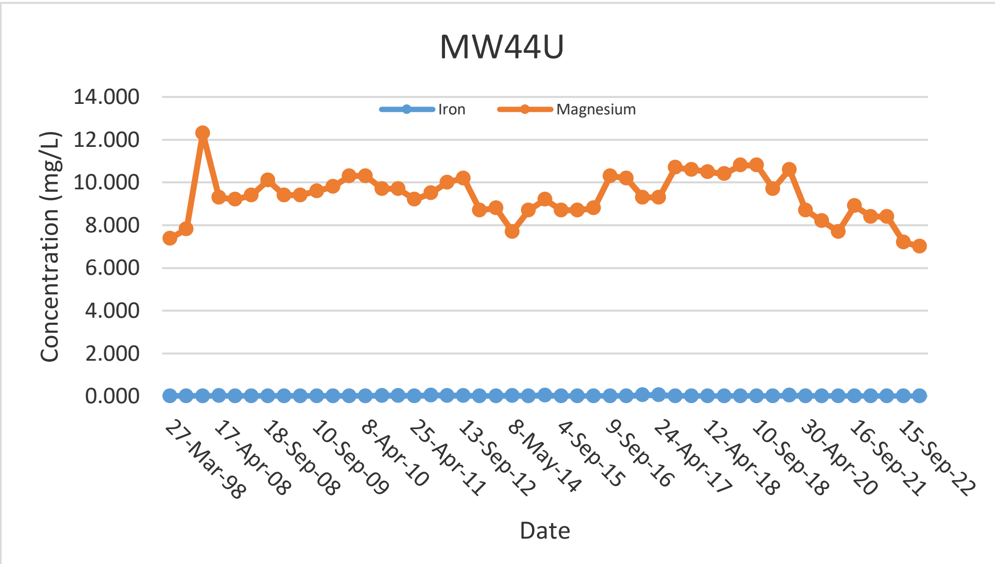


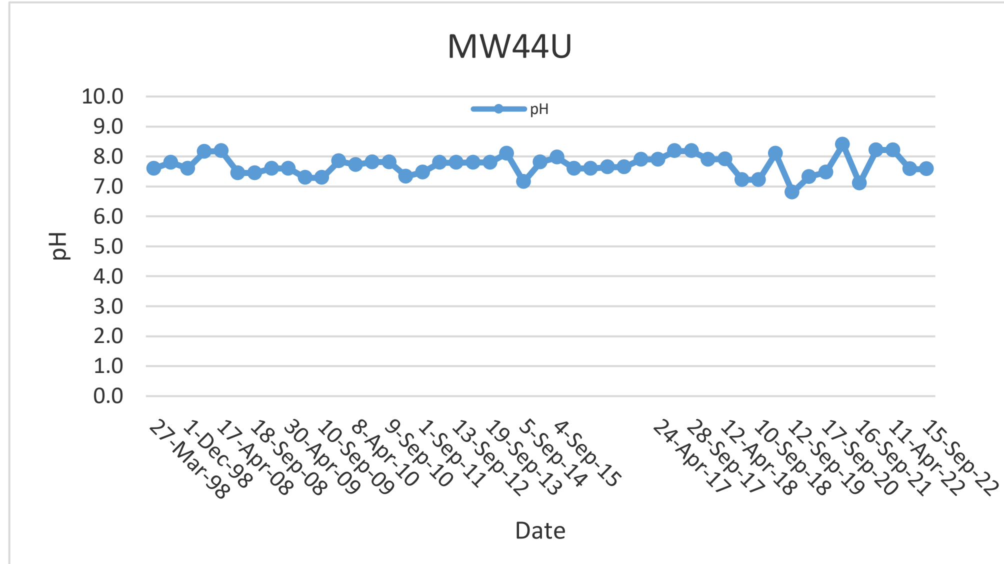


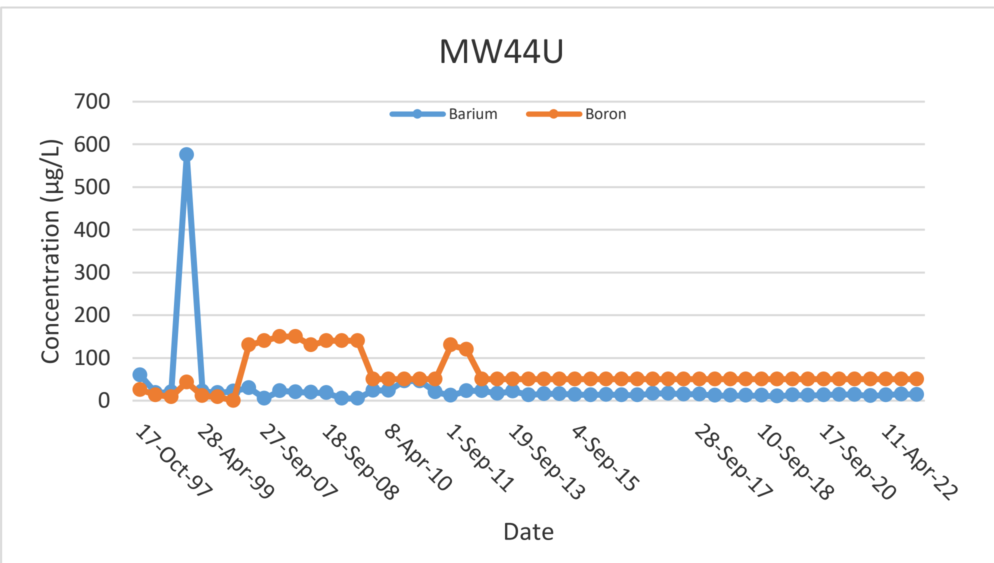


Appendix J:
Trend Graphs MW44U
1997 - 2022

Client: Fundy Regional Services Commission
Project Number: 4662.09

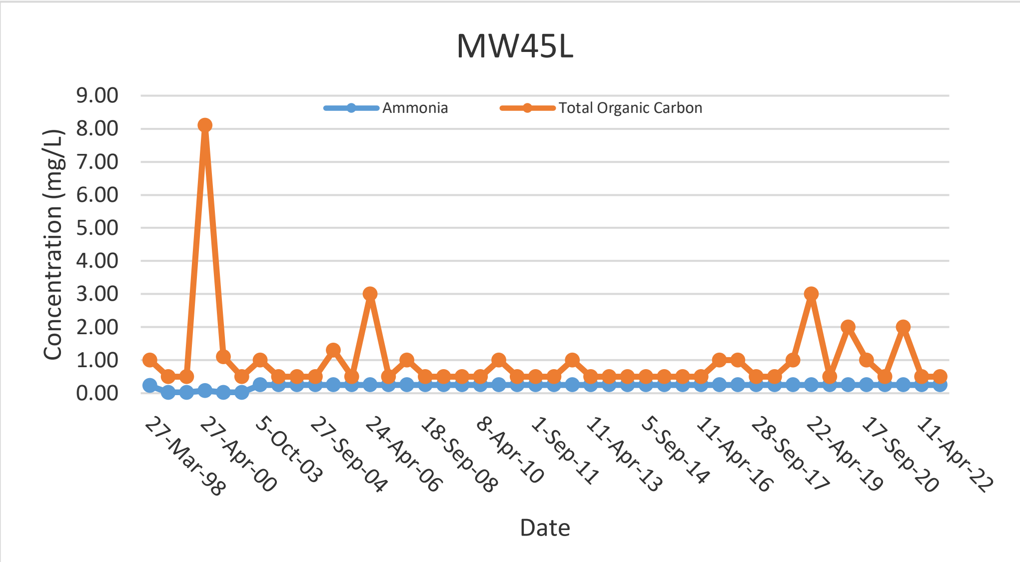


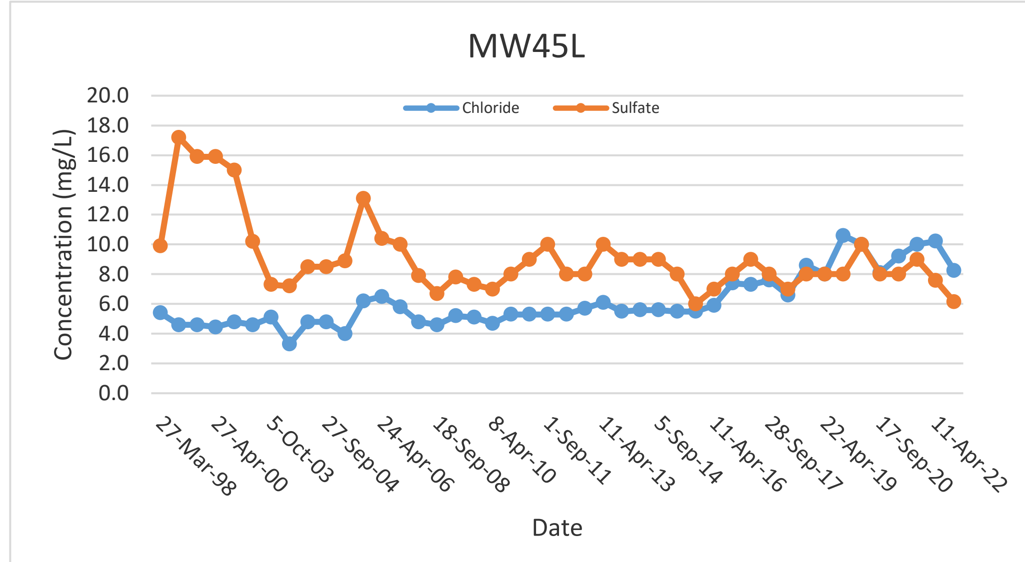


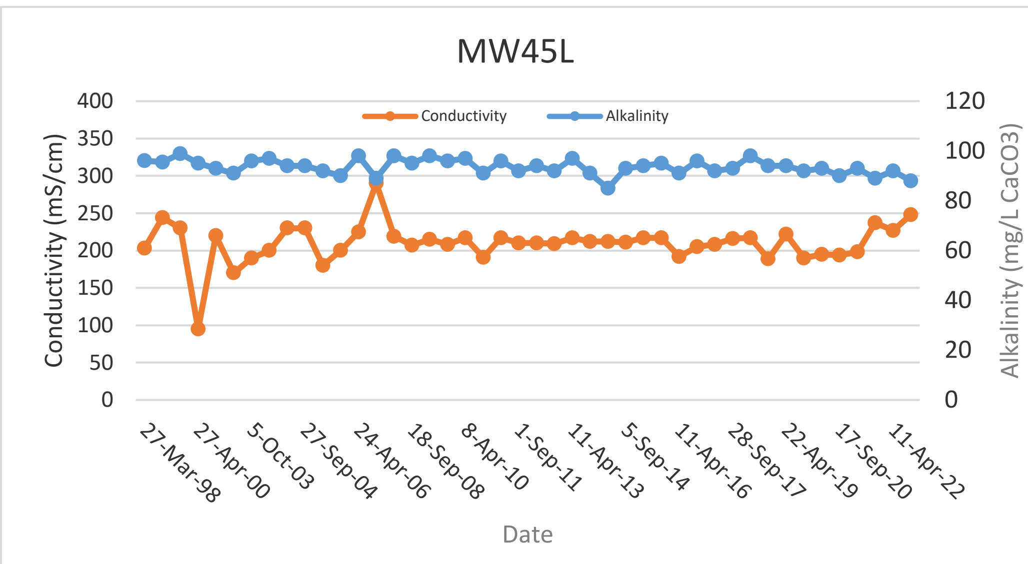


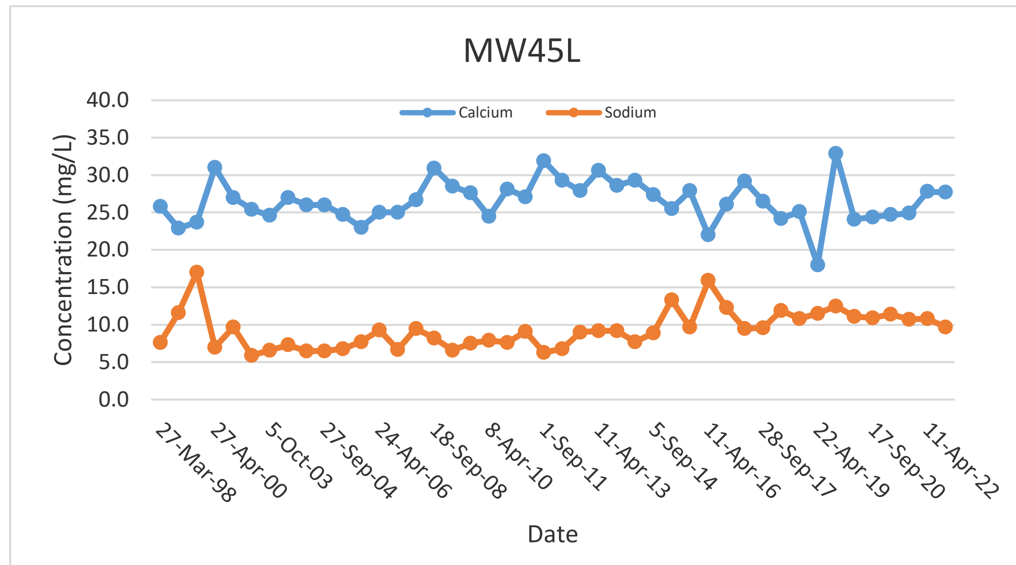
Appendix J:
Trend Graphs MW45L
1997 - 2022

Client: Fundy Regional Services Commission
Project Number: 4662.09









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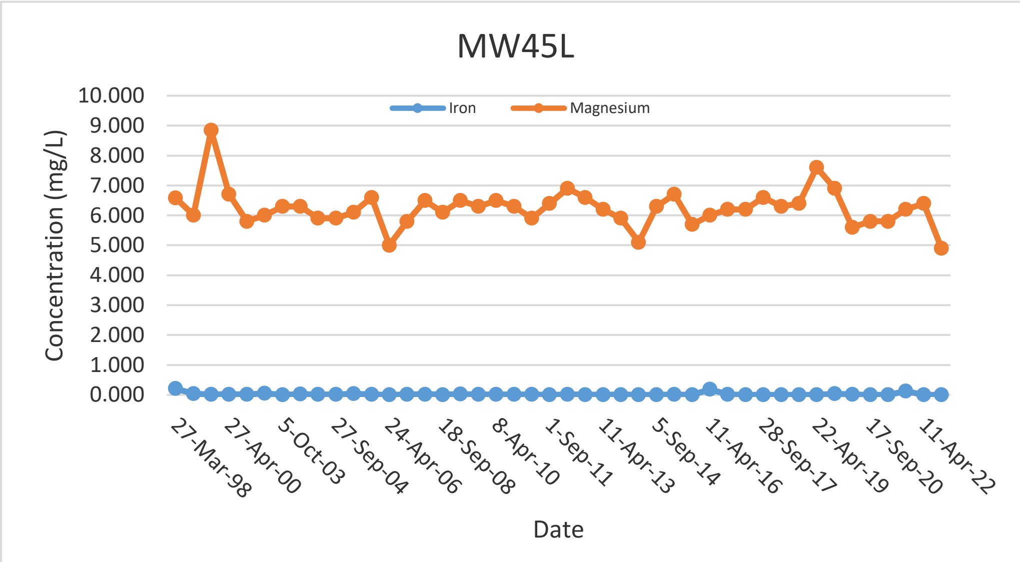
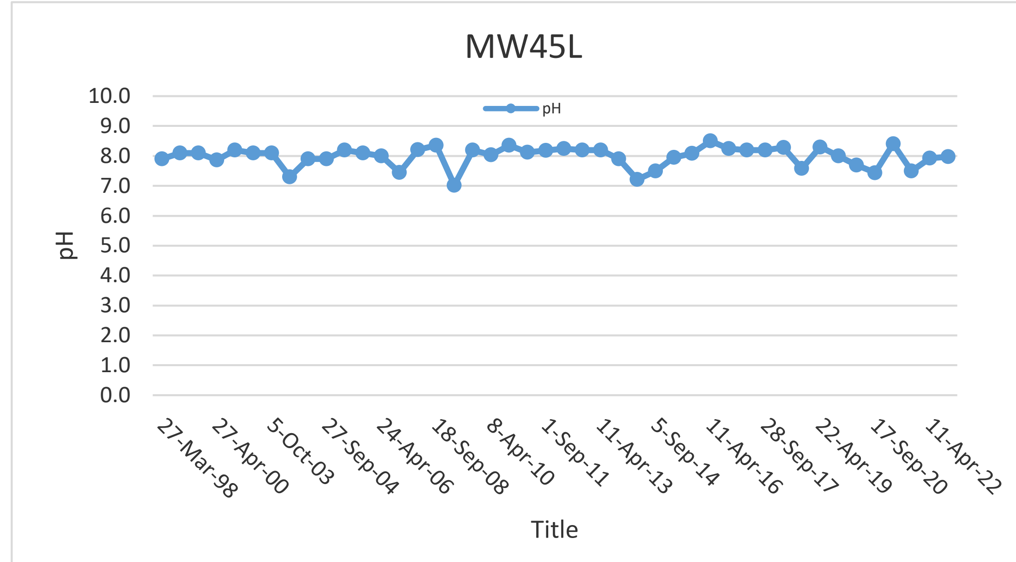
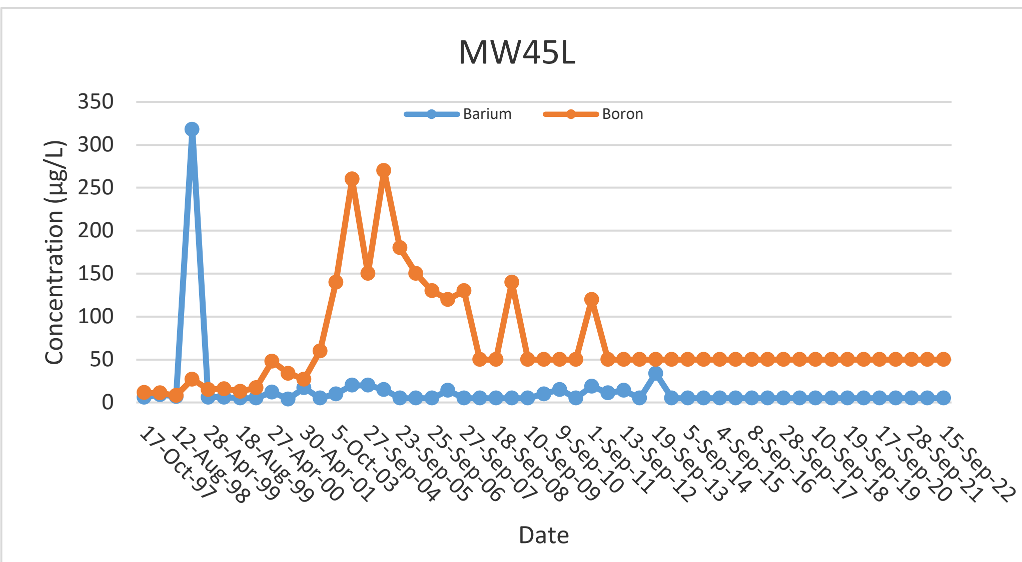
Appendix J:
Trend Graphs MW45L
1997 - 2022

Client: Fundy Regional Services Commission
Project Number: 4662.09







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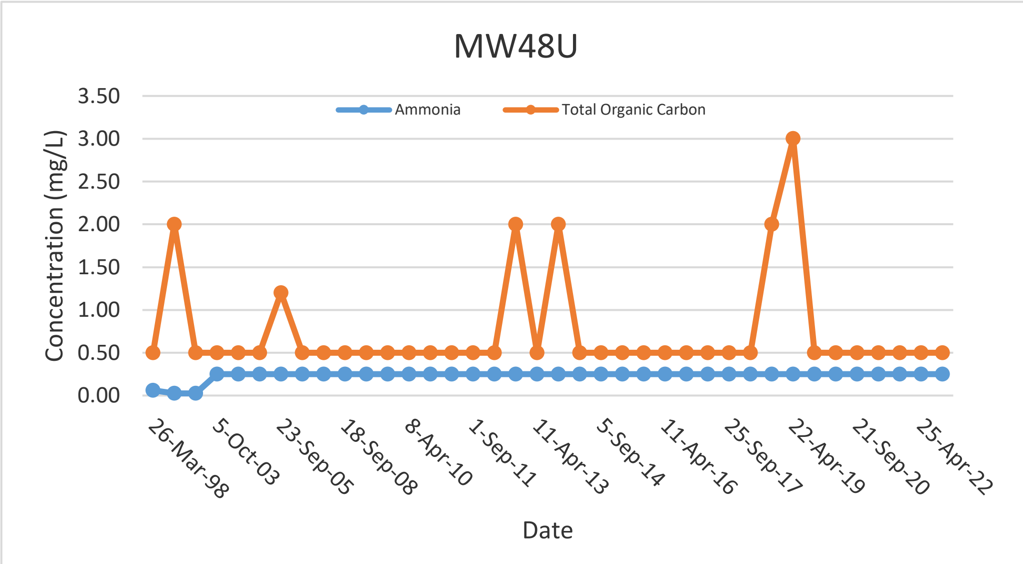
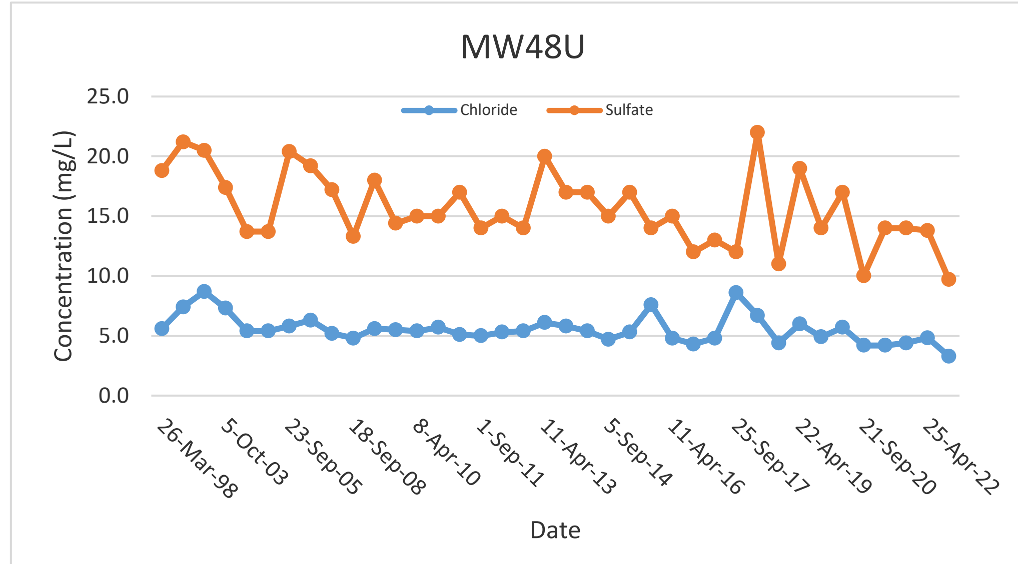
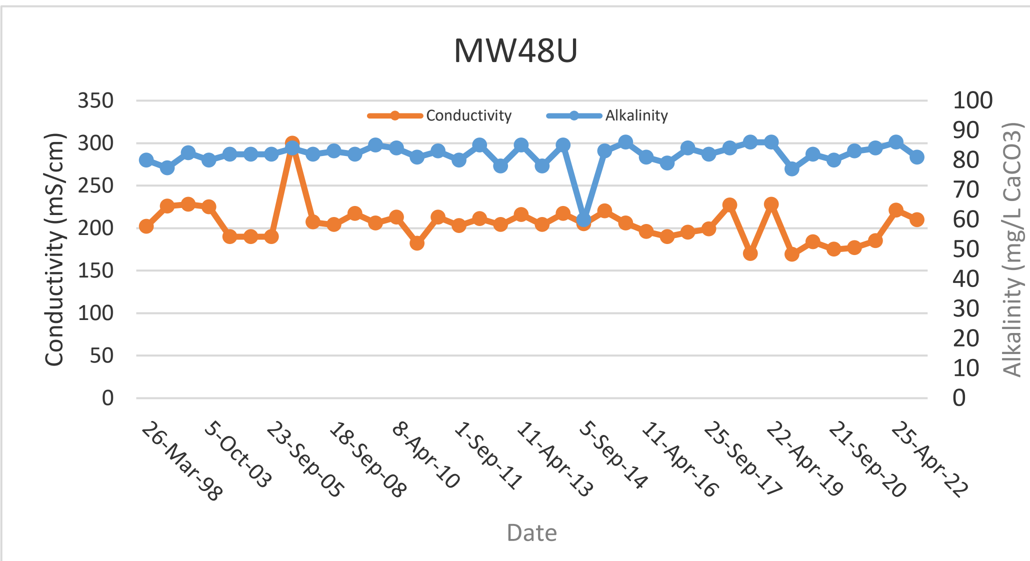
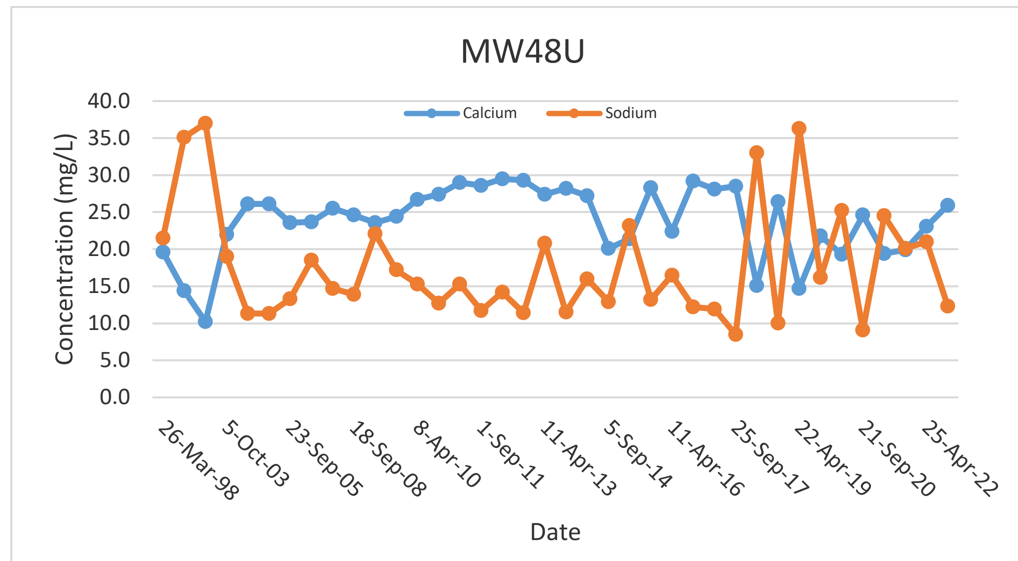
Appendix J:
Trend Graphs MW48U
1997 - 2022

Client: Fundy Regional Services Commission
Project Number: 4662.09



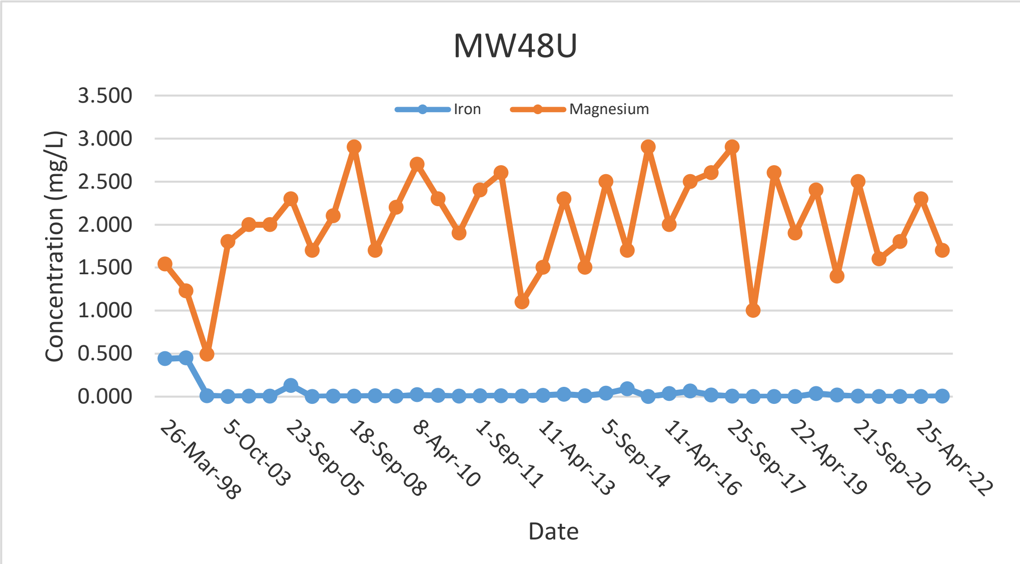


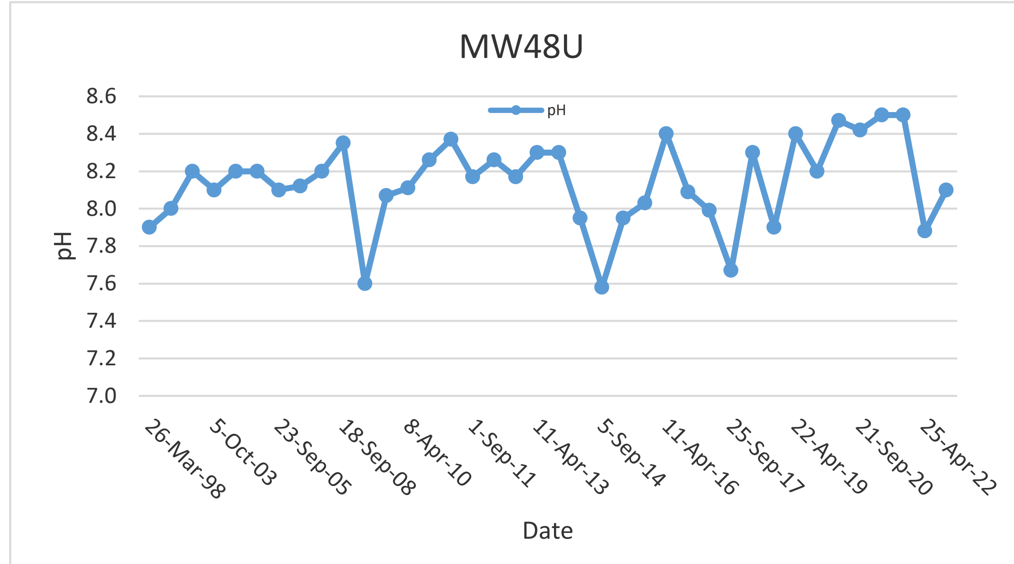


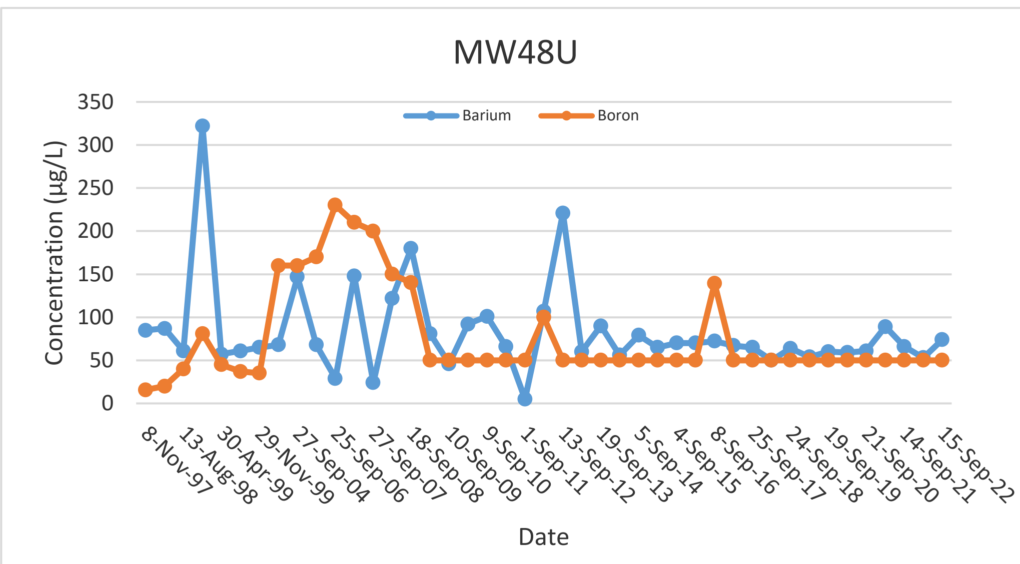


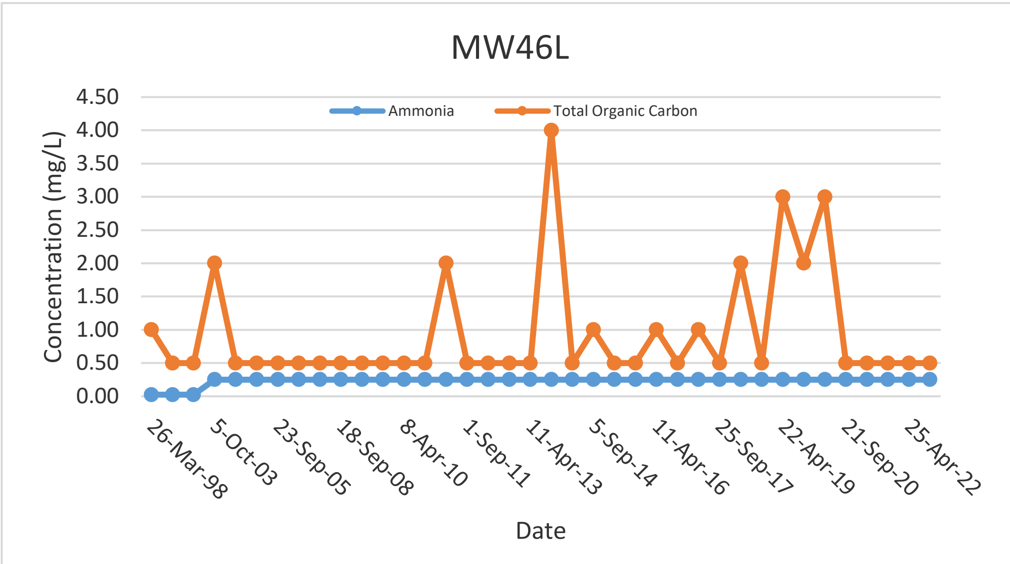
Appendix J:
Trend Graphs MW48U
1997 - 2022

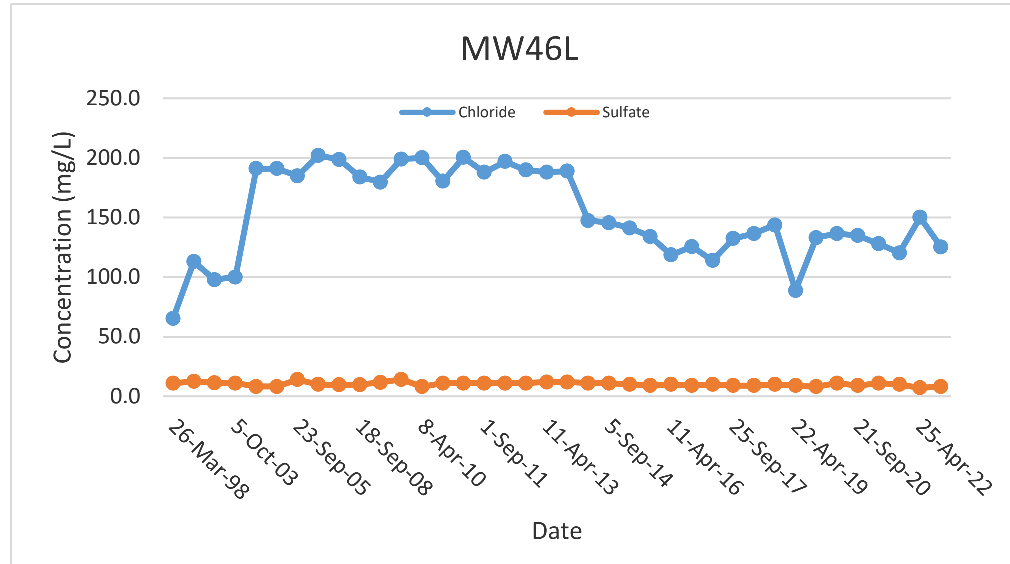
Client: Fundy Regional Services Commission
Project Number: 4662.09

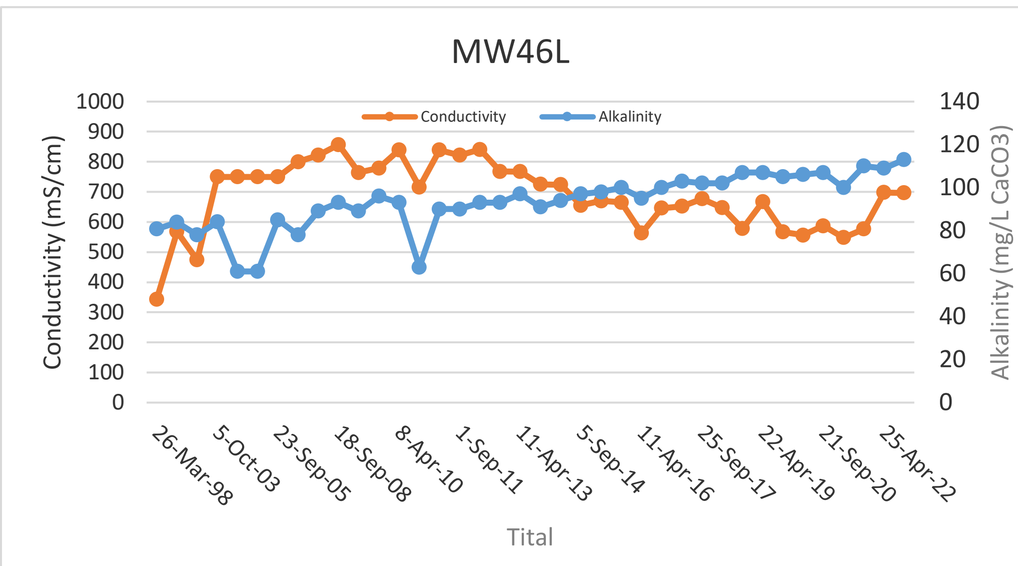


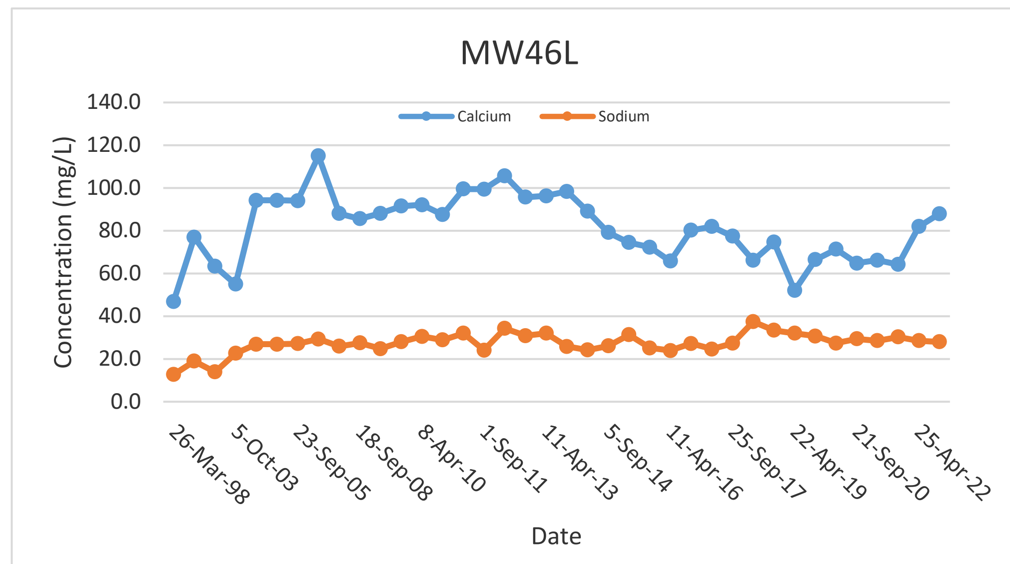





MW46L
Ammonia
Total Organic Carbon
Concentration (mg/L)
4.50
4.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
26-Mar-98
5-Oct-03
23-Sep-05
18-Sep-08
8-Apr-10
1-Sep-11
11-Apr-13
5-Sep-14
11-Apr-16
25-Sep-17
22-Apr-19
21-Sep-20
25-Apr-22
Date


MW46L
Chloride
Sulfate
Concentration (mg/L)
250.0
200.0
150.0
100.0
50.0
0.0
26-Mar-98
5-Oct-03
23-Sep-05
18-Sep-08
8-Apr-10
1-Sep-11
11-Apr-13
5-Sep-14
11-Apr-16
25-Sep-17
22-Apr-19
21-Sep-20
25-Apr-22
Date


MW46L
Conductivity
Alkalinity
Conductivity (mS/cm)
Alkalinity (mg/L CaCO3)
1000
900
800
700
600
500
400
300
200
100
0
140
120
100
80
60
40
20
0
26-Mar-98
5-Oct-03
23-Sep-05
18-Sep-08
8-Apr-10
1-Sep-11
11-Apr-13
5-Sep-14
11-Apr-16
25-Sep-17
22-Apr-19
21-Sep-20
25-Apr-22
Tital


MW46L
Calcium
Sodium
Concentration (mg/L)
140.0
120.0
100.0
80.0
60.0
40.0
20.0
0.0
26-Mar-98
5-Oct-03
23-Sep-05
18-Sep-08
8-Apr-10
1-Sep-11
11-Apr-13
5-Sep-14
11-Apr-16
25-Sep-17
22-Apr-19
21-Sep-20
25-Apr-22
Date

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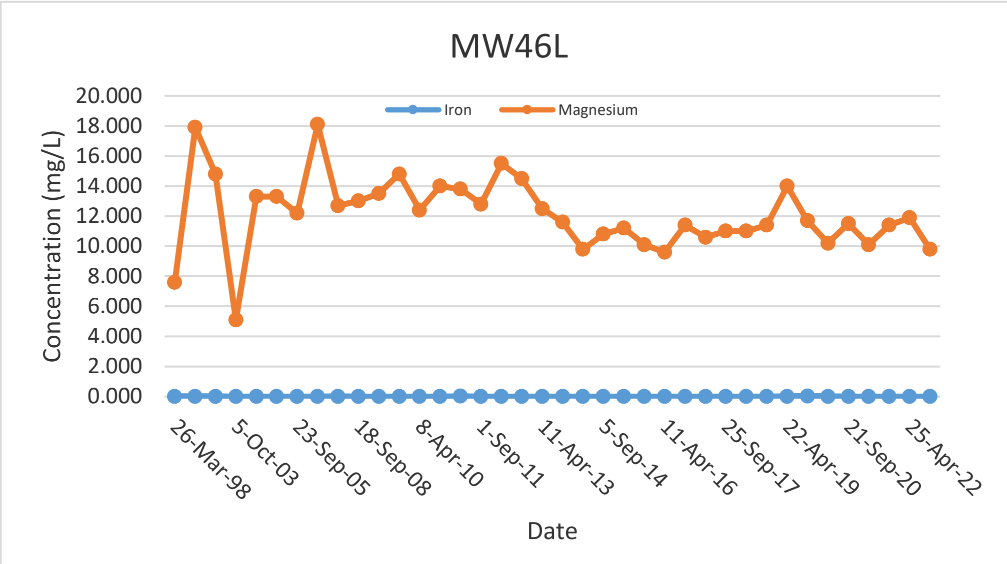
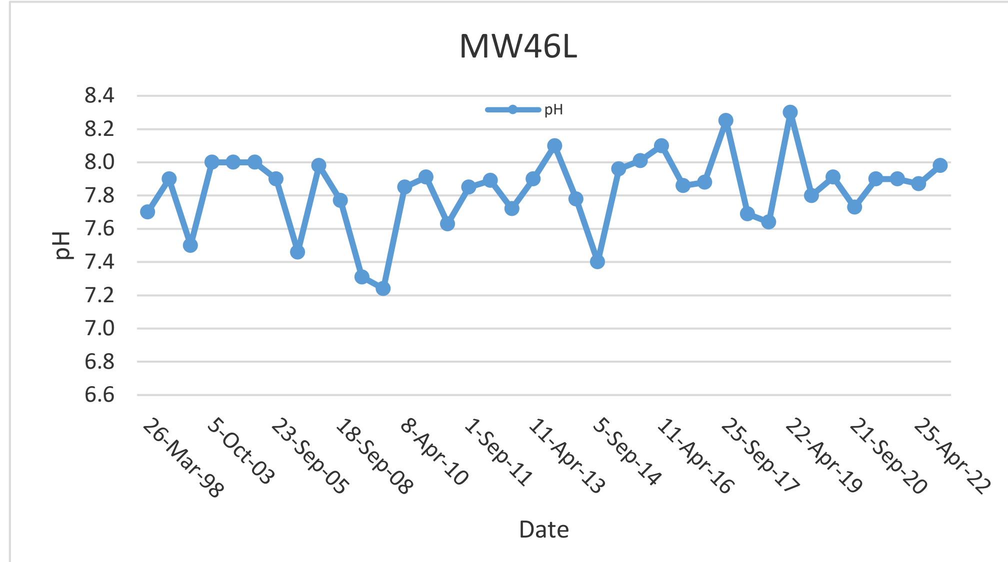
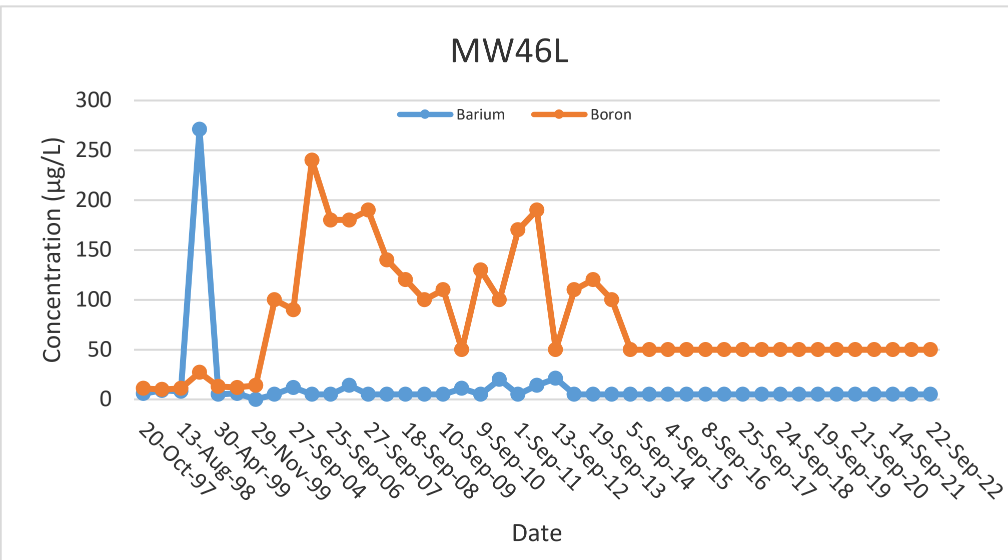
Appendix J:
Trend Graphs MW46L
1997 - 2022

Client: Fundy Regional Services Commission
Project Number: 4662.09

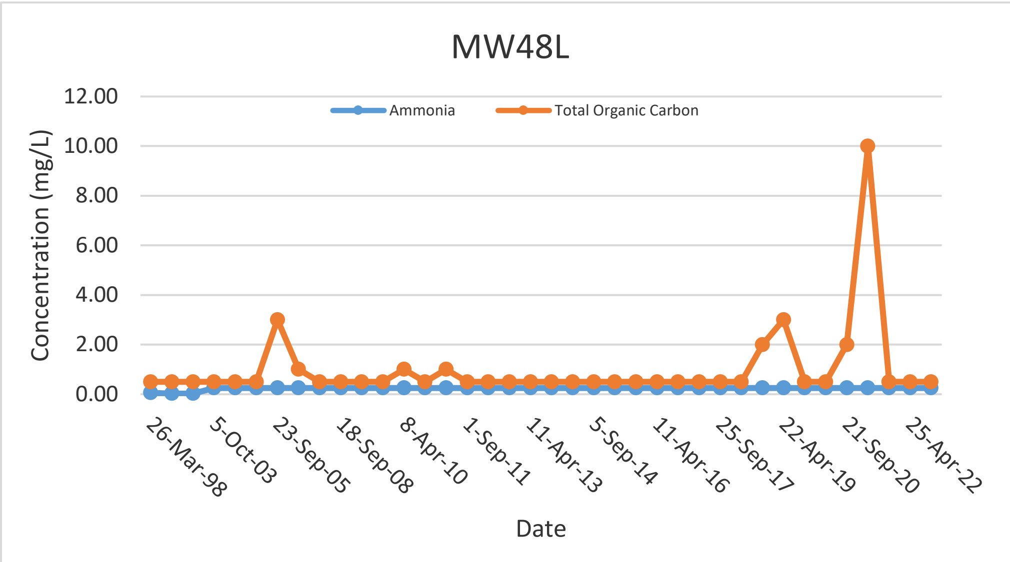


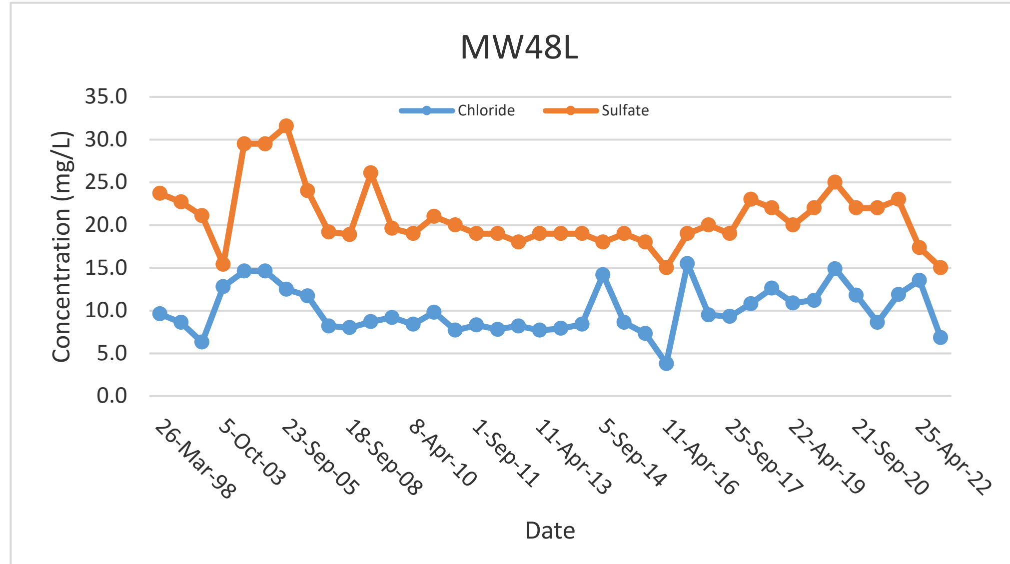


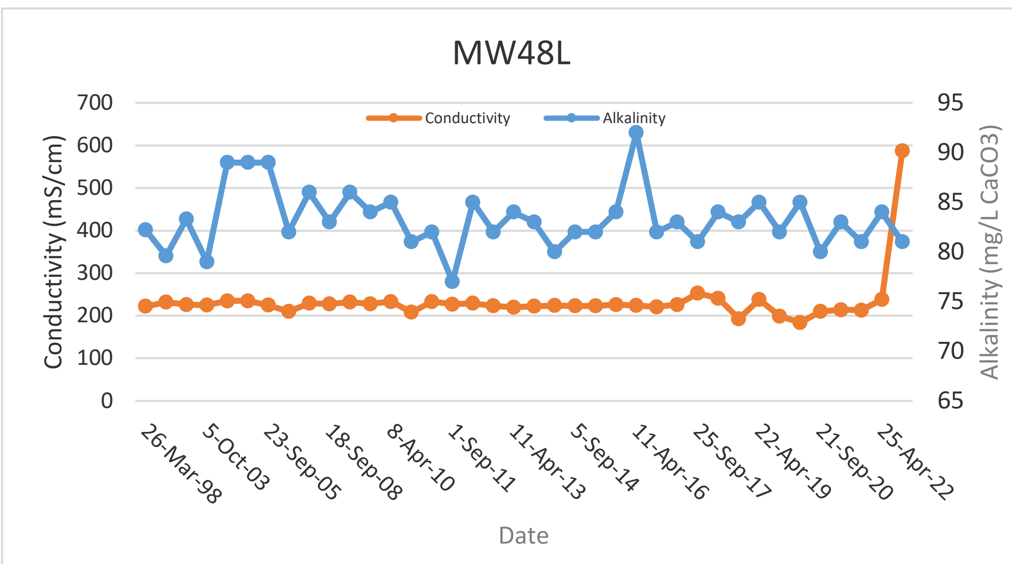


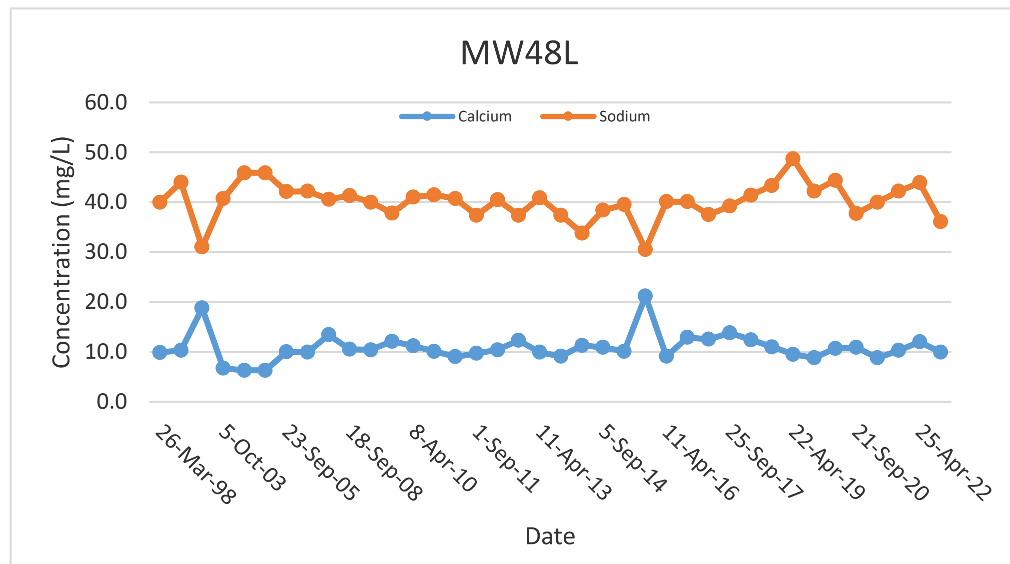
Appendix J:
Trend Graphs MW48L
1997 - 2022

Client: Fundy Regional Services Commission
Project Number: 4662.09









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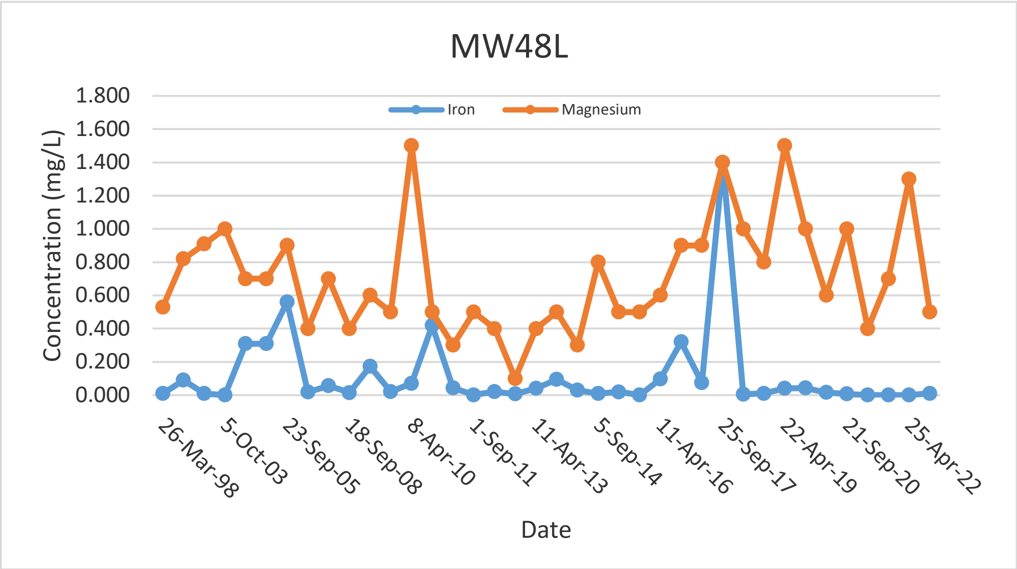
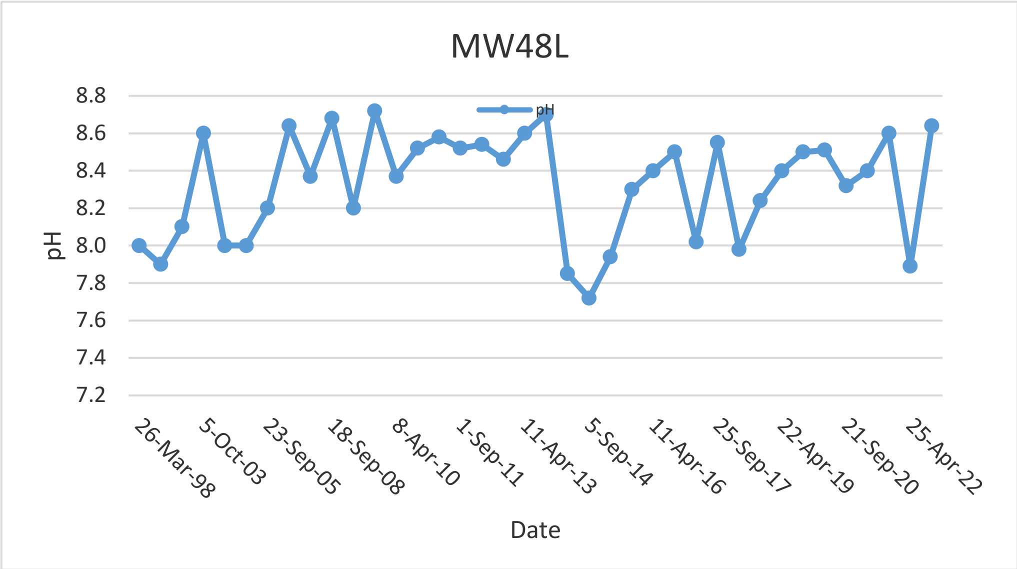
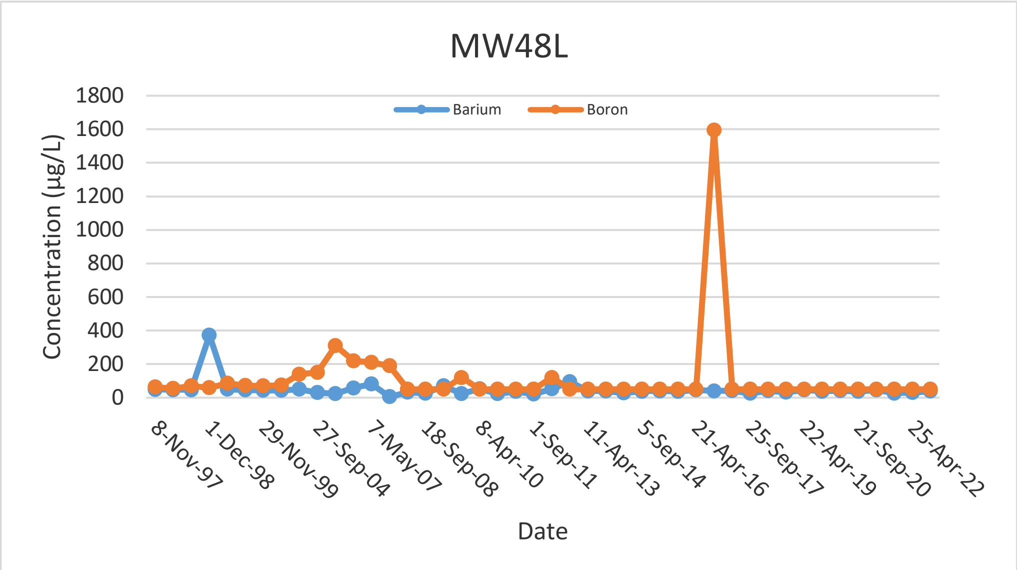
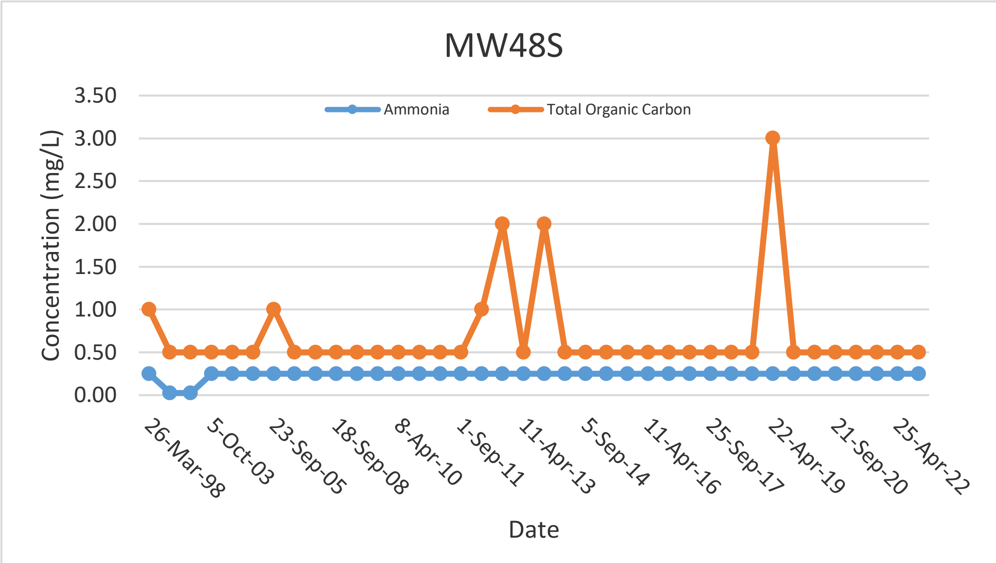
Appendix J:
Trend Graphs MW48L
1997 - 2022

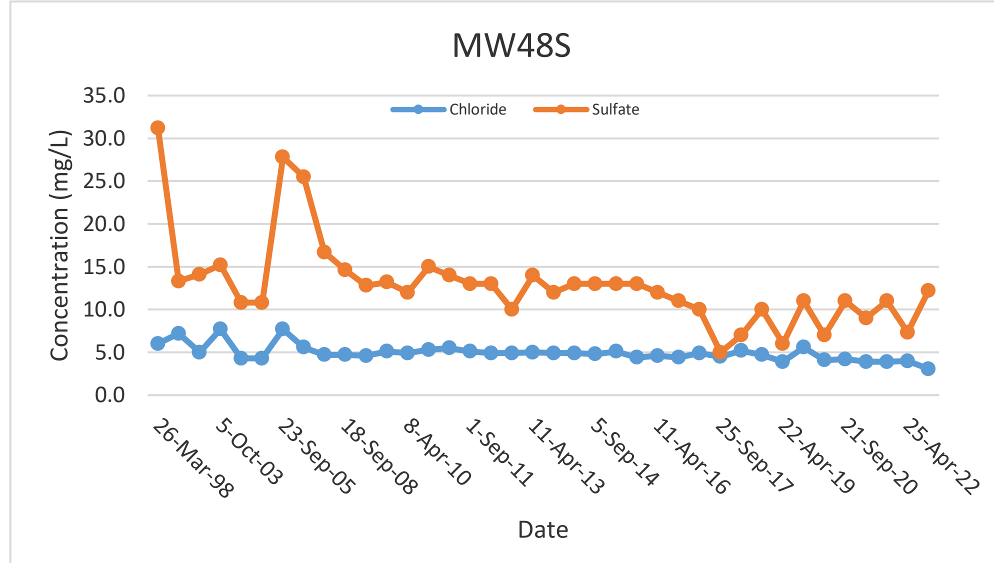
Client: Fundy Regional Services Commission
Project Number: 4662.09

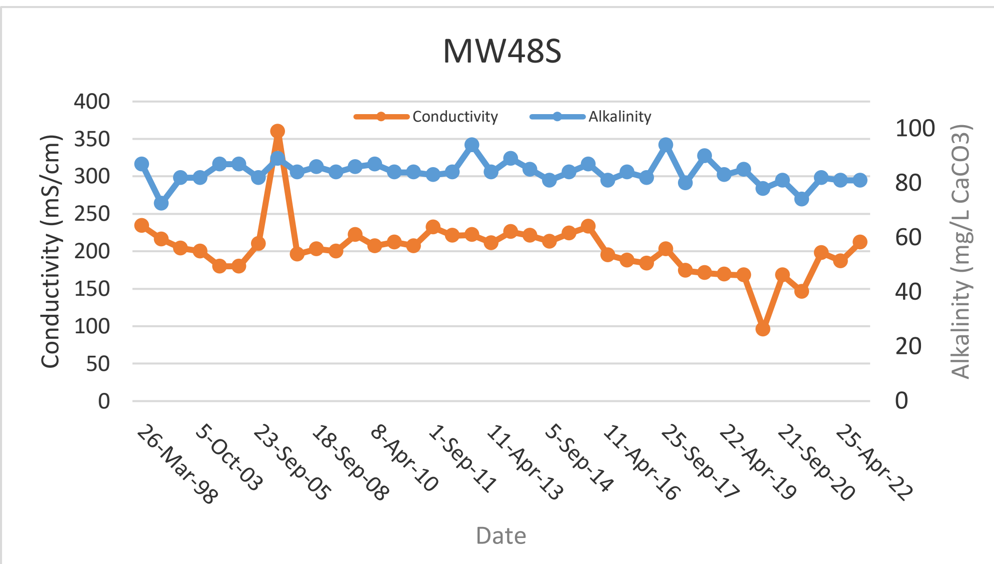


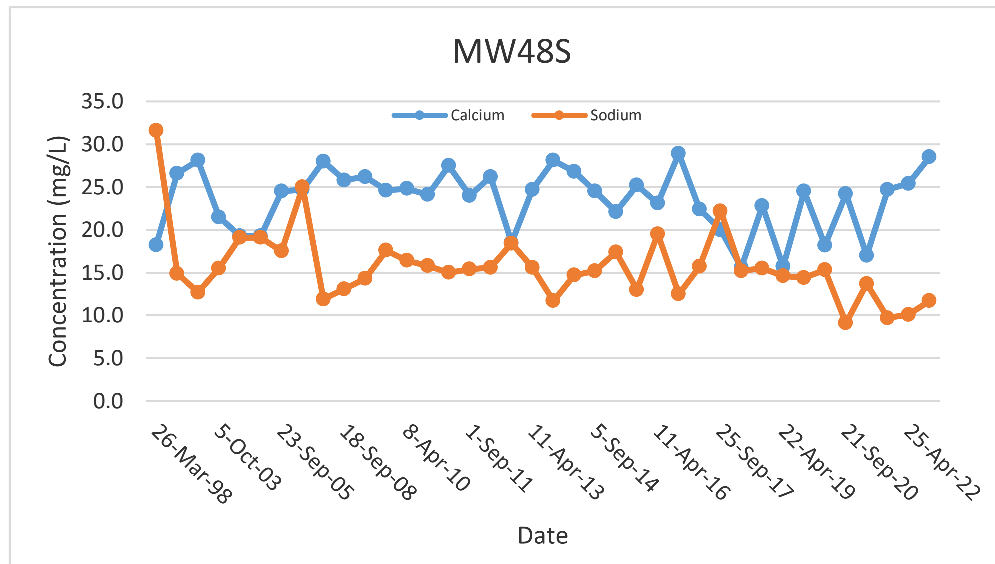


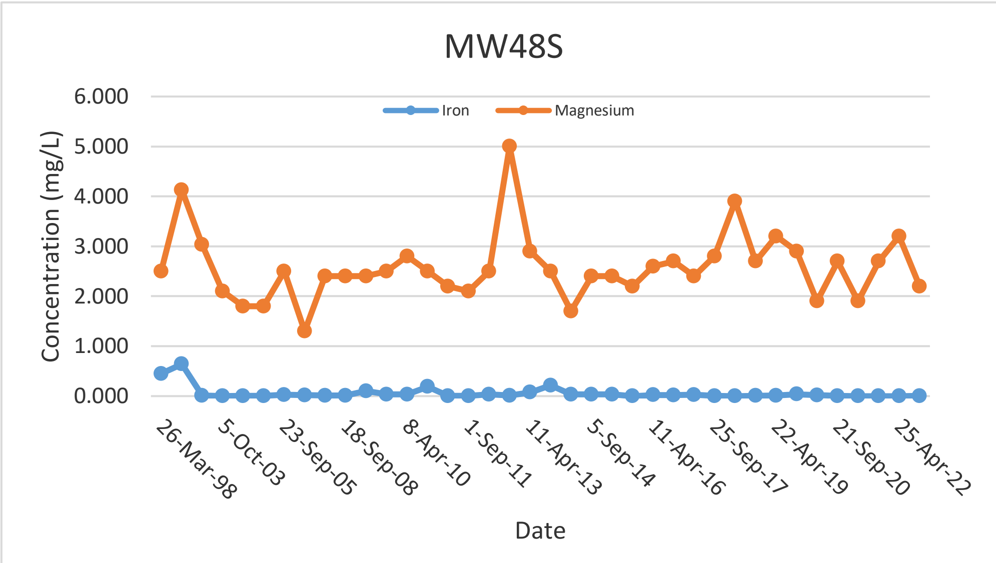


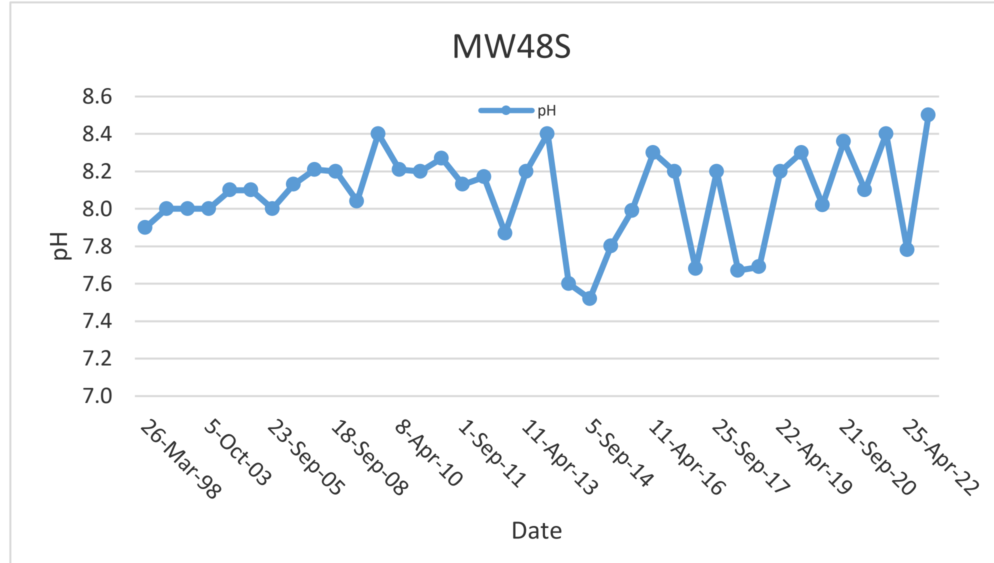

MW48S
Ammonia
Total Organic Carbon
Concentration (mg/L)
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
26-Mar-98
5-Oct-03
23-Sep-05
18-Sep-08
8-Apr-10
1-Sep-11
11-Apr-13
5-Sep-14
11-Apr-16
25-Sep-17
22-Apr-19
21-Sep-20
25-Apr-22
Date

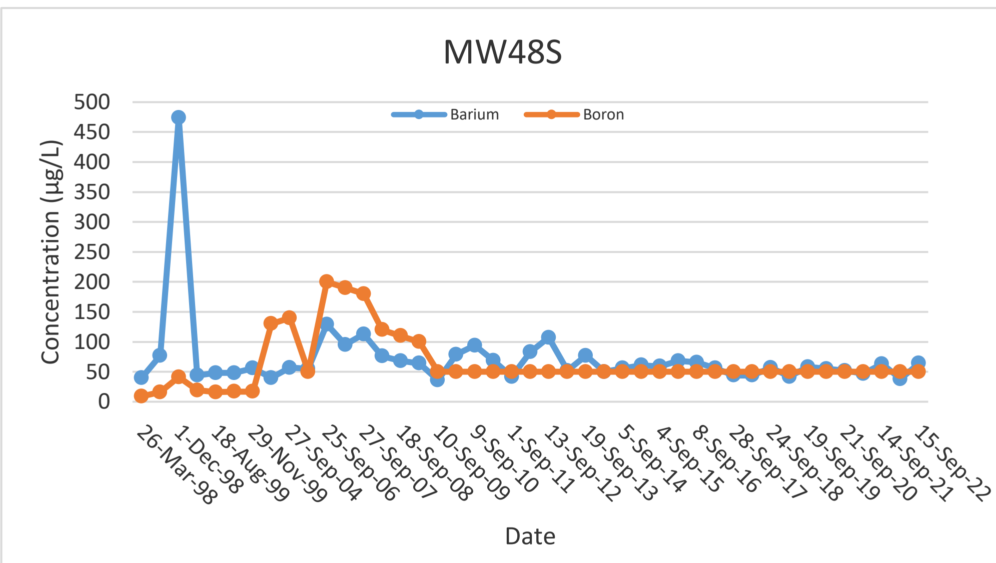

MW48S
Chloride
Sulfate
Concentration (mg/L)
35.0
30.0
25.0
20.0
15.0
10.0
5.0
0.0
26-Mar-98
5-Oct-03
23-Sep-05
18-Sep-08
8-Apr-10
1-Sep-11
11-Apr-13
5-Sep-14
11-Apr-16
25-Sep-17
22-Apr-19
21-Sep-20
25-Apr-22
Date


MW48S
Conductivity
Alkalinity
Conductivity (mS/cm)
400
350
300
250
200
150
100
50
0
Alkalinity (mg/L CaCO3)
100
80
60
40
20
0
26-Mar-98
5-Oct-03
23-Sep-05
18-Sep-08
8-Apr-10
1-Sep-11
11-Apr-13
5-Sep-14
11-Apr-16
25-Sep-17
22-Apr-19
21-Sep-20
25-Apr-22
Date


MW48S
Calcium
Sodium
Concentration (mg/L)
35.0
30.0
25.0
20.0
15.0
10.0
5.0
0.0
26-Mar-98
5-Oct-03
23-Sep-05
18-Sep-08
8-Apr-10
1-Sep-11
11-Apr-13
5-Sep-14
11-Apr-16
25-Sep-17
22-Apr-19
21-Sep-20
25-Apr-22
Date

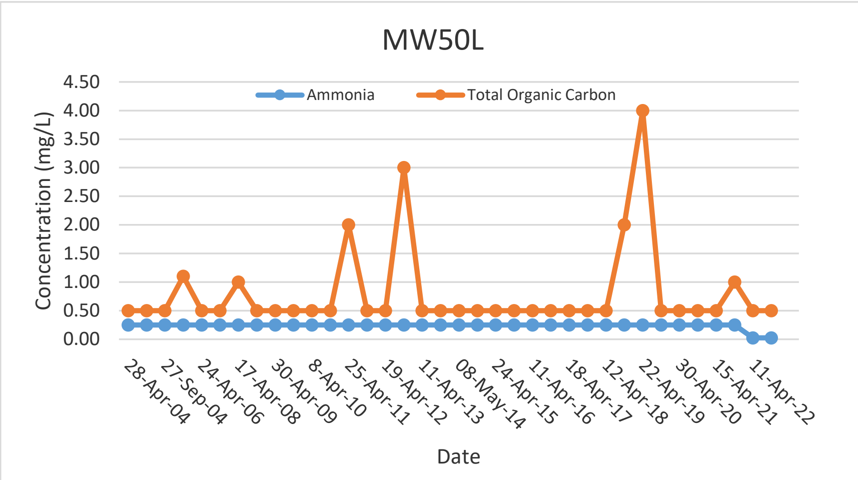

MW48S
Iron
Magnesium
Concentration (mg/L)
6.000
5.000
4.000
3.000
2.000
1.000
0.000
26-Mar-98
5-Oct-03
23-Sep-05
18-Sep-08
8-Apr-10
1-Sep-11
11-Apr-13
5-Sep-14
11-Apr-16
25-Sep-17
22-Apr-19
21-Sep-20
25-Apr-22
Date

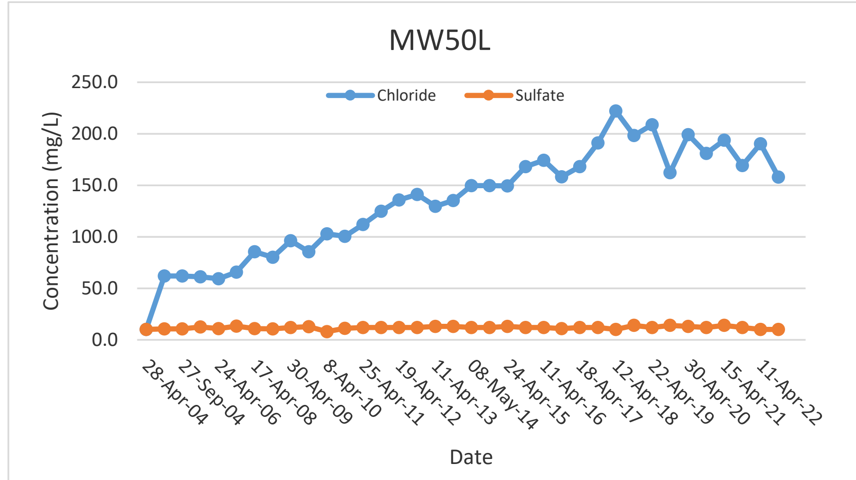

MW48S
pH
pH
8.6
8.4
8.2
8.0
7.8
7.6
7.4
7.2
7.0
26-Mar-98
5-Oct-03
23-Sep-05
18-Sep-08
8-Apr-10
1-Sep-11
11-Apr-13
5-Sep-14
11-Apr-16
25-Sep-17
22-Apr-19
21-Sep-20
25-Apr-22
Date

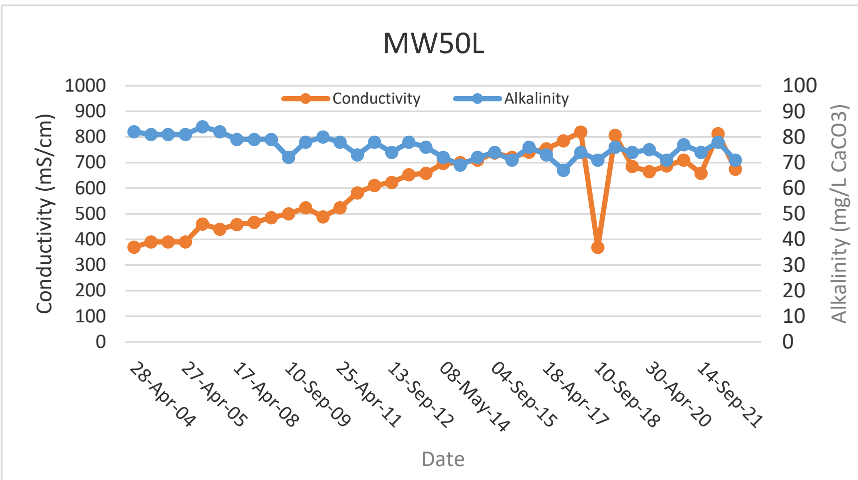

MW48S
Barium
Boron
Concentration (µg/L)
500
450
400
350
300
250
200
150
100
50
0
26-Mar-98
1-Dec-98
18-Aug-99
29-Nov-99
27-Sep-04
25-Sep-06
27-Sep-07
18-Sep-08
10-Sep-09
9-Sep-10
1-Sep-11
13-Sep-12
19-Sep-13
5-Sep-14
4-Sep-15
8-Sep-16
28-Sep-17
24-Sep-18
19-Sep-19
21-Sep-20
14-Sep-21
15-Sep-22
Date

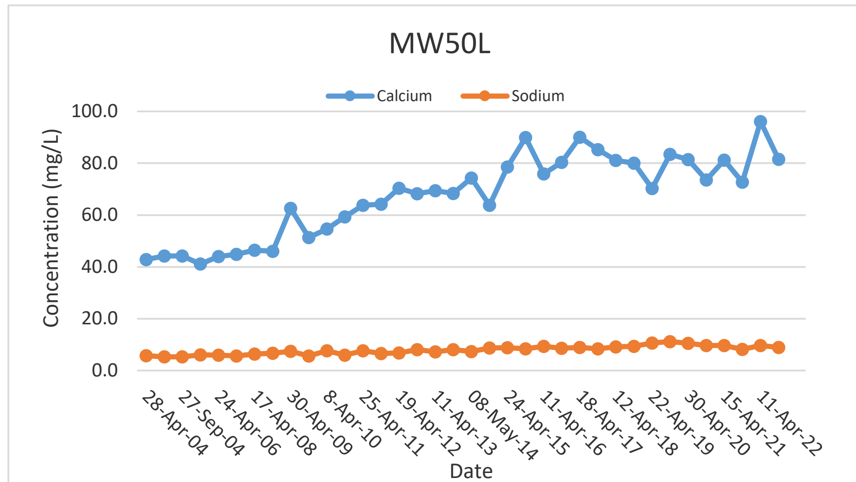
Appendix J:
Trend Graphs MW50L
1997 - 2022

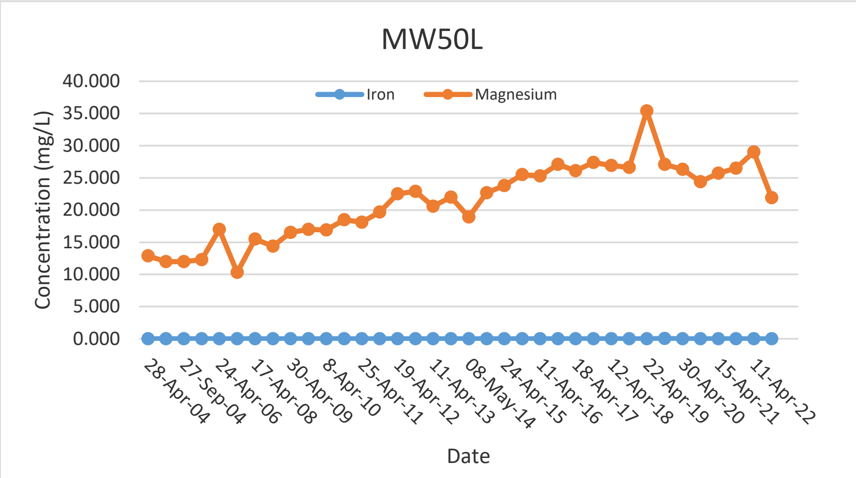
Client: Fundy Regional Services Commission
Project Number: 4662.09

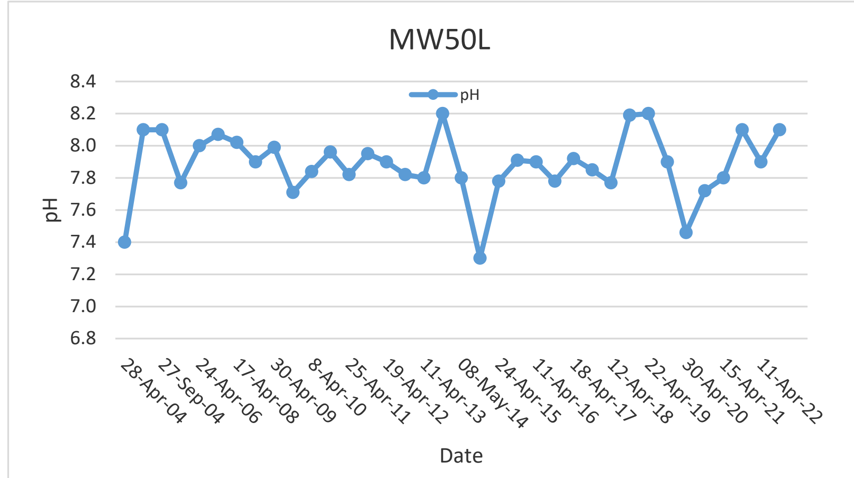


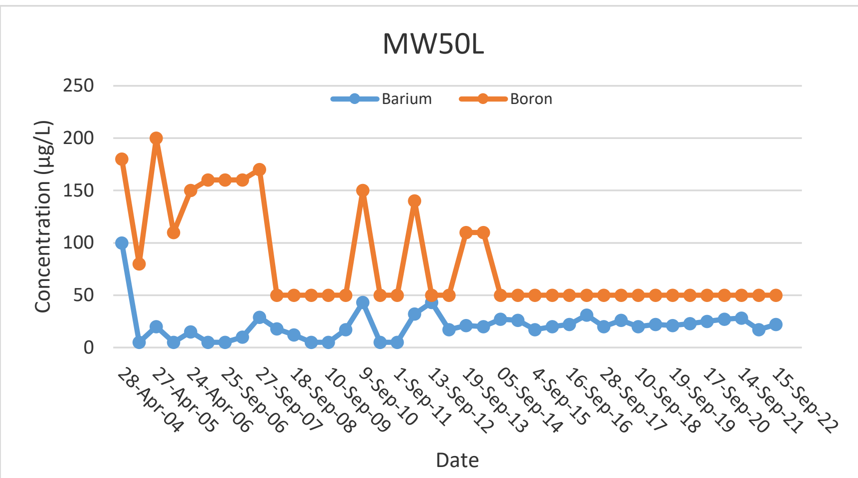


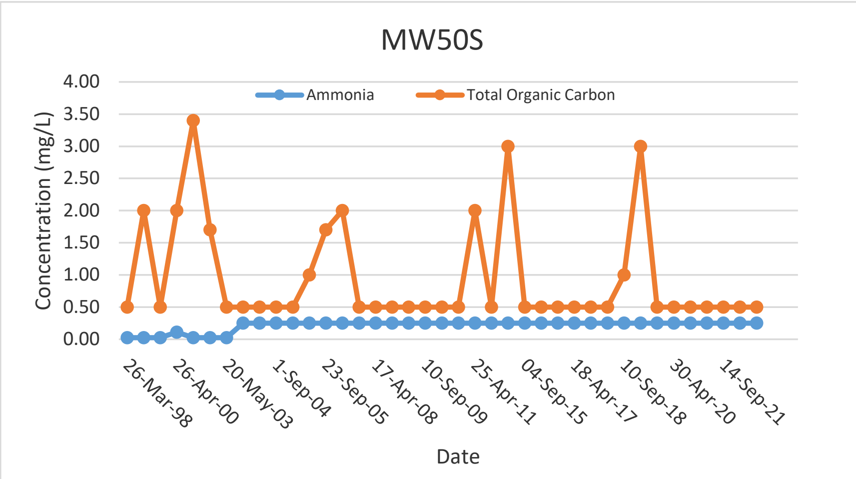


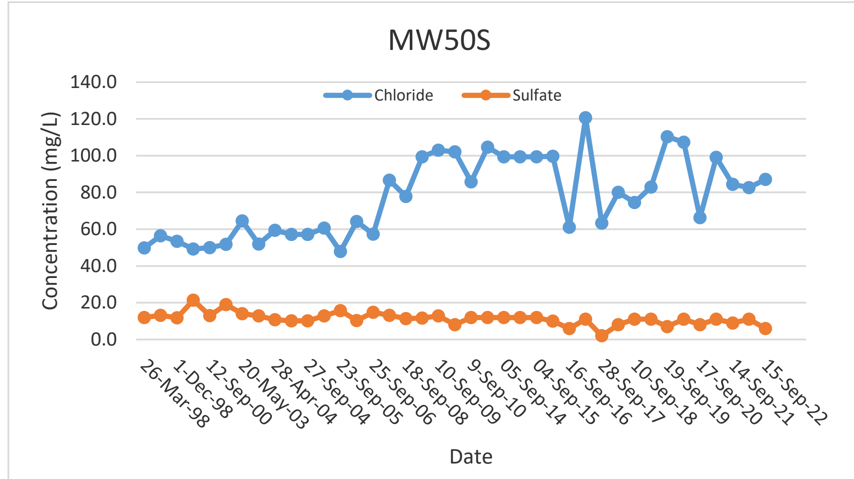


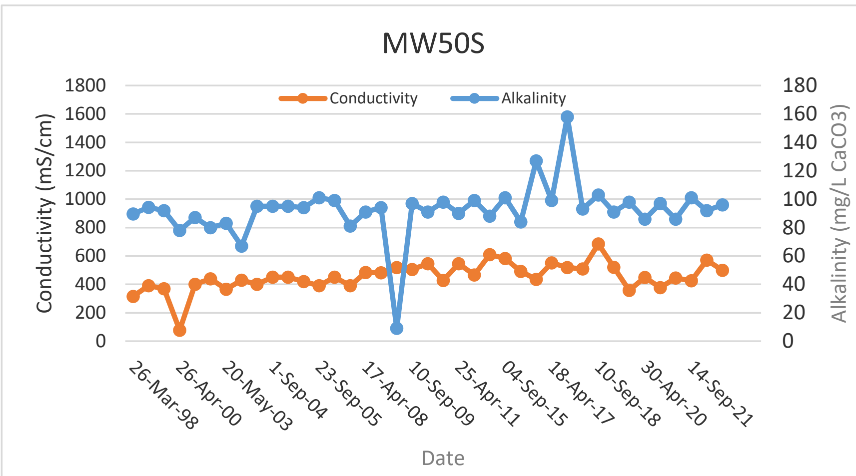

MW50L
Iron
Magnesium
Concentration (mg/L)
40.000
35.000
30.000
25.000
20.000
15.000
10.000
5.000
0.000
28-Apr-04
27-Sep-04
24-Apr-06
17-Apr-08
30-Apr-09
8-Apr-10
25-Apr-11
19-Apr-12
11-Apr-13
08-May-14
24-Apr-15
11-Apr-16
18-Apr-17
12-Apr-18
22-Apr-19
30-Apr-20
15-Apr-21
11-Apr-22
Date

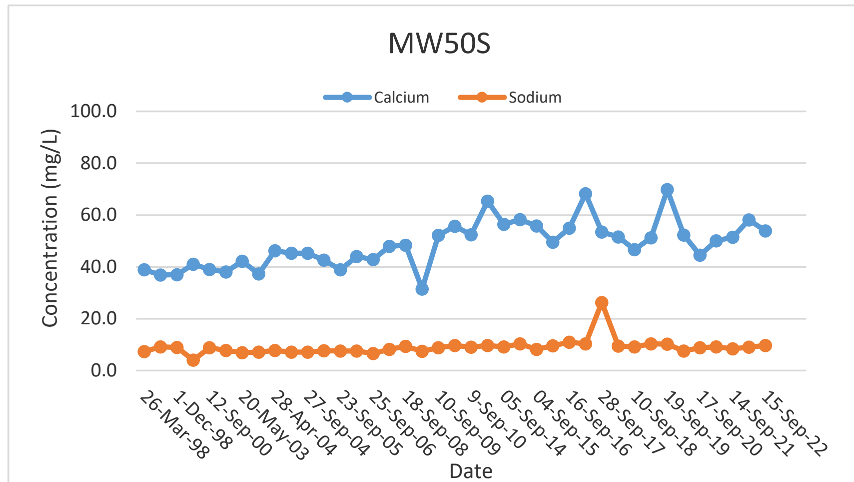

MW50L
pH
pH
8.4
8.2
8.0
7.8
7.6
7.4
7.2
7.0
6.8
28-Apr-04
27-Sep-04
24-Apr-06
17-Apr-08
30-Apr-09
8-Apr-10
25-Apr-11
19-Apr-12
11-Apr-13
08-May-14
24-Apr-15
11-Apr-16
18-Apr-17
12-Apr-18
22-Apr-19
30-Apr-20
15-Apr-21
11-Apr-22
Date

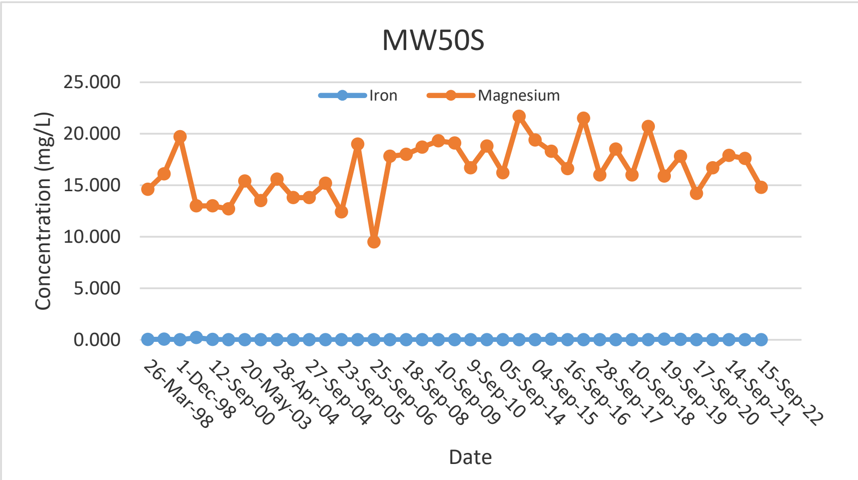

MW50L
Barium
Boron
Concentration (µg/L)
250
200
150
100
50
0
28-Apr-04
27-Apr-05
24-Apr-06
25-Sep-06
27-Sep-07
18-Sep-08
10-Sep-09
9-Sep-10
1-Sep-11
13-Sep-12
19-Sep-13
05-Sep-14
4-Sep-15
16-Sep-16
28-Sep-17
10-Sep-18
19-Sep-19
17-Sep-20
14-Sep-21
15-Sep-22
Date

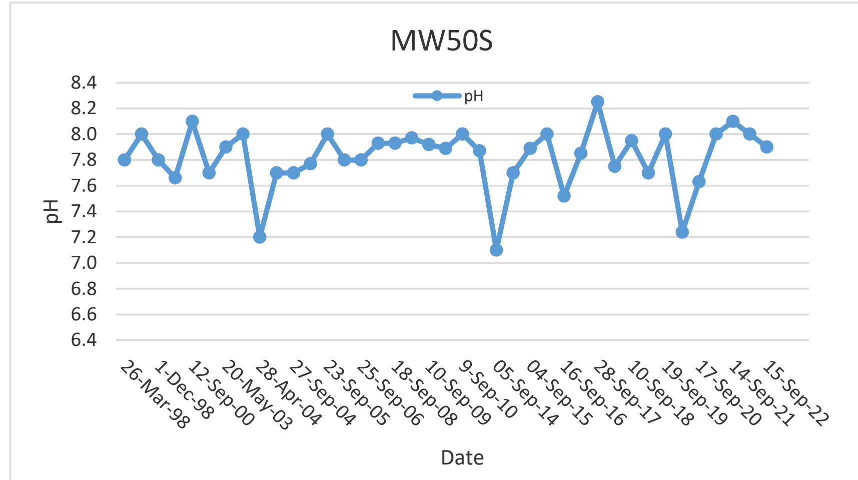

MW50S
Ammonia
Total Organic Carbon
Concentration (mg/L)
4.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
26-Mar-98
26-Apr-00
20-May-03
1-Sep-04
23-Sep-05
17-Apr-08
10-Sep-09
25-Apr-11
04-Sep-15
18-Apr-17
10-Sep-18
30-Apr-20
14-Sep-21
Date


MW50S
Chloride
Sulfate
Concentration (mg/L)
140.0
120.0
100.0
80.0
60.0
40.0
20.0
0.0
26-Mar-98
1-Dec-98
12-Sep-00
20-May-03
28-Apr-04
27-Sep-04
23-Sep-05
25-Sep-06
18-Sep-08
10-Sep-09
9-Sep-10
05-Sep-14
04-Sep-15
16-Sep-16
28-Sep-17
10-Sep-18
19-Sep-19
17-Sep-20
14-Sep-21
15-Sep-22
Date


MW50S
Conductivity
Alkalinity
Conductivity (mS/cm)
Alkalinity (mg/L CaCO3)
1800
1600
1400
1200
1000
800
600
400
200
0
180
160
140
120
100
80
60
40
20
0
26-Mar-98
26-Apr-00
20-May-03
1-Sep-04
23-Sep-05
17-Apr-08
10-Sep-09
25-Apr-11
04-Sep-15
18-Apr-17
10-Sep-18
30-Apr-20
14-Sep-21
Date


MW50S
Calcium
Sodium
Concentration (mg/L)
100.0
80.0
60.0
40.0
20.0
0.0
26-Mar-98
1-Dec-98
12-Sep-00
20-May-03
28-Apr-04
27-Sep-04
23-Sep-05
25-Sep-06
18-Sep-08
10-Sep-09
9-Sep-10
05-Sep-14
04-Sep-15
16-Sep-16
28-Sep-17
10-Sep-18
19-Sep-19
17-Sep-20
14-Sep-21
15-Sep-22
Date


MW50S
Iron
Magnesium
Concentration (mg/L)
25.000
20.000
15.000
10.000
5.000
0.000
26-Mar-98
1-Dec-98
12-Sep-00
20-May-03
28-Apr-04
27-Sep-04
23-Sep-05
25-Sep-06
18-Sep-08
10-Sep-09
9-Sep-10
05-Sep-14
04-Sep-15
16-Sep-16
28-Sep-17
10-Sep-18
19-Sep-19
17-Sep-20
14-Sep-21
15-Sep-22
Date


MW50S
pH
pH
8.4
8.2
8.0
7.8
7.6
7.4
7.2
7.0
6.8
6.6
6.4
26-Mar-98
1-Dec-98
12-Sep-00
20-May-03
28-Apr-04
27-Sep-04
23-Sep-05
25-Sep-06
18-Sep-08
10-Sep-09
9-Sep-10
05-Sep-14
04-Sep-15
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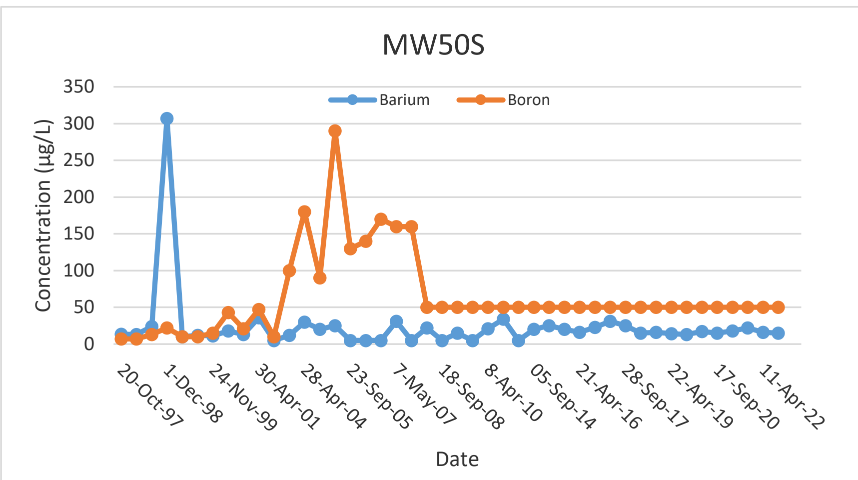
17-Sep-20
14-Sep-21
15-Sep-22
Date


MW50S
Barium
Boron
Concentration (µg/L)
350
300
250
200
150
100
50
0
20-Oct-97
1-Dec-98
24-Nov-99
30-Apr-01
28-Apr-04
23-Sep-05
7-May-07
18-Sep-08
8-Apr-10
05-Sep-14
21-Apr-16
28-Sep-17
22-Apr-19
17-Sep-20
11-Apr-22
Date

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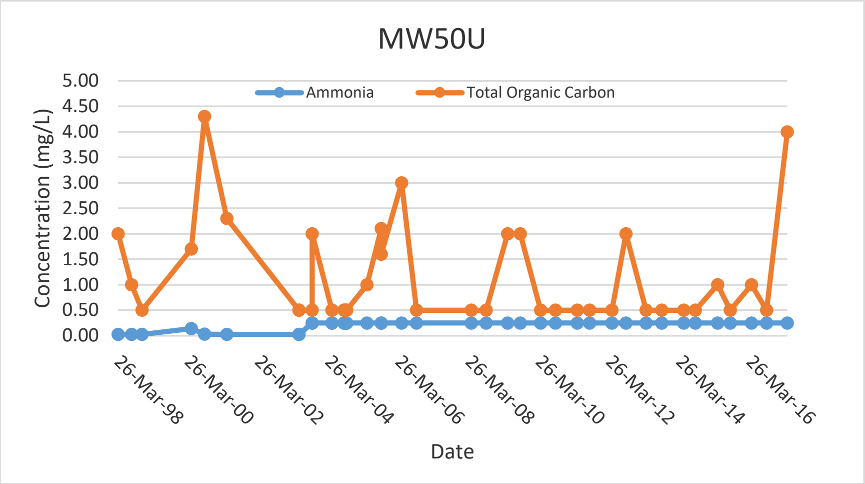
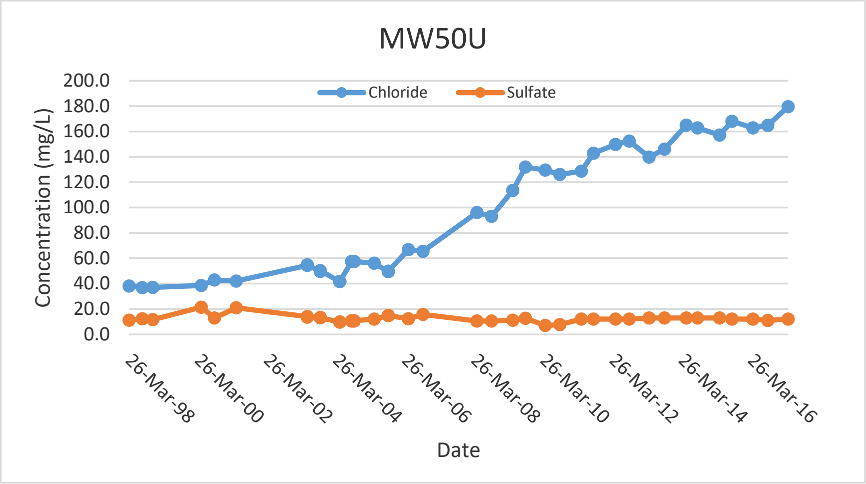
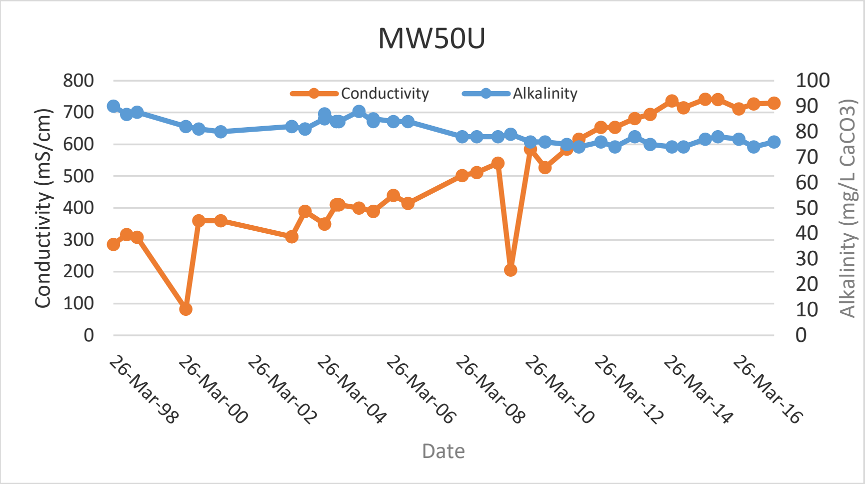
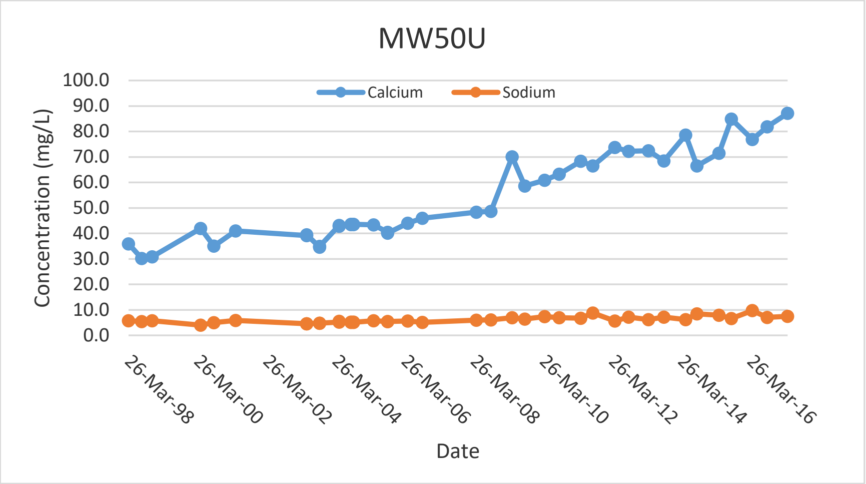
Appendix J:
Trend Graphs MW50U
1997 - 2017

Client: Fundy Regional Services Commission
Project Number: 4662.09









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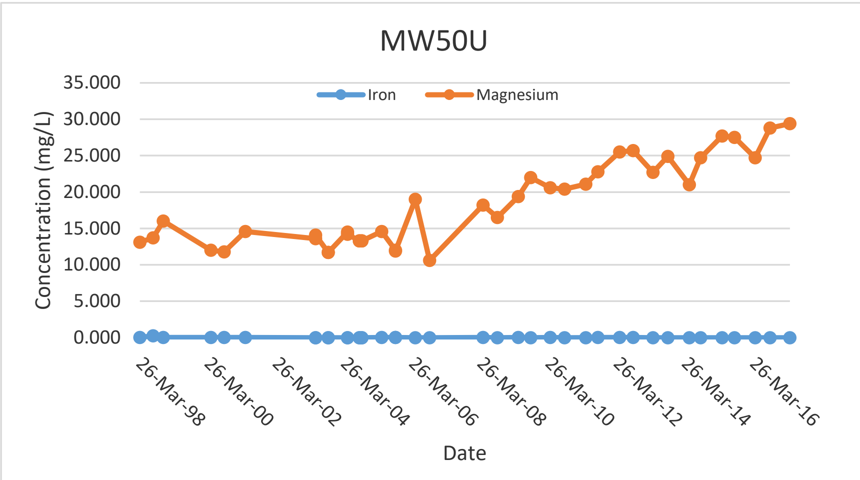
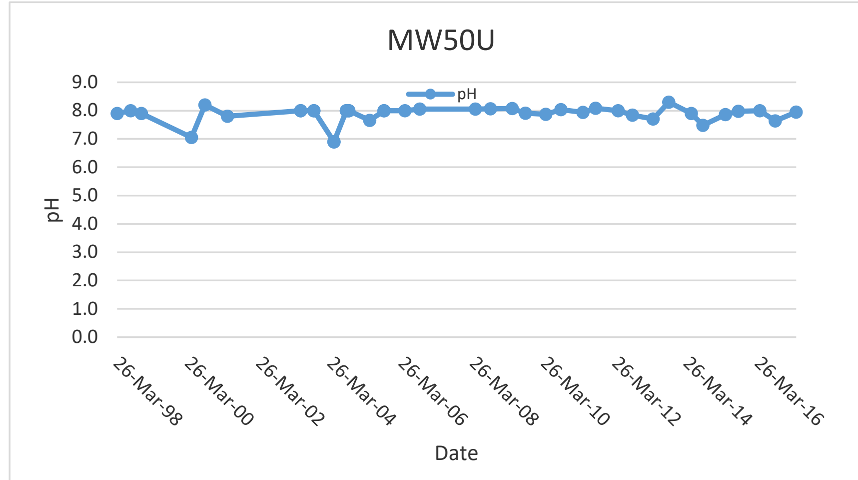
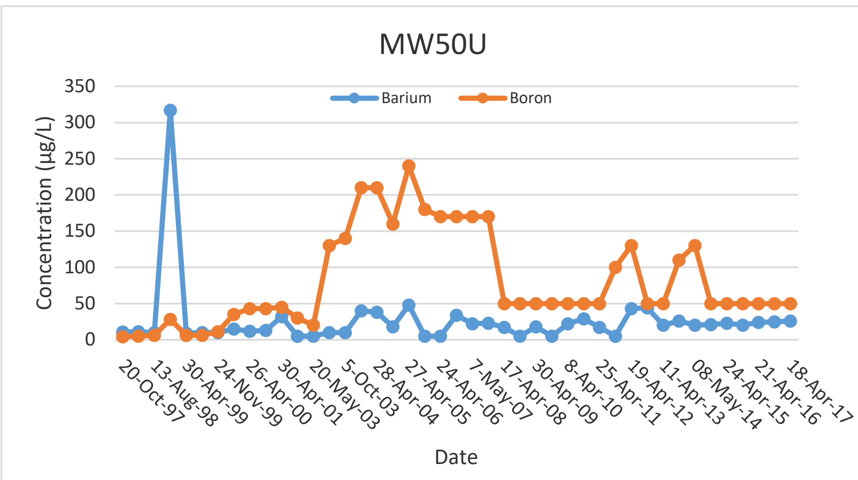
Appendix J:
Trend Graphs MW50U
1997 - 2017

Client: Fundy Regional Services Commission
Project Number: 4662.09







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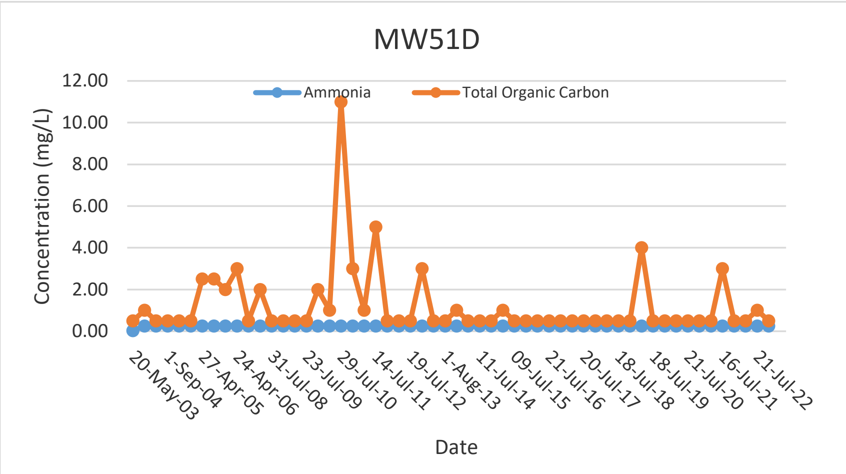
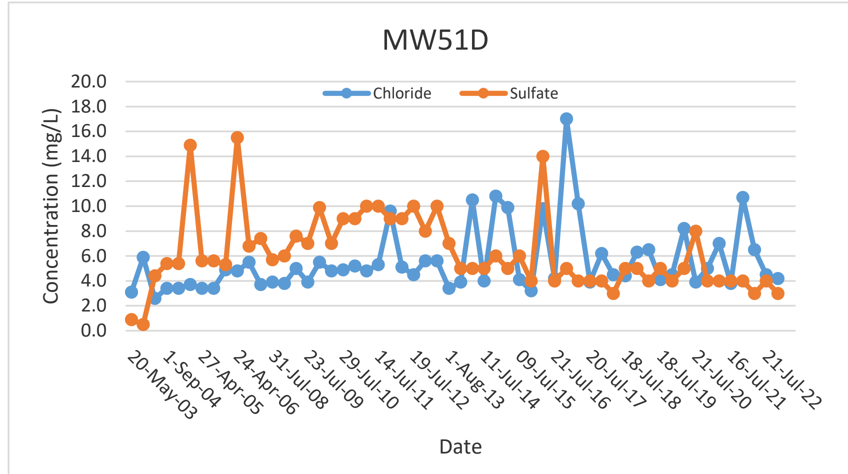
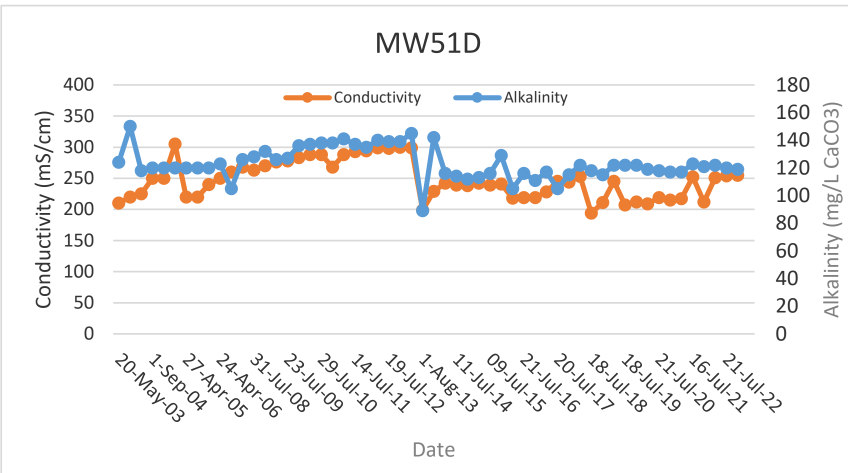
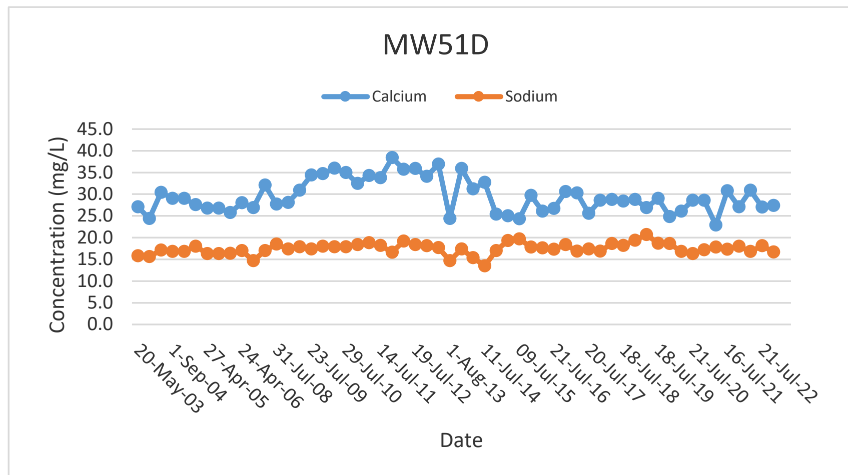
Appendix J:
Trend Graphs MW51D
1997 - 2022

Client: Fundy Regional Services Commission
Project Number: 4662.09









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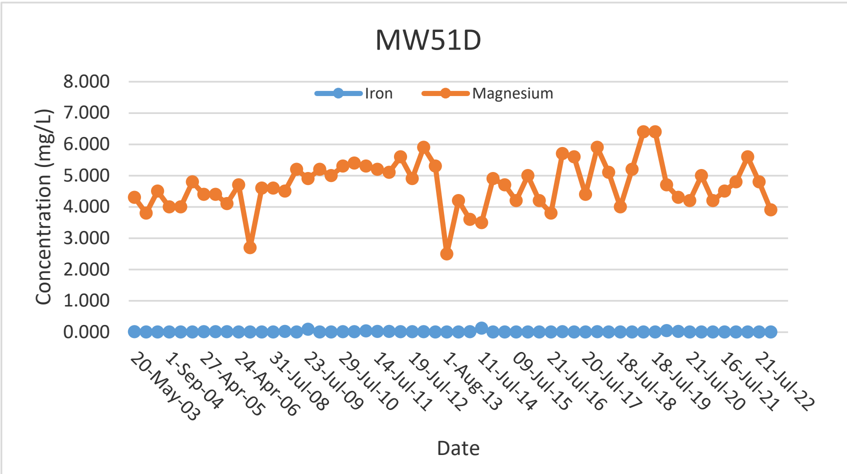
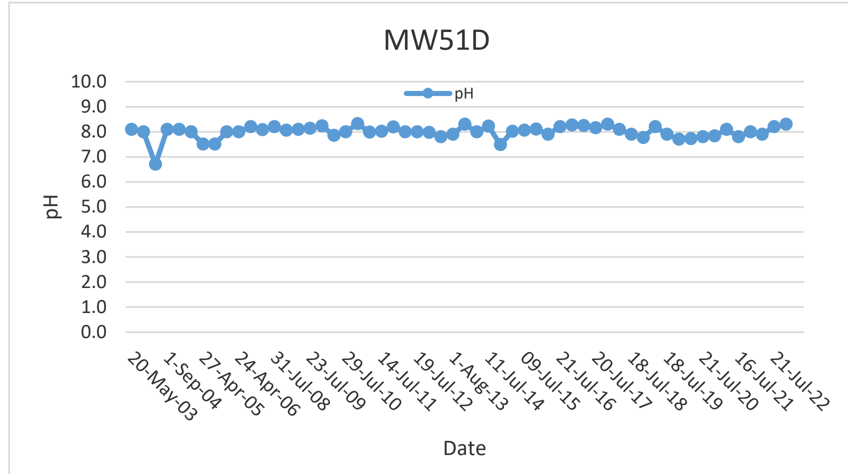
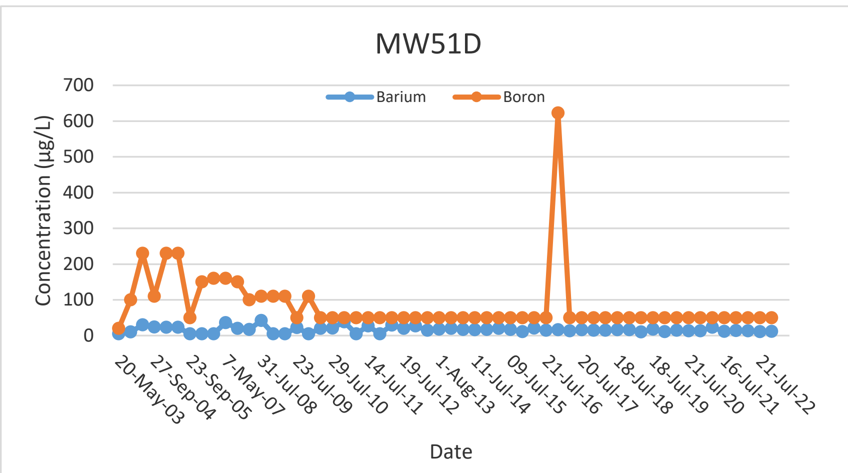
Appendix J:
Trend Graphs MW51D
1997 - 2022

Client: Fundy Regional Services Commission
Project Number: 4662.09

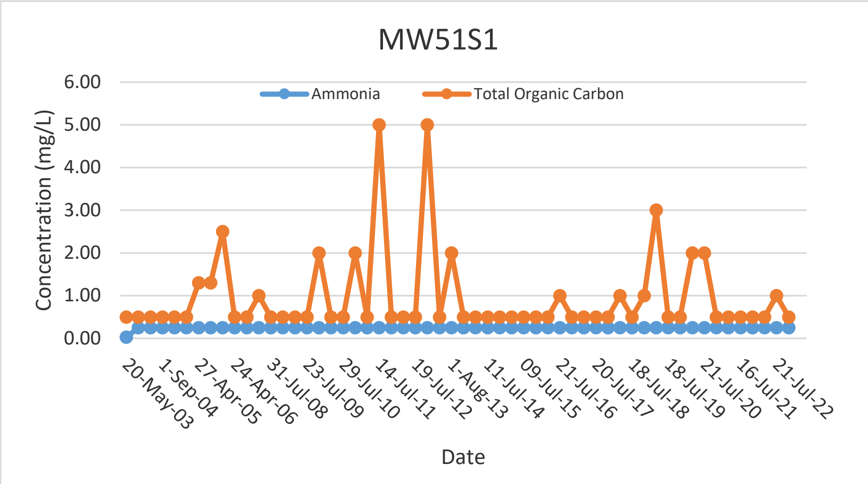


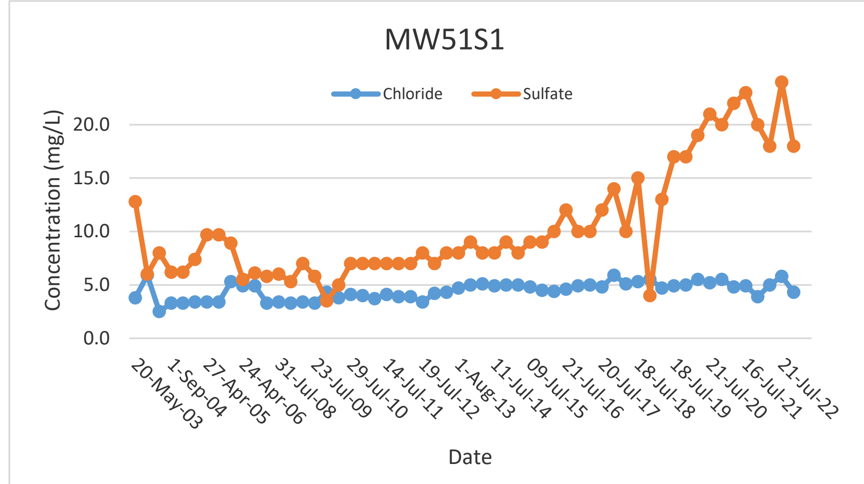


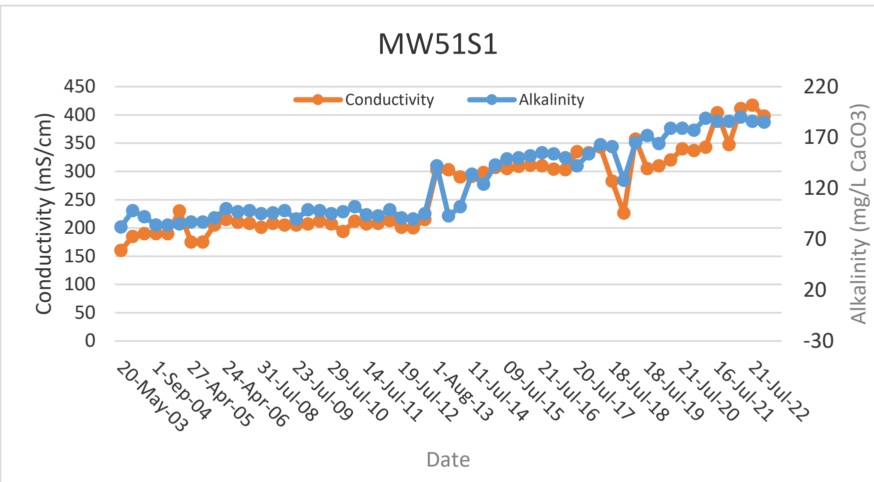


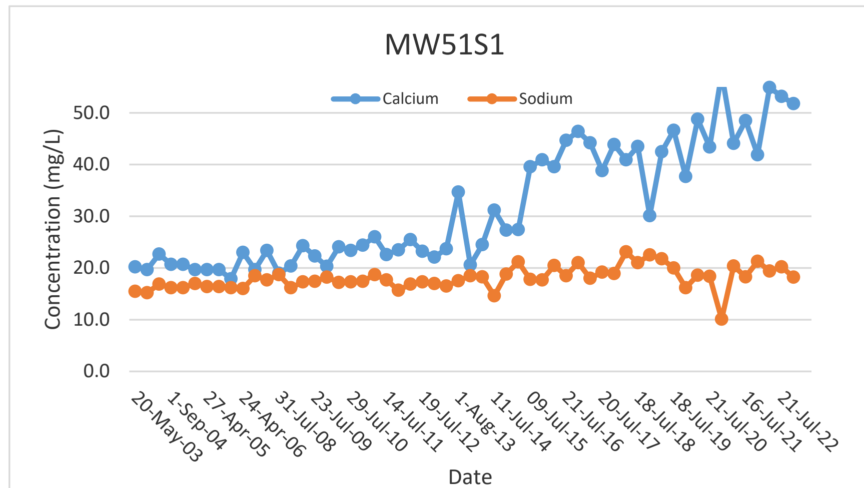
Appendix J:
Trend Graphs MW51S1
1997 - 2022

Client: Fundy Regional Services Commission
Project Number: 4662.09









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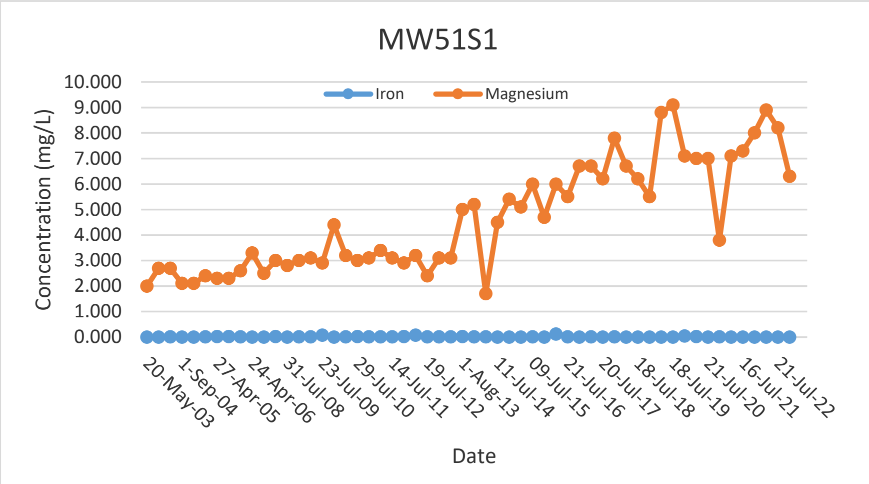
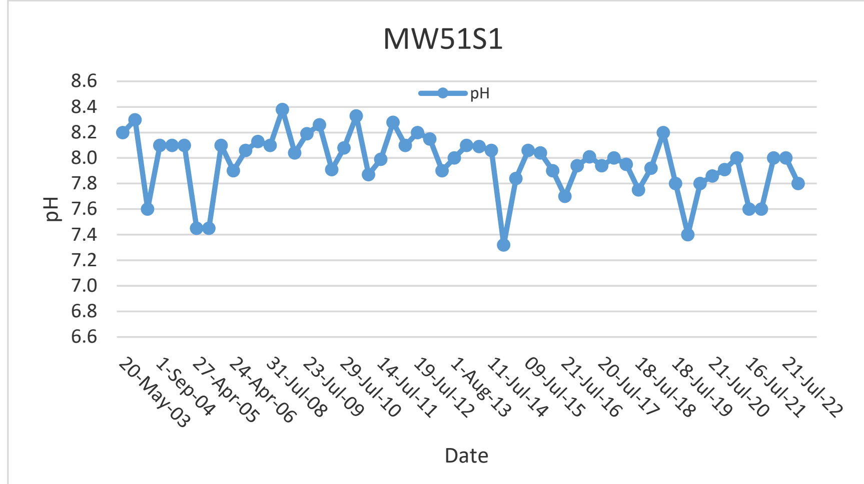
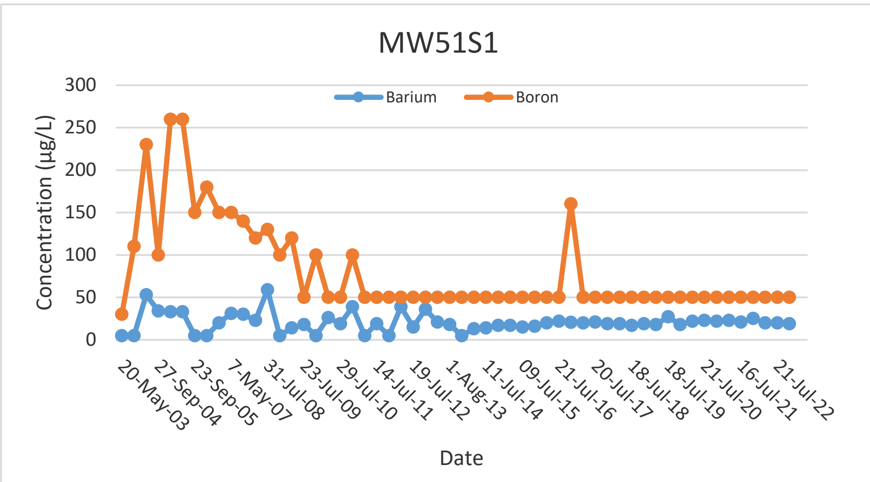
Appendix J:
Trend Graphs MW51S1
1997 - 2022

Client: Fundy Regional Services Commission
Project Number: 4662.09

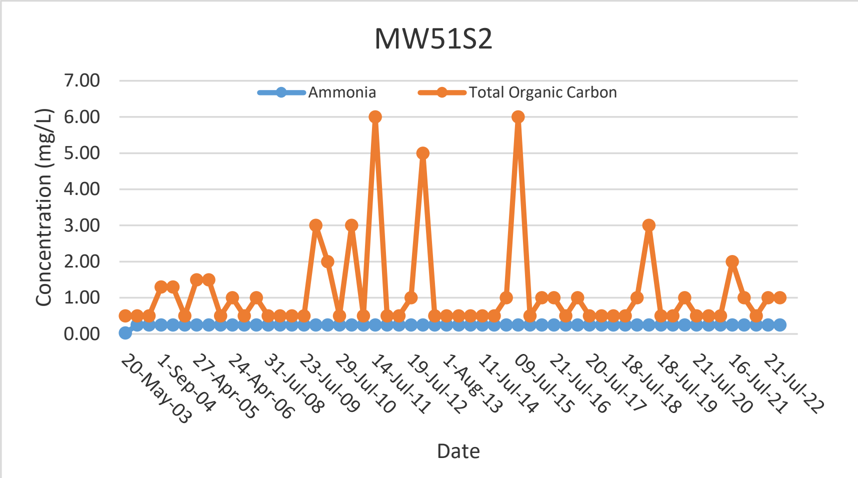


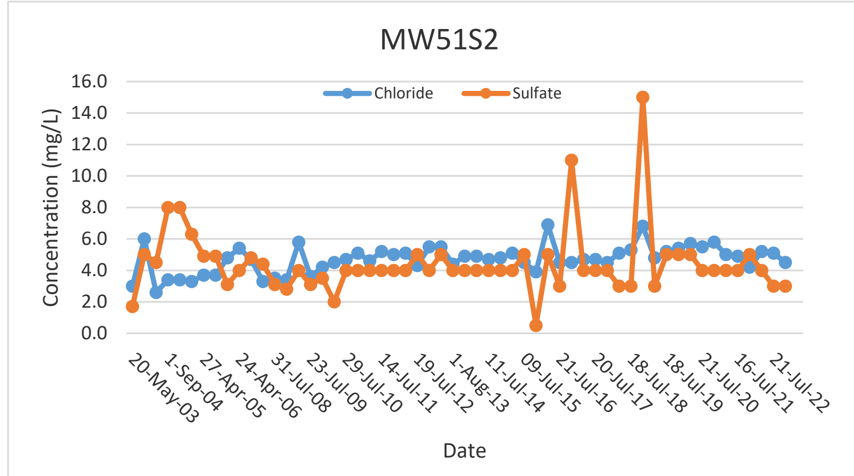


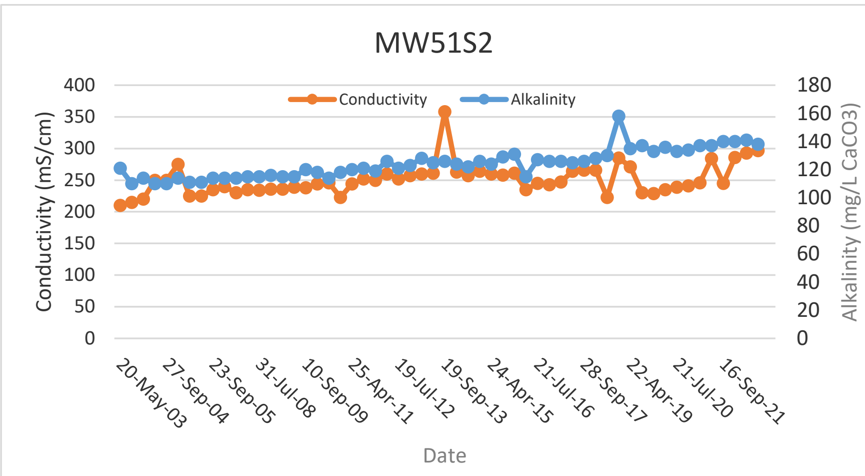


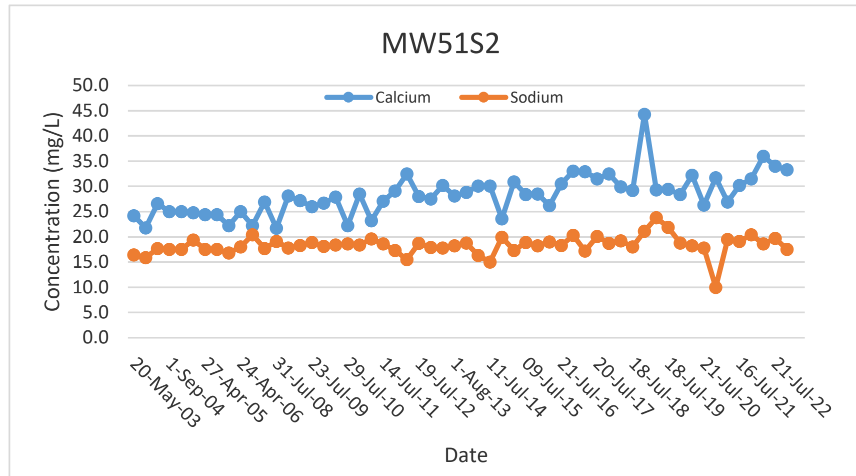
Appendix J:
Trend Graphs MW51S2
1997 - 2022

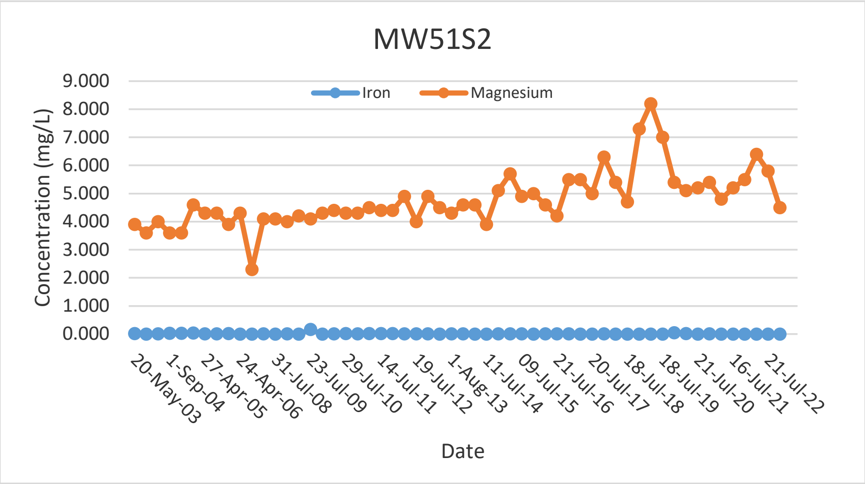
Client: Fundy Regional Services Commission
Project Number: 4662.09

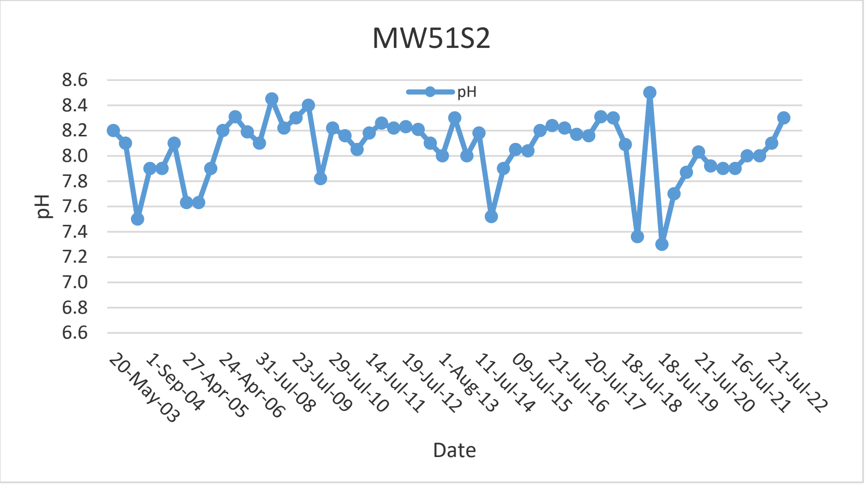









MW51S2
Iron
Magnesium
Concentration (mg/L)
9.000
8.000
7.000
6.000
5.000
4.000
3.000
2.000
1.000
0.000
20-May-03
1-Sep-04
27-Apr-05
24-Apr-06
31-Jul-08
23-Jul-09
29-Jul-10
14-Jul-11
19-Jul-12
1-Aug-13
11-Jul-14
09-Jul-15
21-Jul-16
20-Jul-17
18-Jul-18
18-Jul-19
21-Jul-20
16-Jul-21
21-Jul-22
Date


MW51S2
pH
8.6
8.4
8.2
8.0
7.8
7.6
7.4
7.2
7.0
6.8
6.6
20-May-03
1-Sep-04
27-Apr-05
24-Apr-06
31-Jul-08
23-Jul-09
29-Jul-10
14-Jul-11
19-Jul-12
1-Aug-13
11-Jul-14
09-Jul-15
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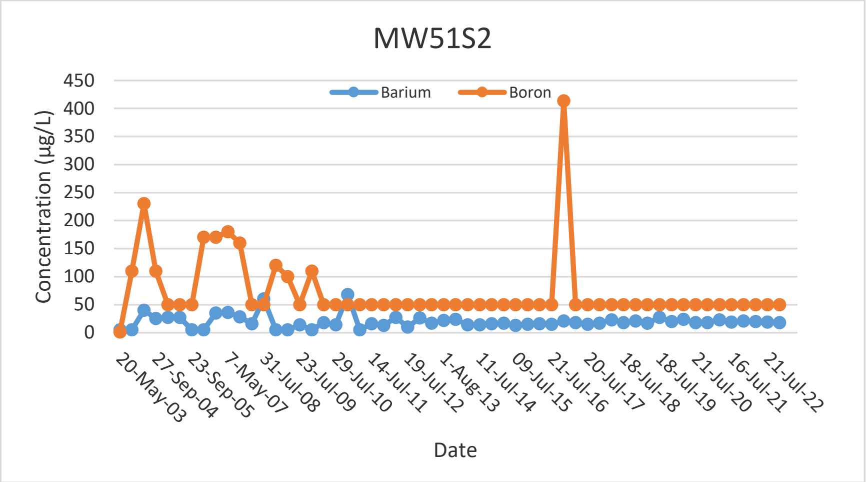
18-Jul-18
18-Jul-19
21-Jul-20
16-Jul-21
21-Jul-22
Date


MW51S2
Barium
Boron
Concentration (µg/L)
450
400
350
300
250
200
150
100
50
0
20-May-03
27-Sep-04
23-Sep-05
7-May-07
31-Jul-08
23-Jul-09
29-Jul-10
14-Jul-11
19-Jul-12
1-Aug-13
11-Jul-14
09-Jul-15
21-Jul-16
20-Jul-17
18-Jul-18
18-Jul-19
21-Jul-20
16-Jul-21
21-Jul-22
Date

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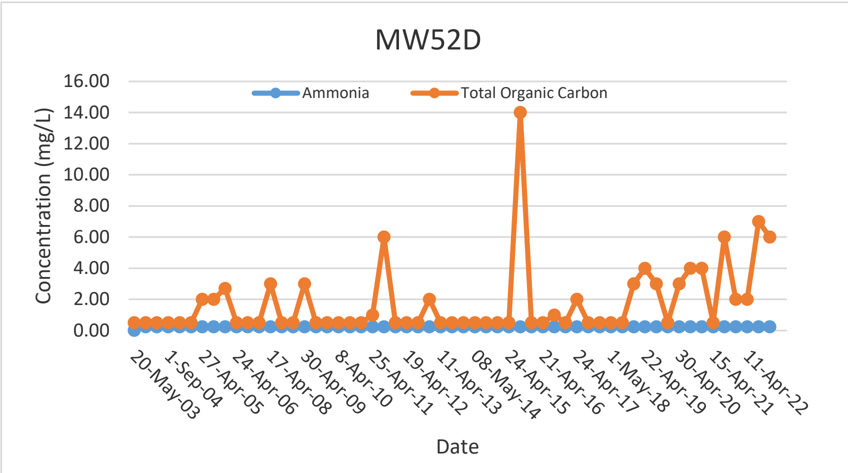
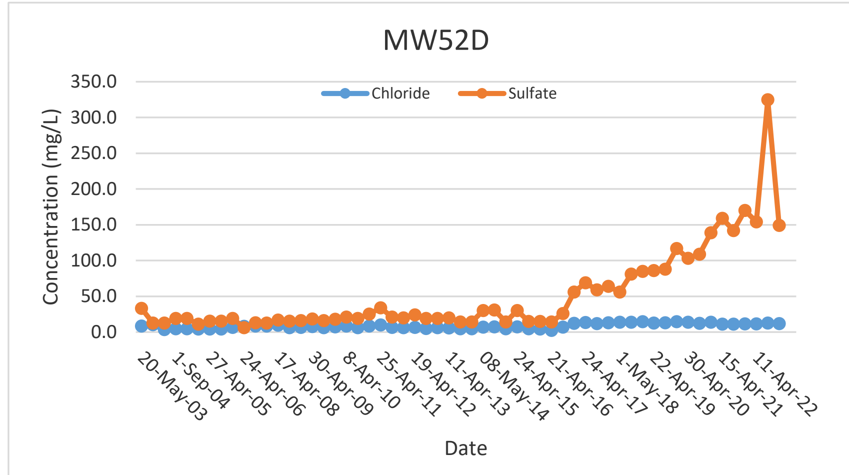
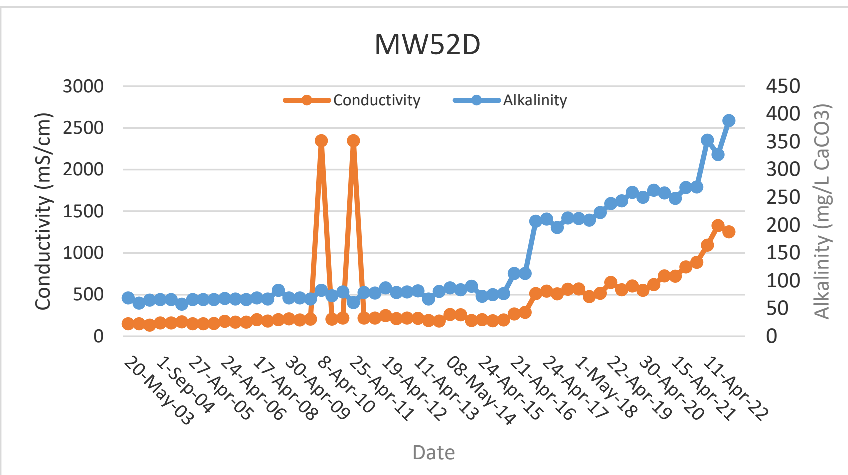
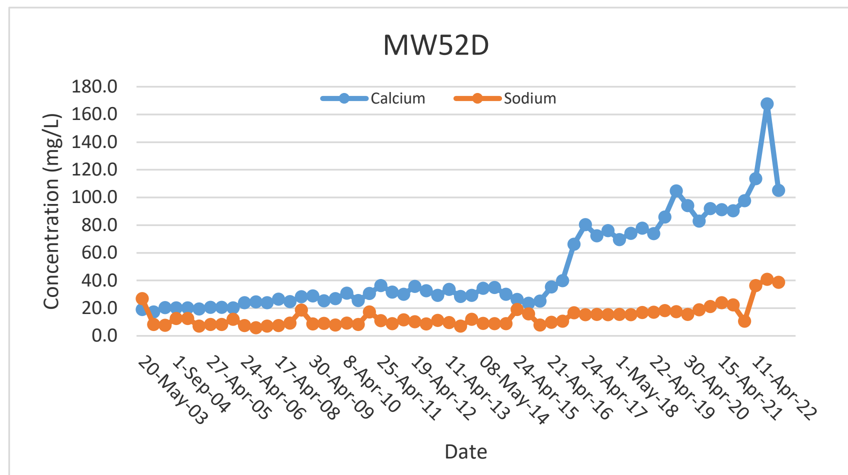
Appendix J:
Trend Graphs MW52D
1997 - 2022

Client: Fundy Regional Services Commission
Project Number: 4662.09









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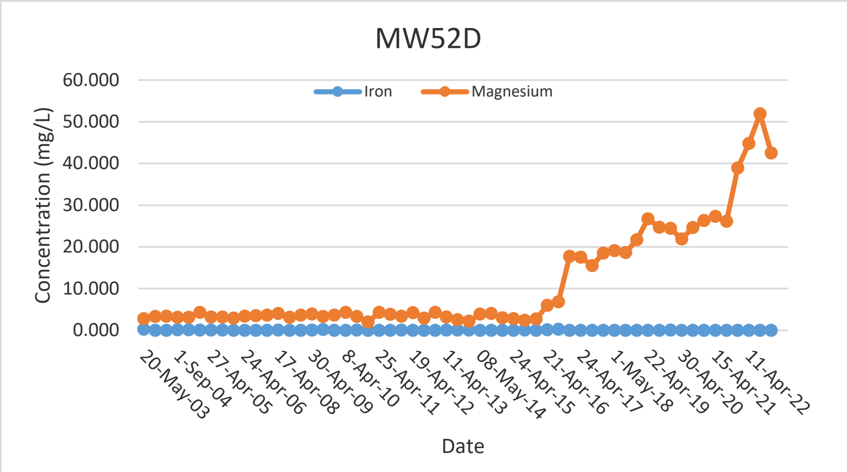
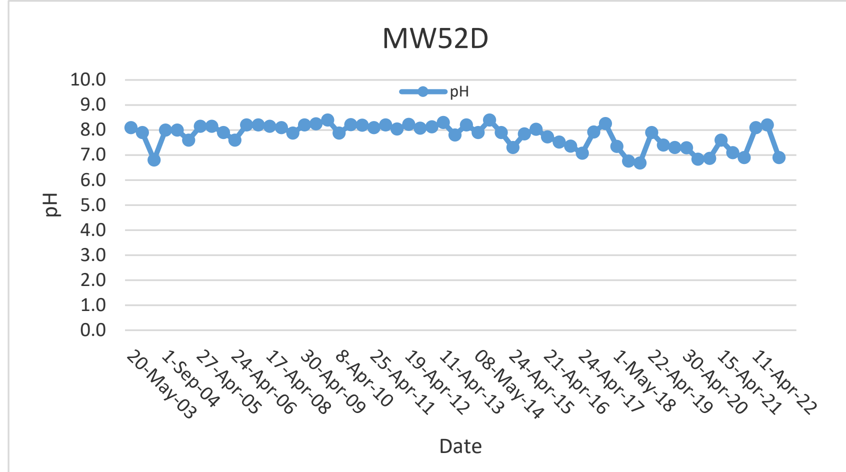
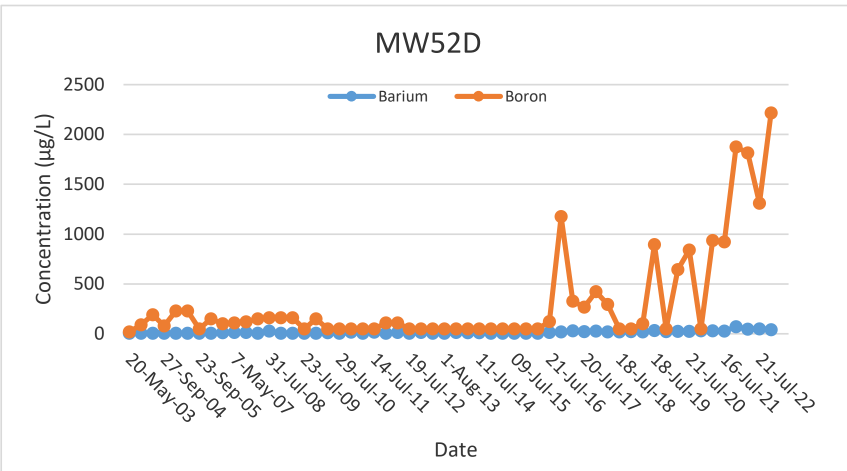
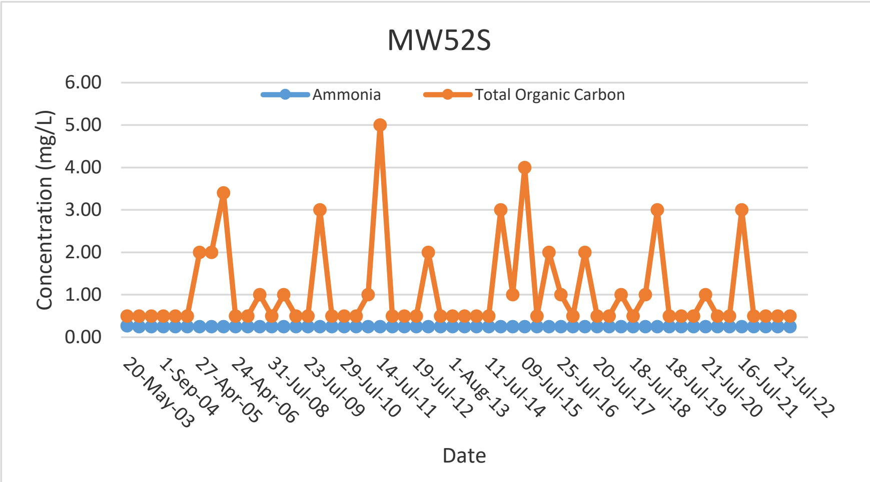
Appendix J:
Trend Graphs MW52D
1997 - 2022

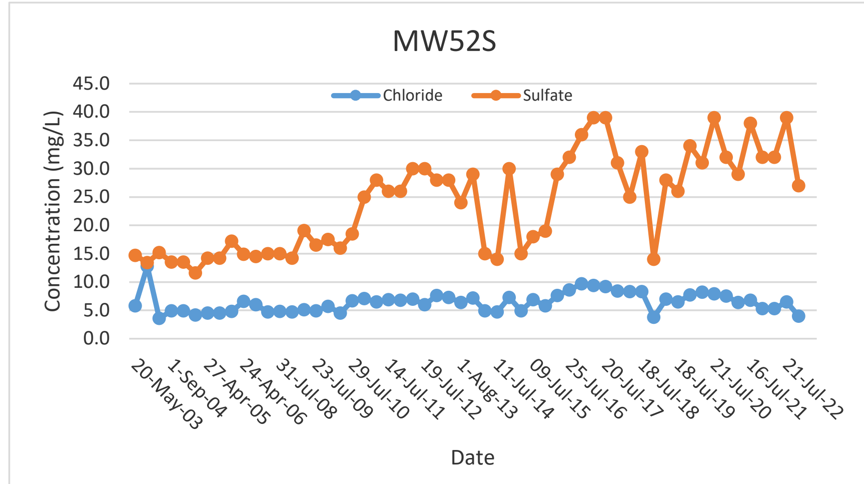
Client: Fundy Regional Services Commission
Project Number: 4662.09

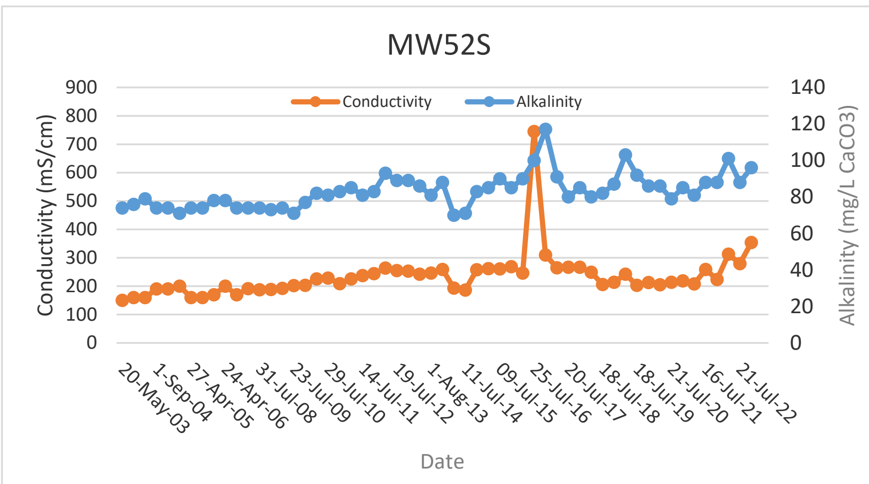


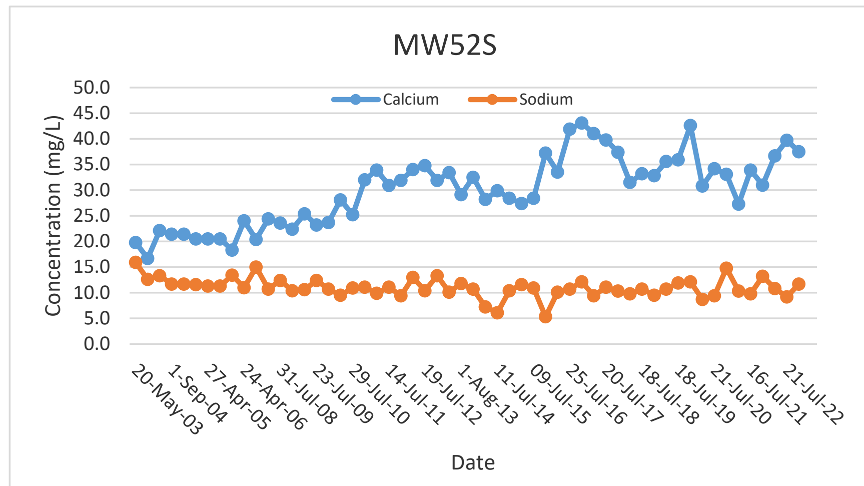





MW52S
Ammonia
Total Organic Carbon
Concentration (mg/L)
6.00
5.00
4.00
3.00
2.00
1.00
0.00
20-May-03
1-Sep-04
27-Apr-05
24-Apr-06
31-Jul-08
23-Jul-09
29-Jul-10
14-Jul-11
19-Jul-12
1-Aug-13
11-Jul-14
09-Jul-15
25-Jul-16
20-Jul-17
18-Jul-18
18-Jul-19
21-Jul-20
16-Jul-21
21-Jul-22
Date

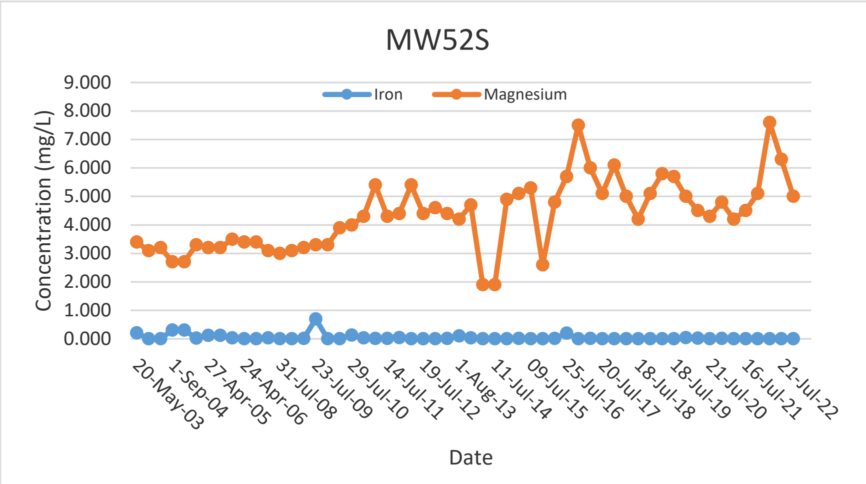

MW52S
Chloride
Sulfate
Concentration (mg/L)
45.0
40.0
35.0
30.0
25.0
20.0
15.0
10.0
5.0
0.0
20-May-03
1-Sep-04
27-Apr-05
24-Apr-06
31-Jul-08
23-Jul-09
29-Jul-10
14-Jul-11
19-Jul-12
1-Aug-13
11-Jul-14
09-Jul-15
25-Jul-16
20-Jul-17
18-Jul-18
18-Jul-19
21-Jul-20
16-Jul-21
21-Jul-22
Date

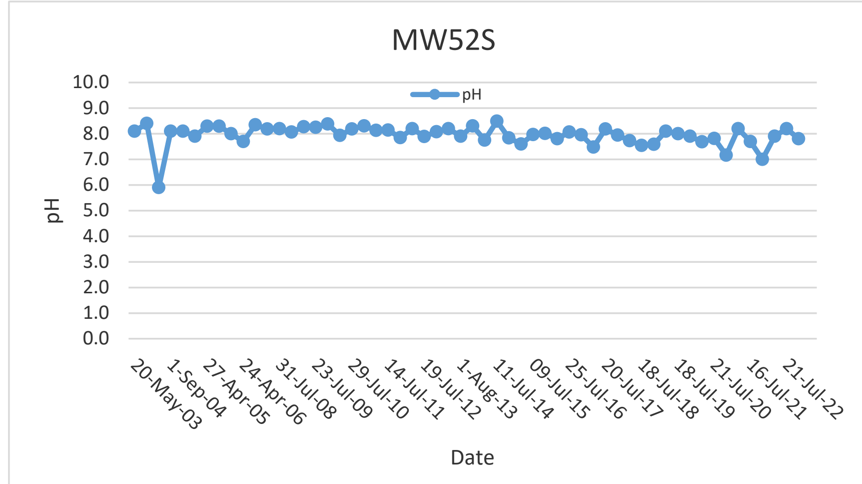

MW52S
Conductivity
Alkalinity
Conductivity (mS/cm)
900
800
700
600
500
400
300
200
100
0
Alkalinity (mg/L CaCO3)
140
120
100
80
60
40
20
0
20-May-03
1-Sep-04
27-Apr-05
24-Apr-06
31-Jul-08
23-Jul-09
29-Jul-10
14-Jul-11
19-Jul-12
1-Aug-13
11-Jul-14
09-Jul-15
25-Jul-16
20-Jul-17
18-Jul-18
18-Jul-19
21-Jul-20
16-Jul-21
21-Jul-22
Date

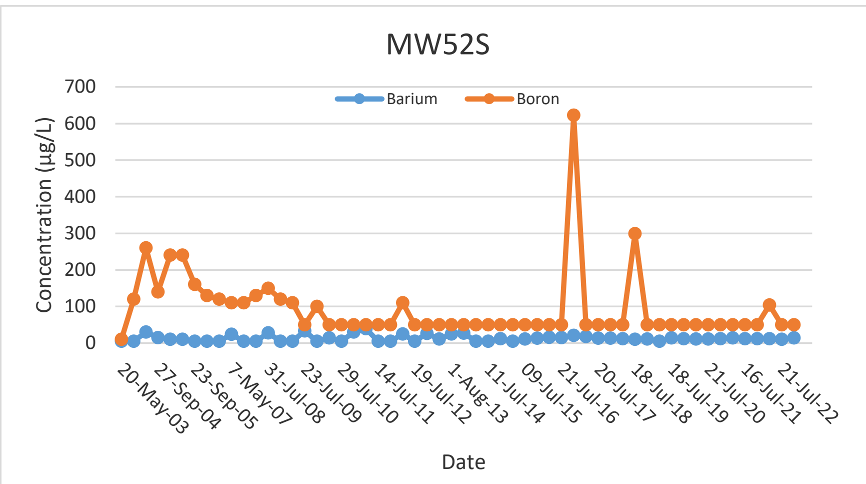

MW52S
Calcium
Sodium
Concentration (mg/L)
50.0
45.0
40.0
35.0
30.0
25.0
20.0
15.0
10.0
5.0
0.0
20-May-03
1-Sep-04
27-Apr-05
24-Apr-06
31-Jul-08
23-Jul-09
29-Jul-10
14-Jul-11
19-Jul-12
1-Aug-13
11-Jul-14
09-Jul-15
25-Jul-16
20-Jul-17
18-Jul-18
18-Jul-19
21-Jul-20
16-Jul-21
21-Jul-22
Date

Appendix J:
Trend Graphs MW52S
1997 - 2022

Client: Fundy Regional Services Commission
Project Number: 4662.09







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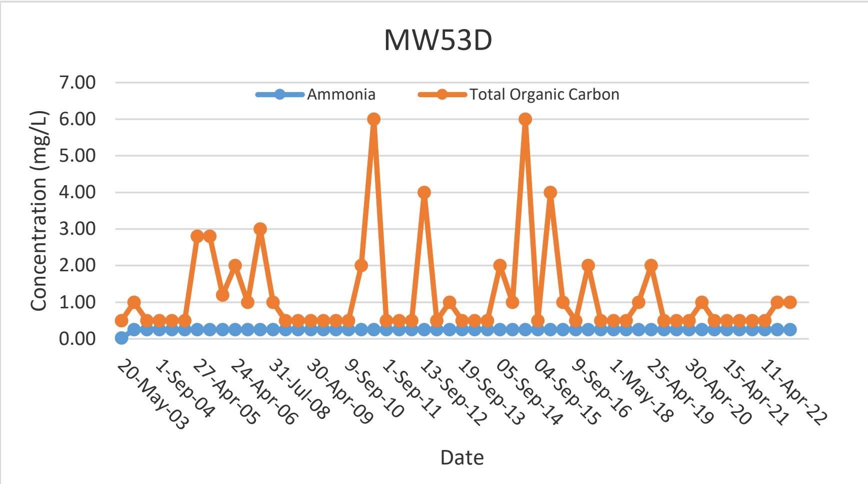
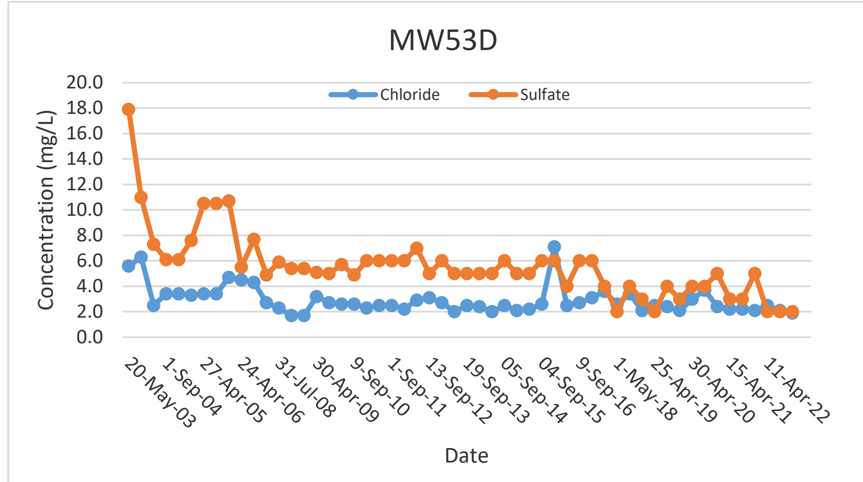
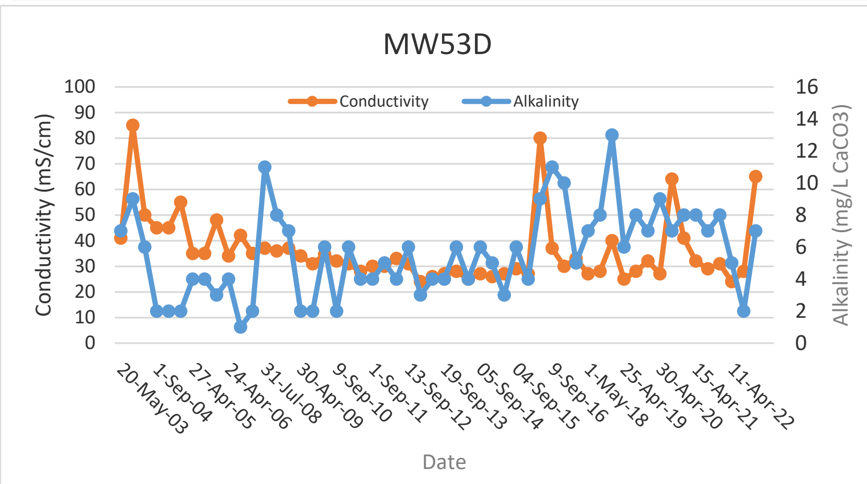
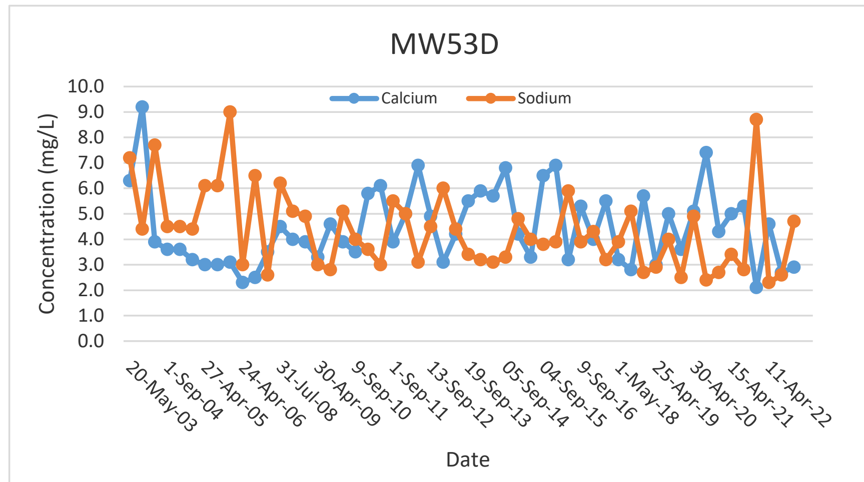
Appendix J:
Trend Graphs MW53D
1997 - 2022

Client: Fundy Regional Services Commission
Project Number: 4662.09









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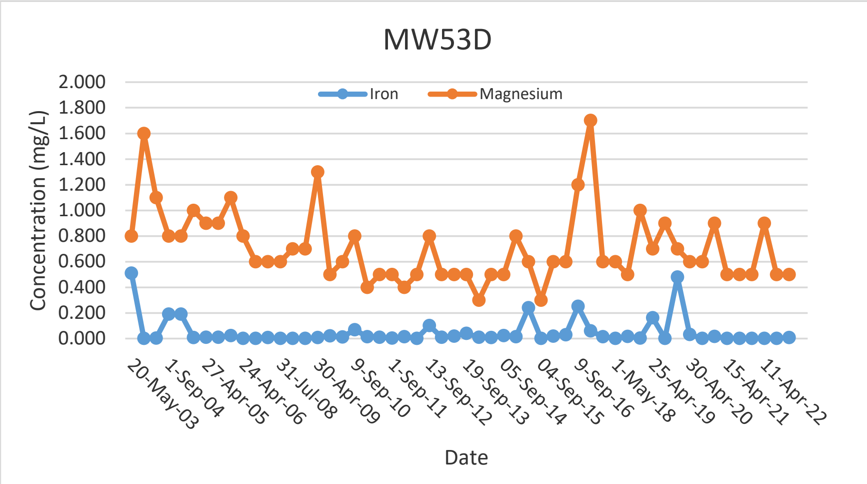
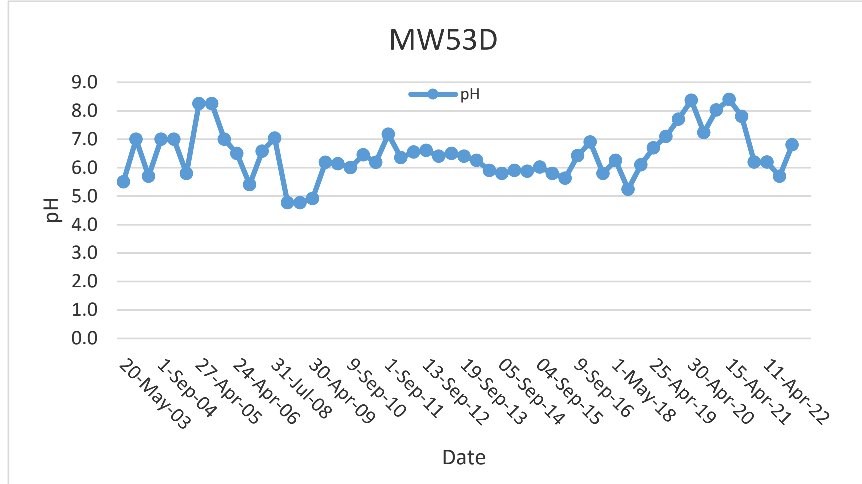
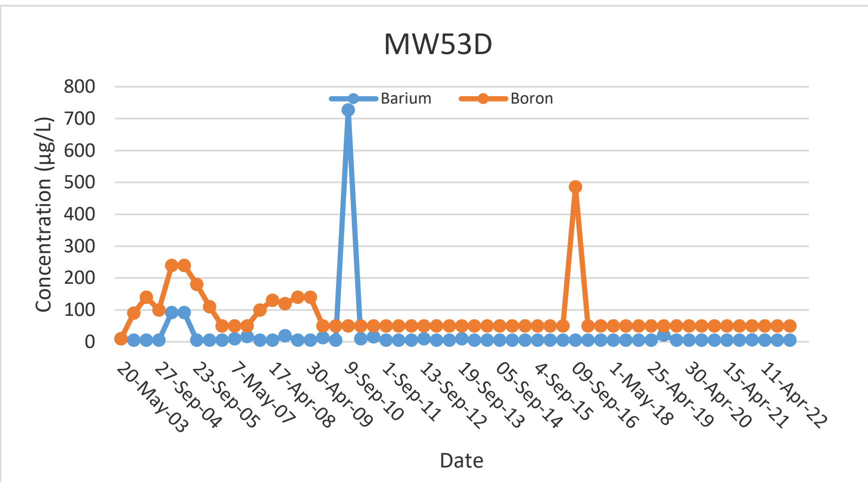
Appendix J:
Trend Graphs MW53D
1997 - 2022

Client: Fundy Regional Services Commission
Project Number: 4662.09







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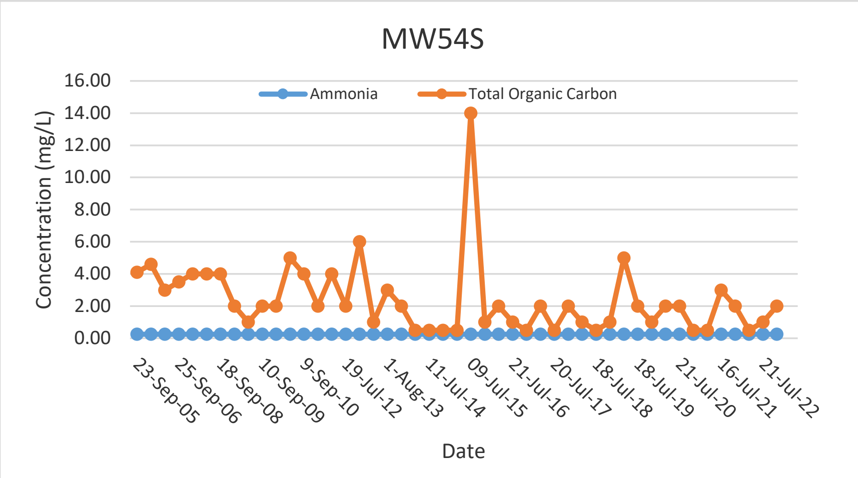
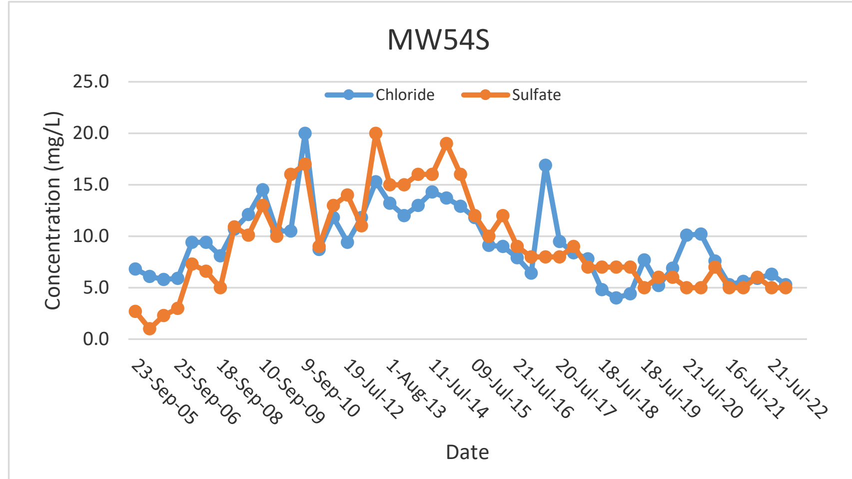
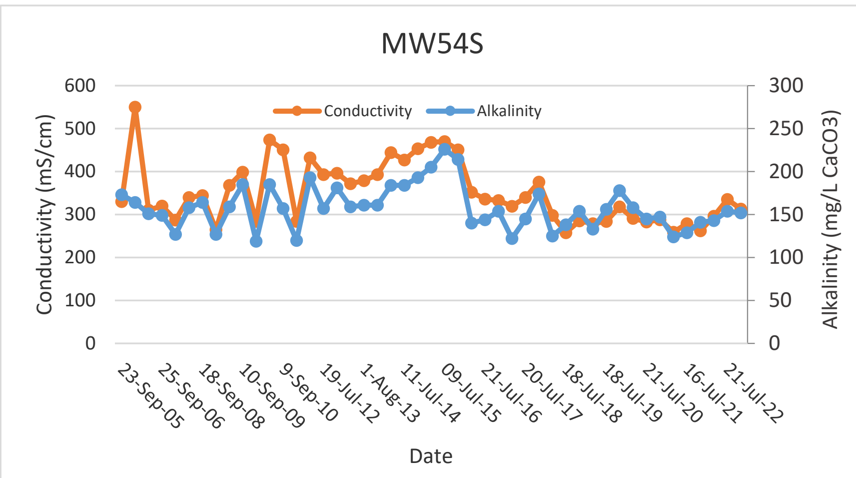
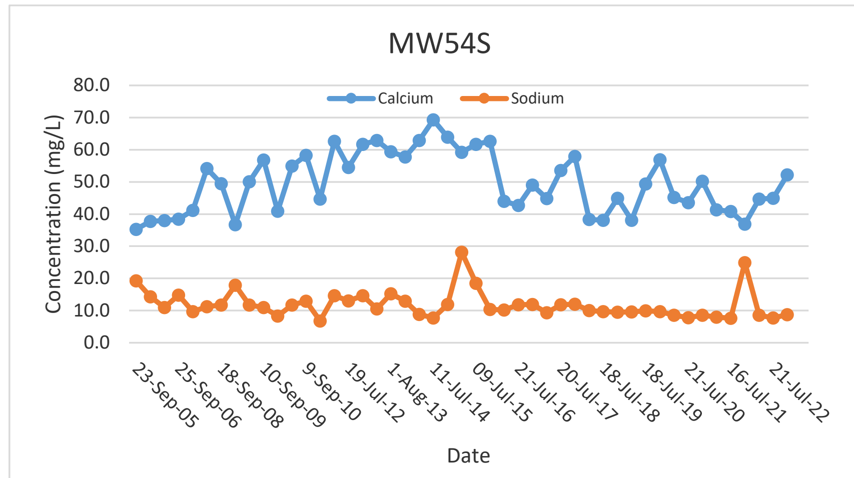
Appendix J:
Trend Graphs MW54S
1997 - 2022

Client: Fundy Regional Services Commission
Project Number: 4662.09









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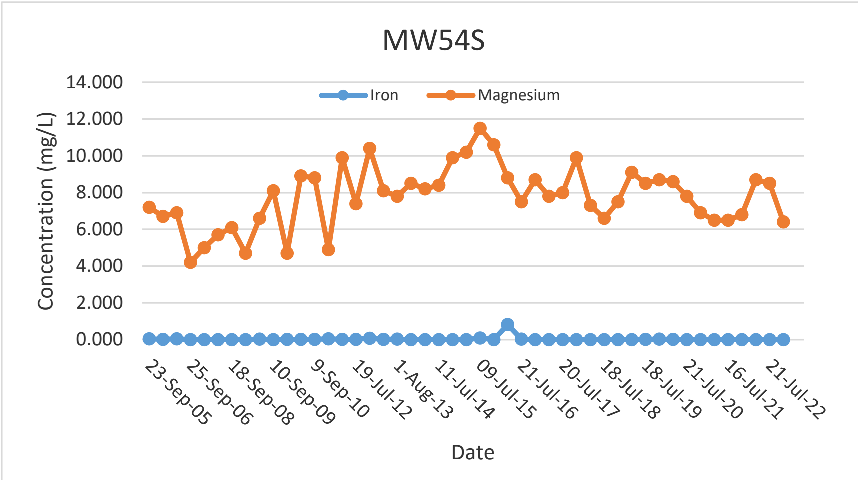
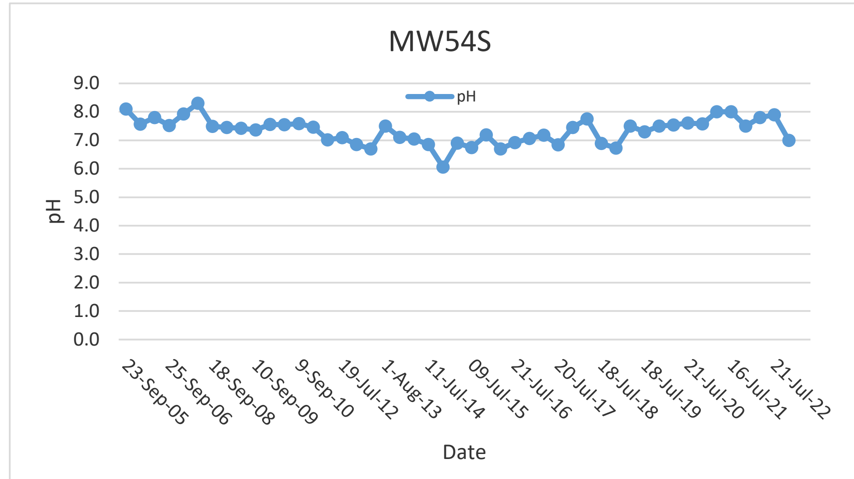
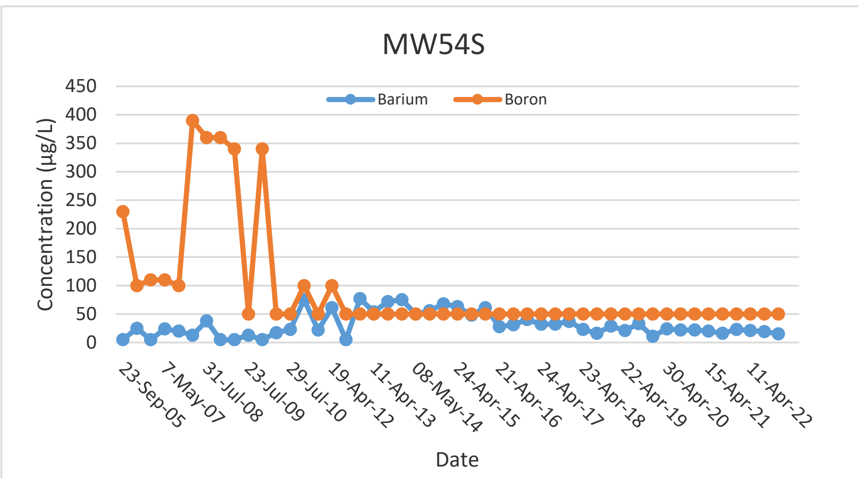
Consulting Engineers and Scientists

Appendix J:
Trend Graphs MW54S
1997 - 2022

Client: Fundy Regional Services Commission
Project Number: 4662.09

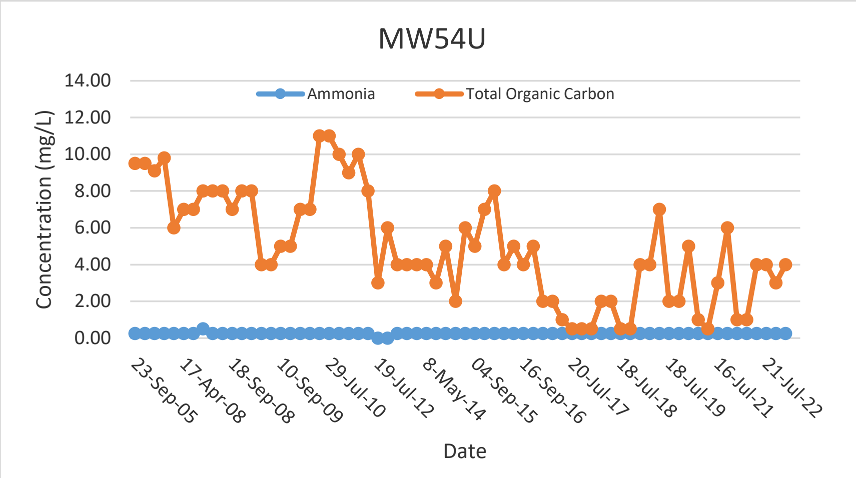


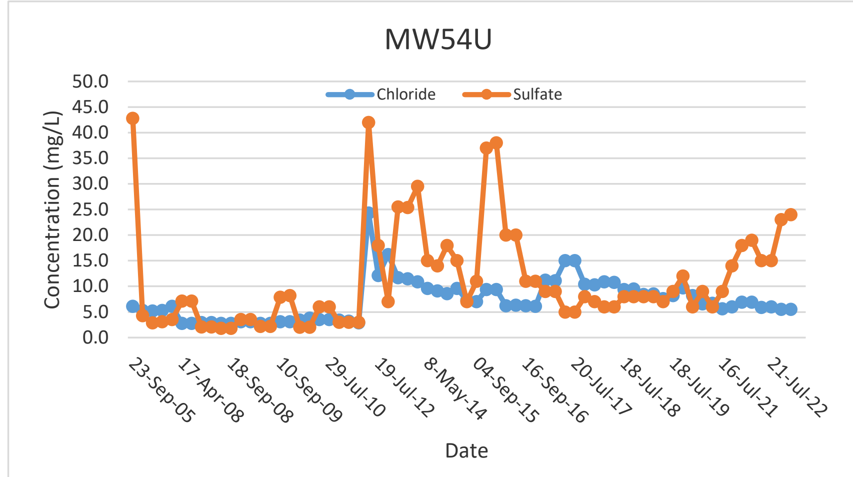


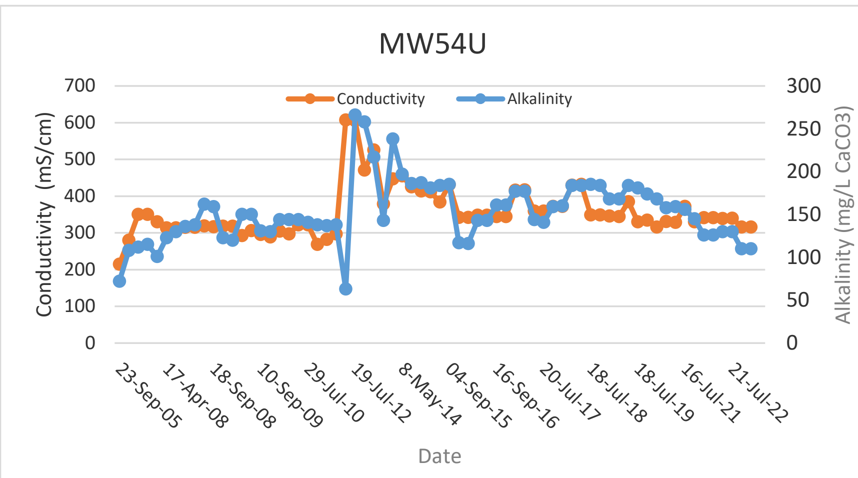


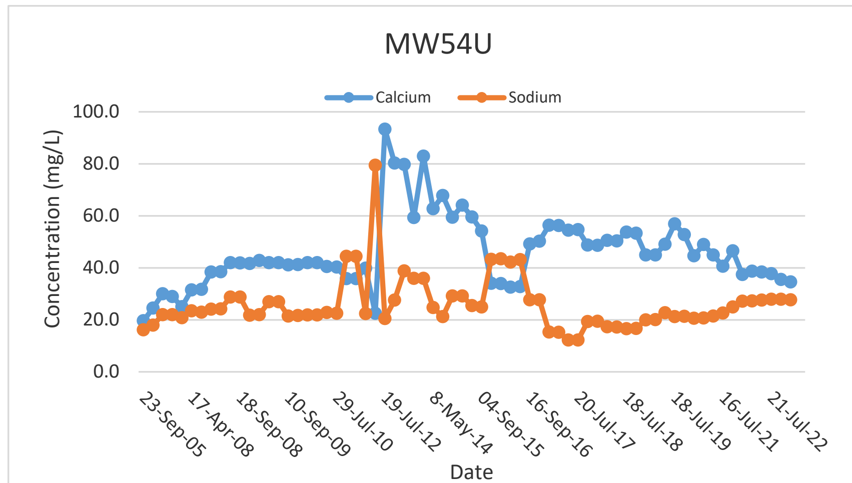
Appendix J:
Trend Graphs MW54U
1997 - 2022

Client: Fundy Regional Services Commission
Project Number: 4662.09









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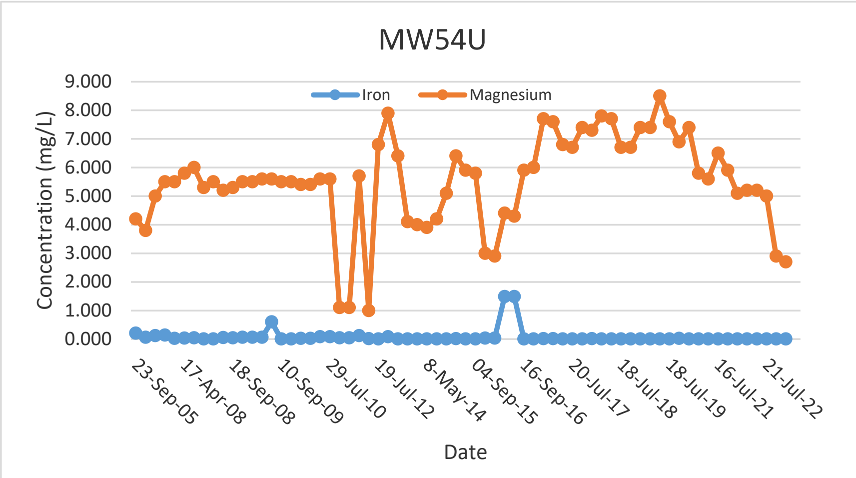
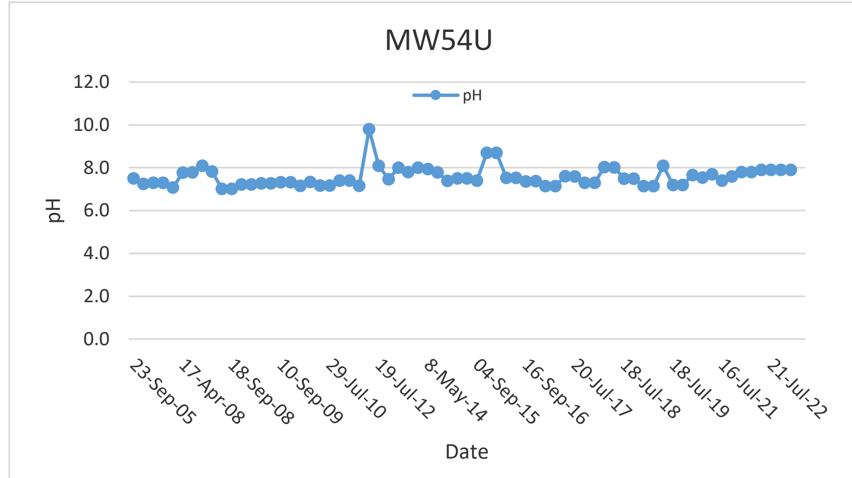
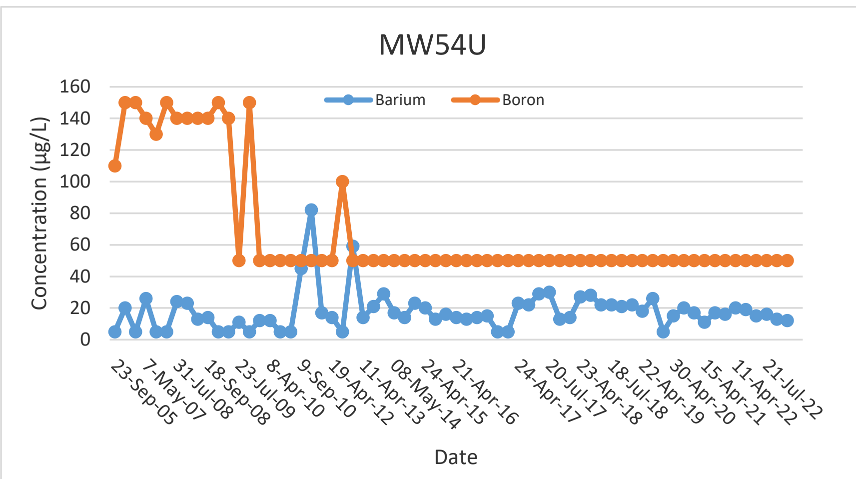
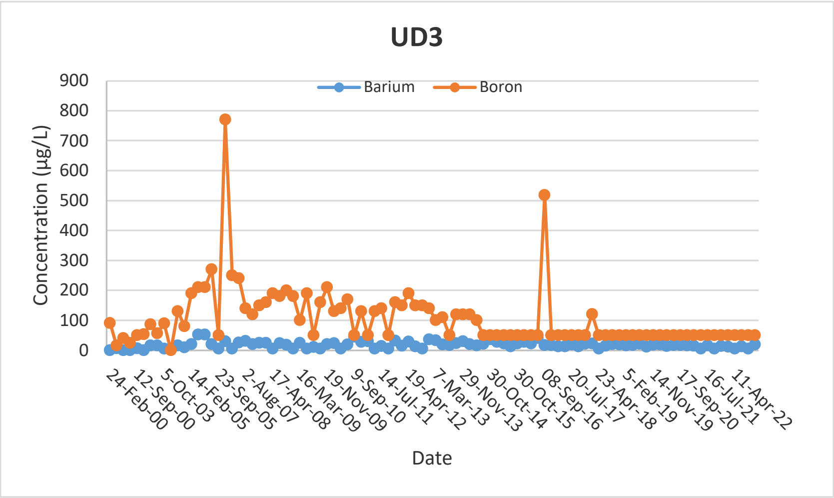
Appendix J:
Trend Graphs MW54U
1997 - 2022

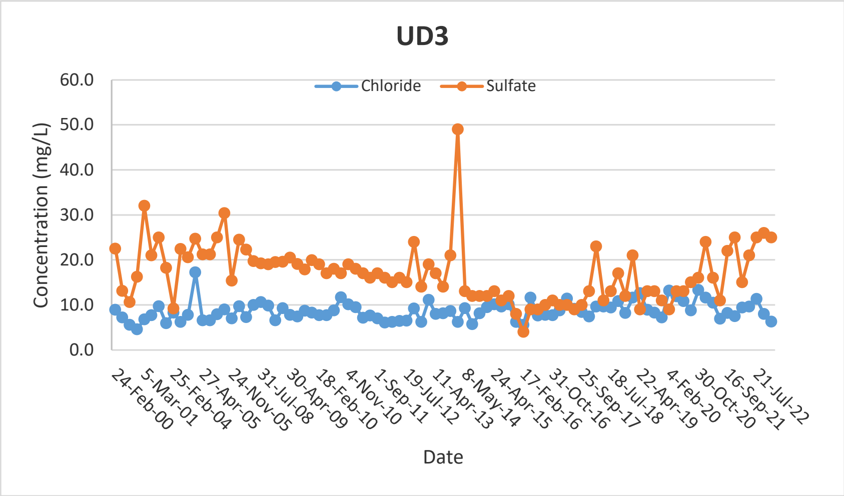
Client: Fundy Regional Services Commission
Project Number: 4662.09

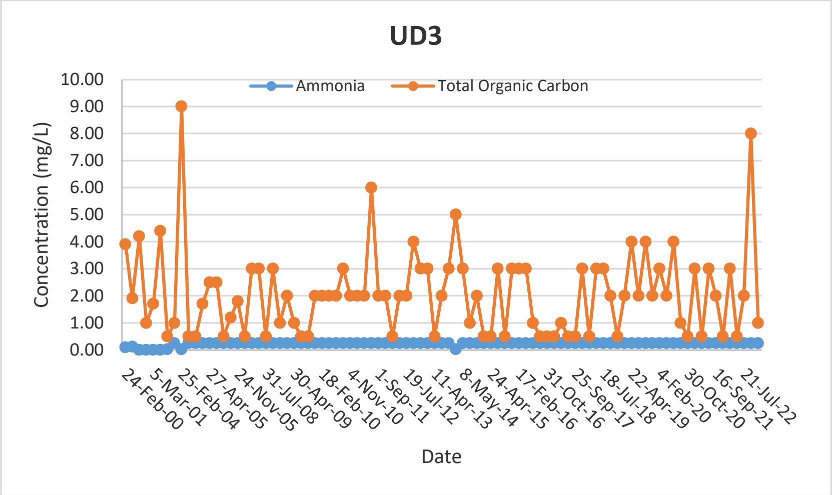


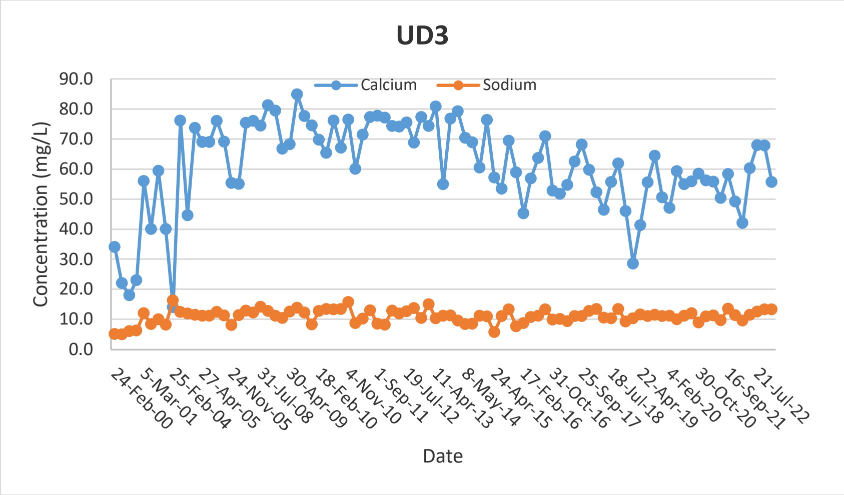


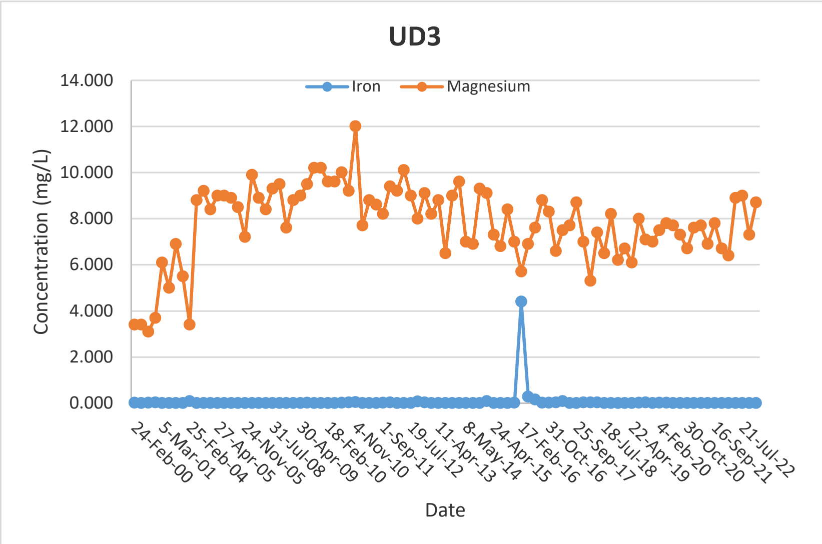


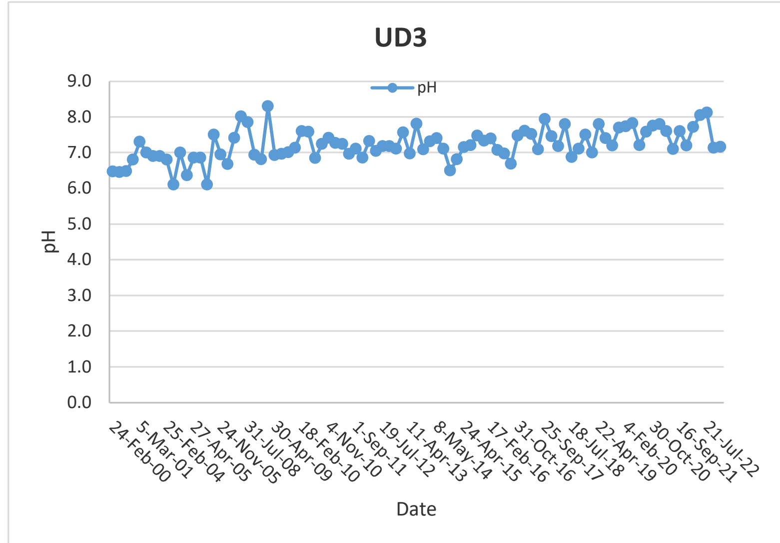

UD3
Barium
Boron
Concentration (µg/L)
Date

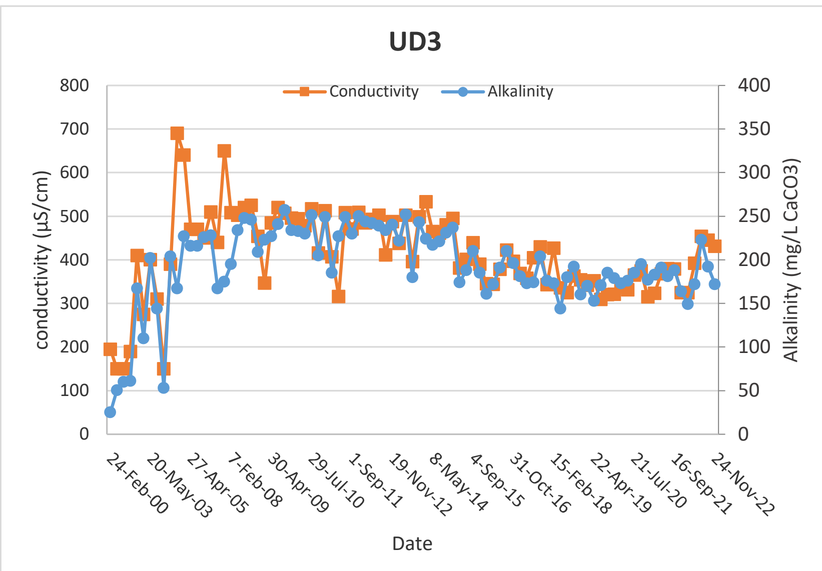

UD3
Chloride
Sulfate
Concentration (mg/L)
Date

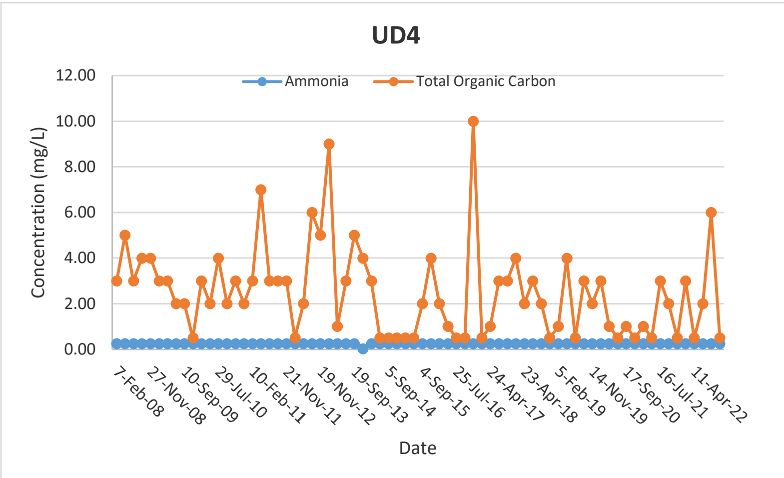

UD3
Ammonia
Total Organic Carbon
Concentration (mg/L)
Date

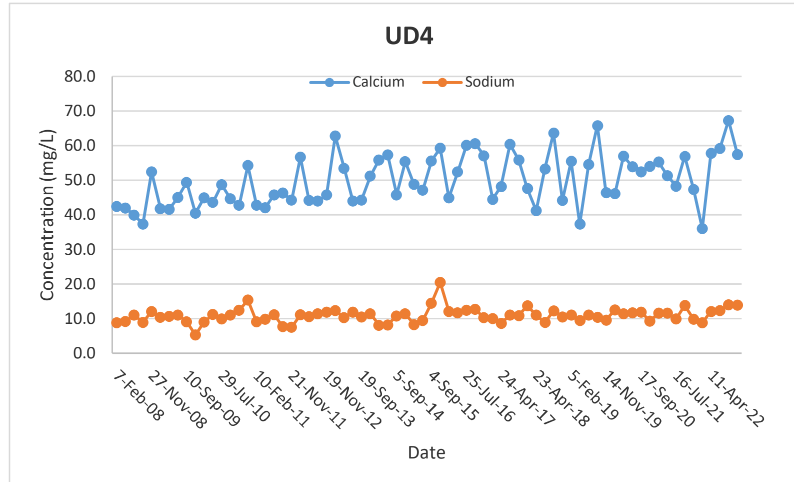

UD3
Calcium
Sodium
Concentration (mg/L)
Date

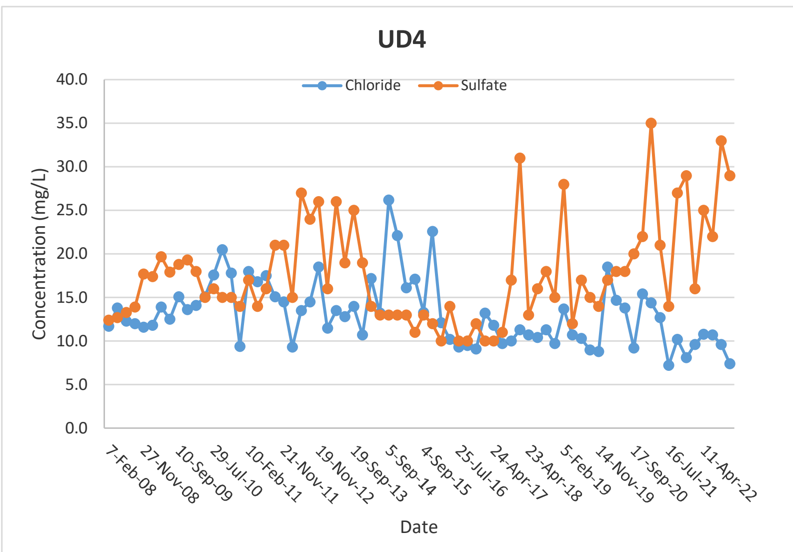

UD3
Iron
Magnesium
Concentration (mg/L)
14.000
12.000
10.000
8.000
6.000
4.000
2.000
0.000
24-Feb-00
5-Mar-01
25-Feb-04
27-Apr-05
24-Nov-05
31-Jul-08
30-Apr-09
18-Feb-10
4-Nov-10
1-Sep-11
19-Jul-12
11-Apr-13
8-May-14
24-Apr-15
17-Feb-16
31-Oct-16
25-Sep-17
18-Jul-18
22-Apr-19
4-Feb-20
30-Oct-20
16-Sep-21
21-Jul-22
Date

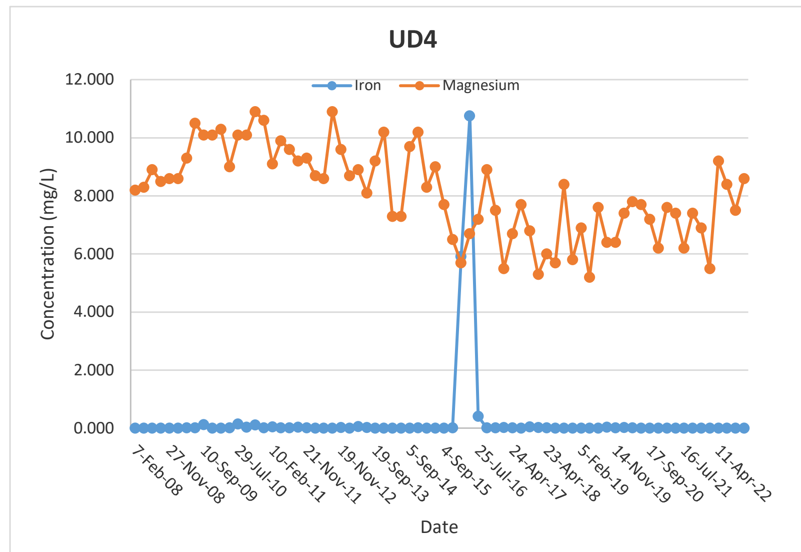

UD3
pH
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
24-Feb-00
5-Mar-01
25-Feb-04
27-Apr-05
24-Nov-05
31-Jul-08
30-Apr-09
18-Feb-10
4-Nov-10
1-Sep-11
19-Jul-12
11-Apr-13
8-May-14
24-Apr-15
17-Feb-16
31-Oct-16
25-Sep-17
18-Jul-18
22-Apr-19
4-Feb-20
30-Oct-20
16-Sep-21
21-Jul-22
Date

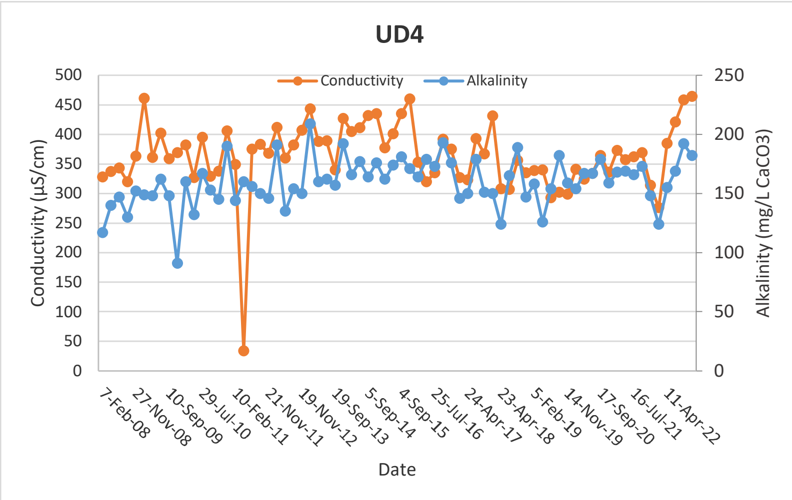

UD3
Conductivity
Alkalinity
conductivity (µS/cm)
Alkalinity (mg/L CaCO3)
800
700
600
500
400
300
200
100
0
400
350
300
250
200
150
100
50
0
24-Feb-00
20-May-03
27-Apr-05
7-Feb-08
30-Apr-09
29-Jul-10
1-Sep-11
19-Nov-12
8-May-14
4-Sep-15
31-Oct-16
15-Feb-18
22-Apr-19
21-Jul-20
16-Sep-21
24-Nov-22
Date

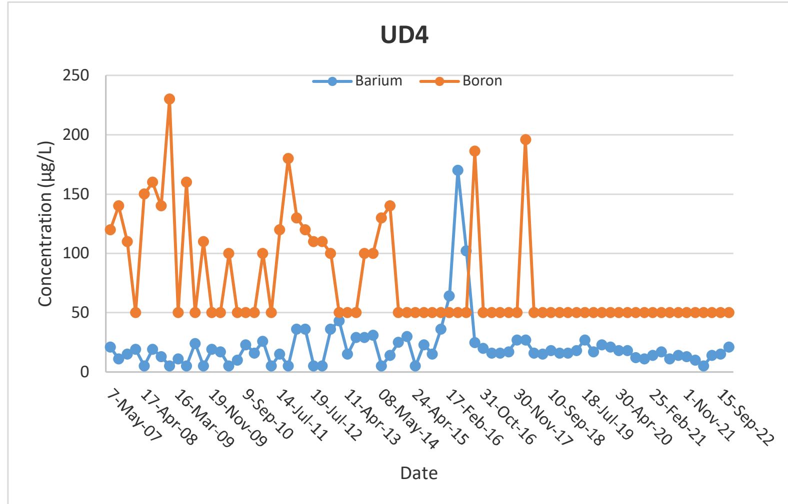

UD4
Ammonia
Total Organic Carbon
Concentration (mg/L)
Date

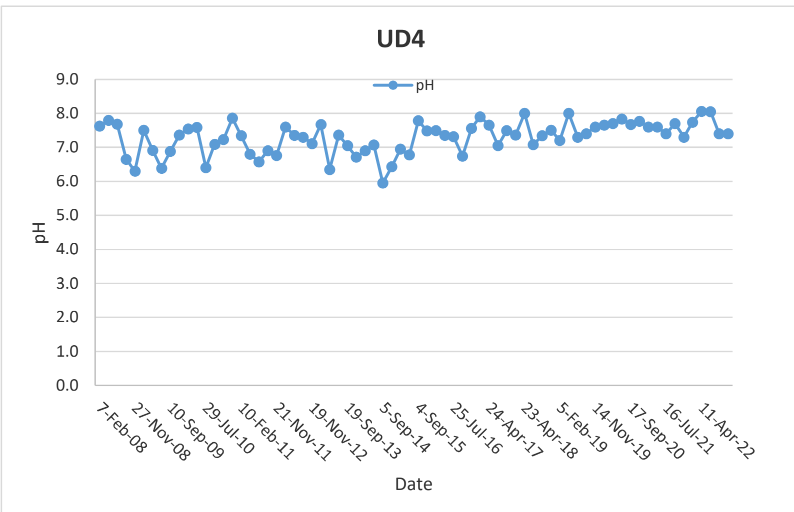

UD4
Calcium
Sodium
Concentration (mg/L)
Date


UD4
Chloride
Sulfate
Concentration (mg/L)
Date


UD4
Iron
Magnesium
Concentration (mg/L)
Date

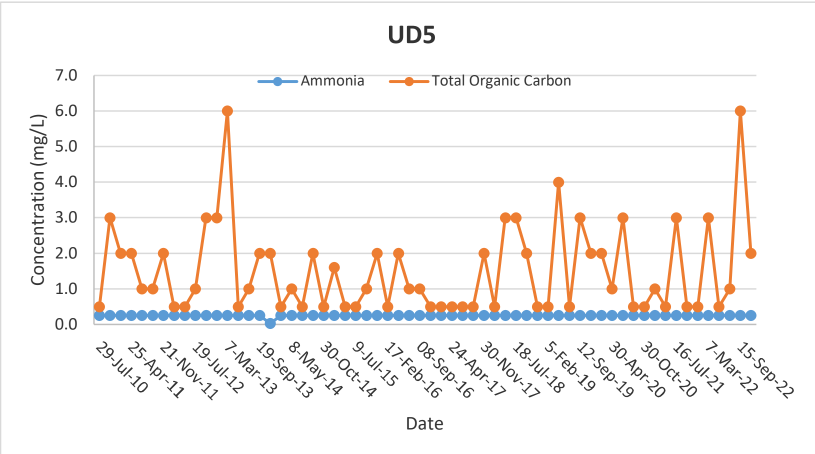

UD4
Conductivity
Alkalinity
Conductivity (µS/cm)
Alkalinity (mg/L CaCO3)
Date

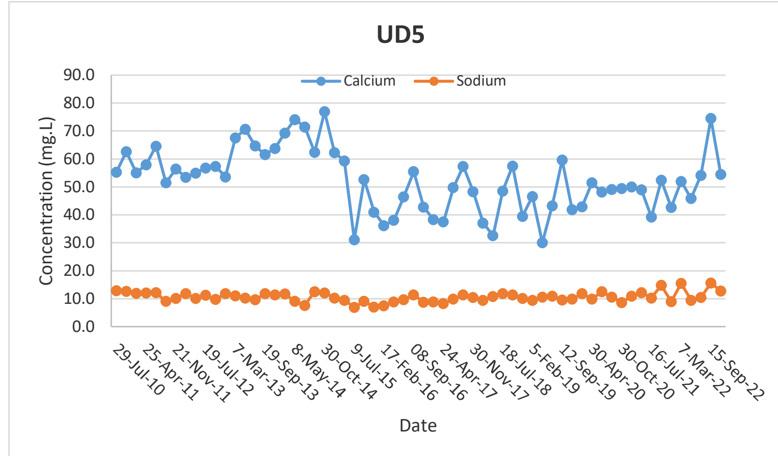

UD4
Barium
Boron
Concentration (µg/L)
Date

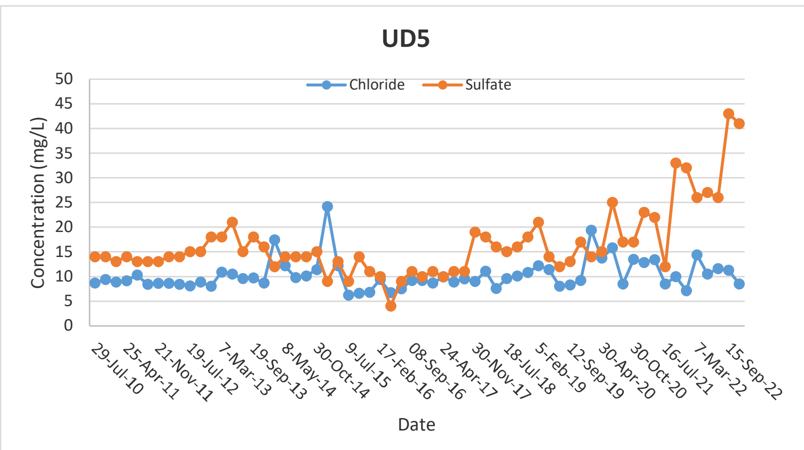

UD4
pH
Date

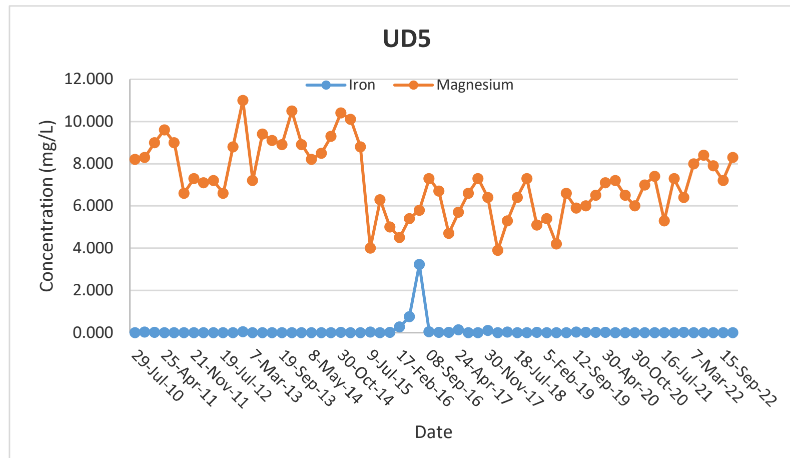
Appendix J:
Trend Graphs UD5
1997 - 2022

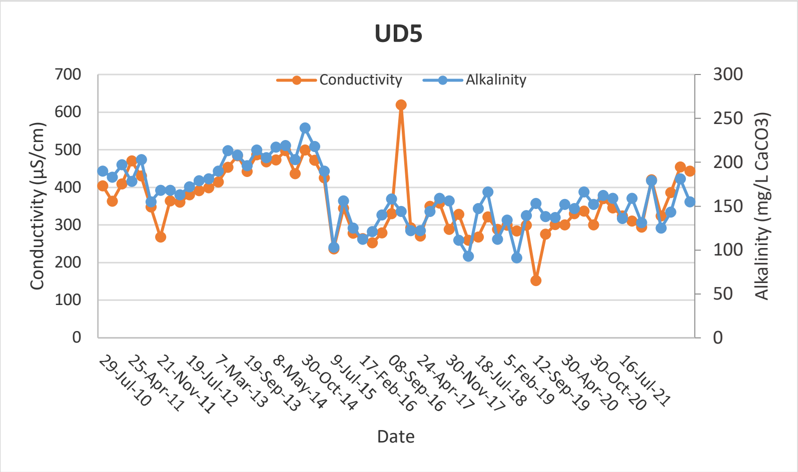
Client: Fundy Regional Services Commission
Project Number: 4662.09

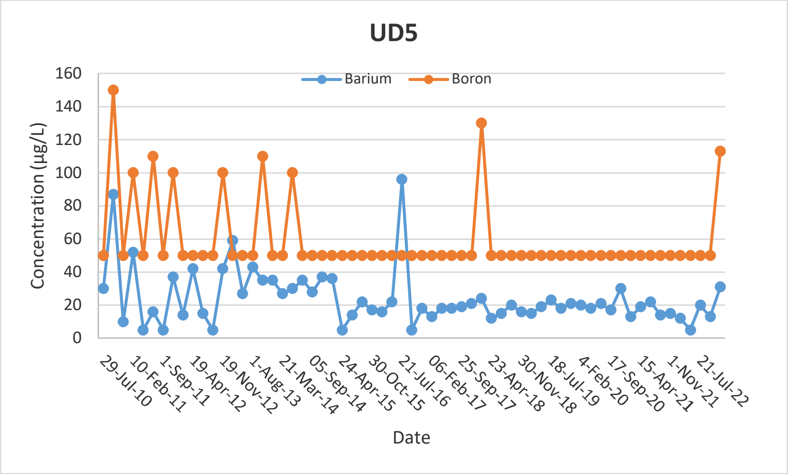


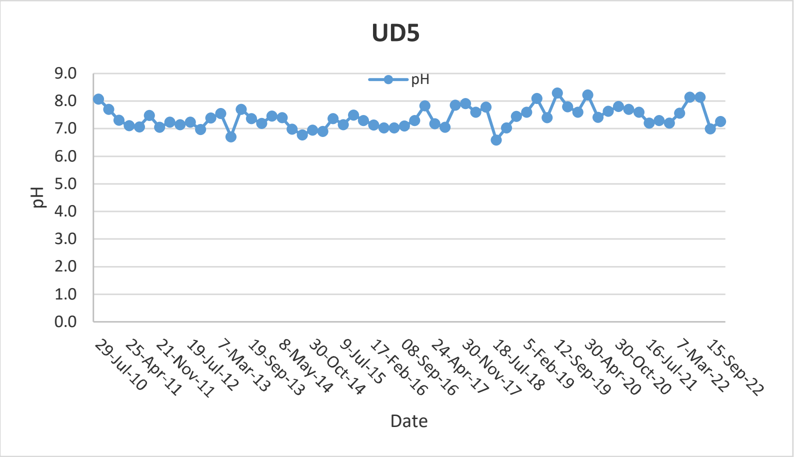







UD5
Conductivity
Alkalinity
Conductivity (µS/cm)
Alkalinity (mg/L CaCO3)
0
100
200
300
400
500
600
700
0
50
100
150
200
250
300
29-Jul-10
25-Apr-11
21-Nov-11
19-Jul-12
7-Mar-13
19-Sep-13
8-May-14
30-Oct-14
9-Jul-15
17-Feb-16
08-Sep-16
24-Apr-17
30-Nov-17
18-Jul-18
5-Feb-19
12-Sep-19
30-Apr-20
30-Oct-20
16-Jul-21
Date


UD5
Barium
Boron
Concentration (µg/L)
0
20
40
60
80
100
120
140
160
29-Jul-10
10-Feb-11
1-Sep-11
19-Apr-12
19-Nov-12
1-Aug-13
21-Mar-14
05-Sep-14
24-Apr-15
30-Oct-15
21-Jul-16
06-Feb-17
25-Sep-17
23-Apr-18
30-Nov-18
18-Jul-19
4-Feb-20
17-Sep-20
15-Apr-21
1-Nov-21
21-Jul-22
Date


UD5
pH
pH
0.0
1.0
2.0
3.0
4.0
5.0
6.0
7.0
8.0
9.0
29-Jul-10
25-Apr-11
21-Nov-11
19-Jul-12
7-Mar-13
19-Sep-13
8-May-14
30-Oct-14
9-Jul-15
17-Feb-16
08-Sep-16
24-Apr-17
30-Nov-17
18-Jul-18
5-Feb-19
12-Sep-19
30-Apr-20
30-Oct-20
16-Jul-21
7-Mar-22
15-Sep-22
Date

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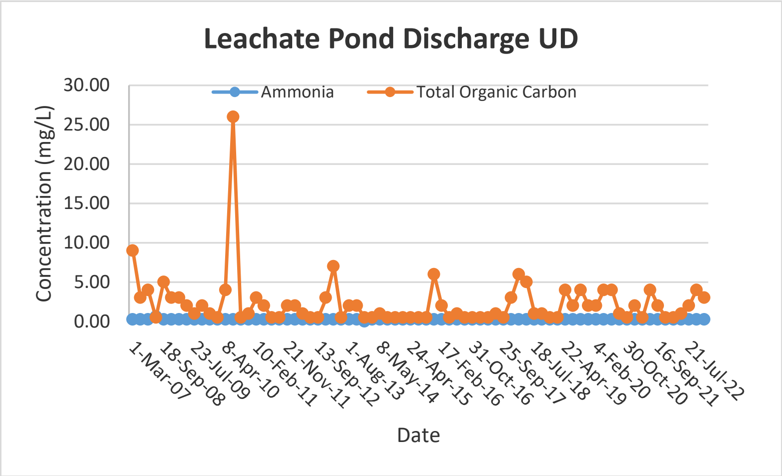
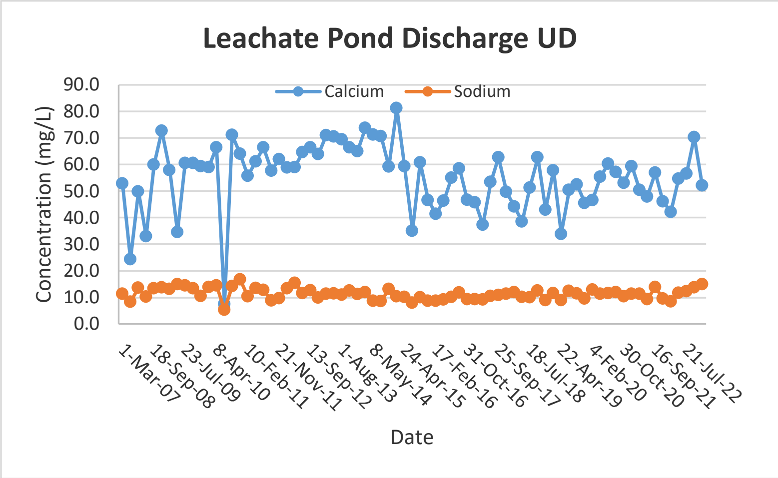
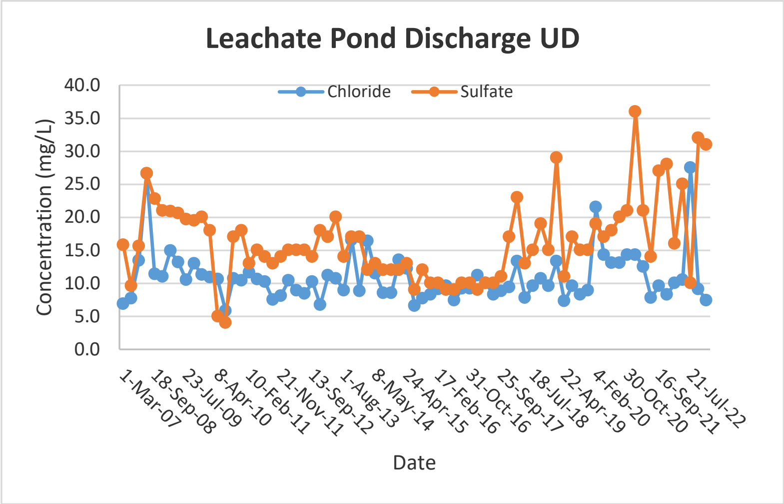
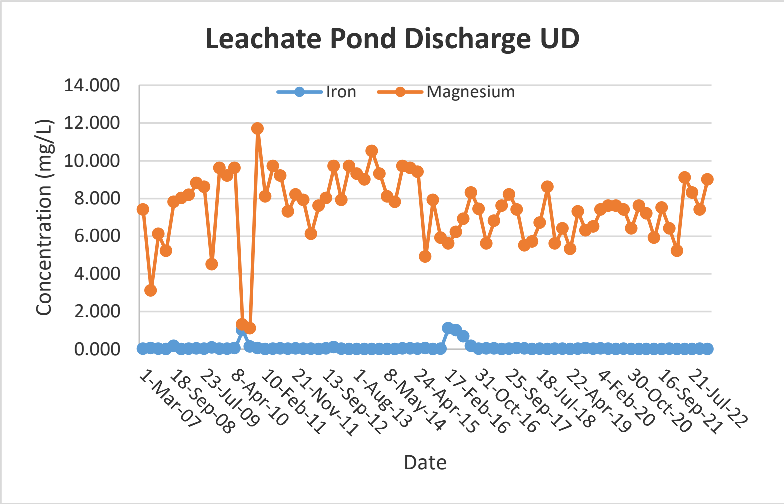
Appendix J:
Trend Graphs Leachate Pond Discharge
1997 - 2022

Client: Fundy Regional Services Commission
Project Number: 4662.09



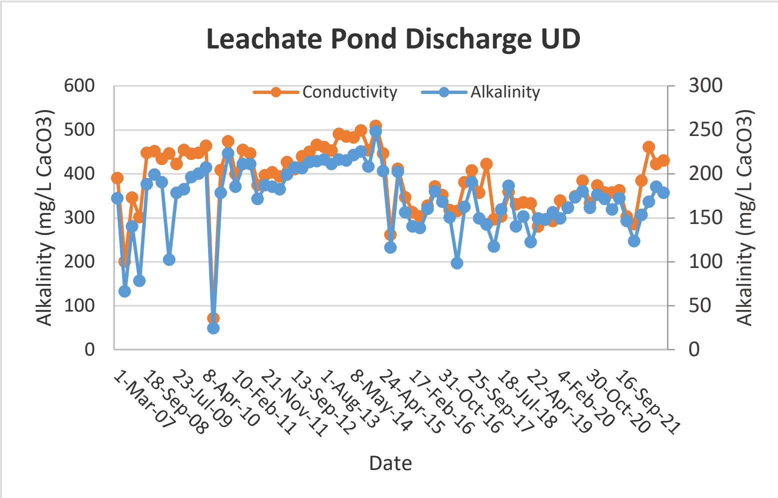


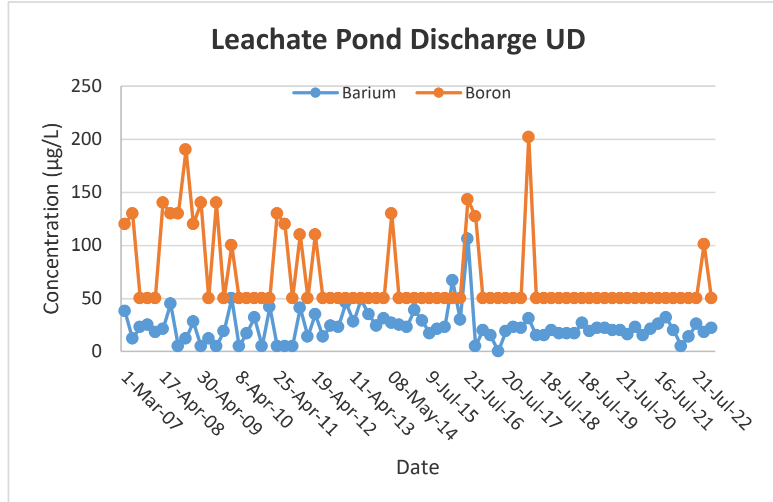


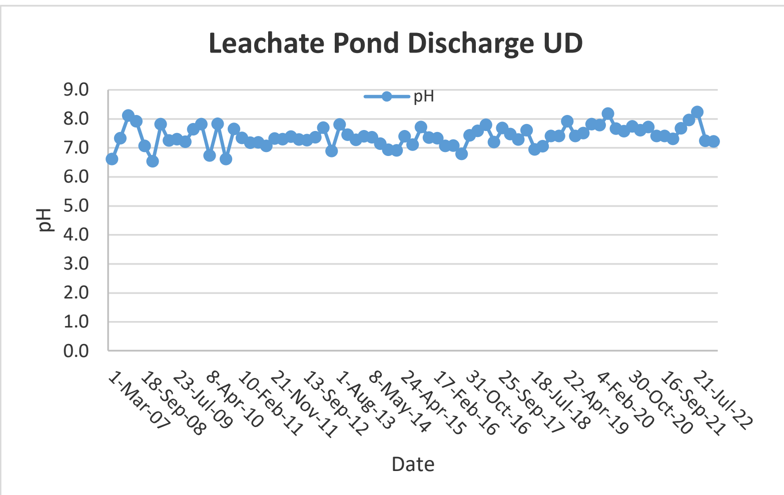


Appendix J:
Trend Graphs Leachate Pond Discharge
1997 - 2022

Client: Fundy Regional Services Commission
Project Number: 4662.09







experience • knowledge • integrity

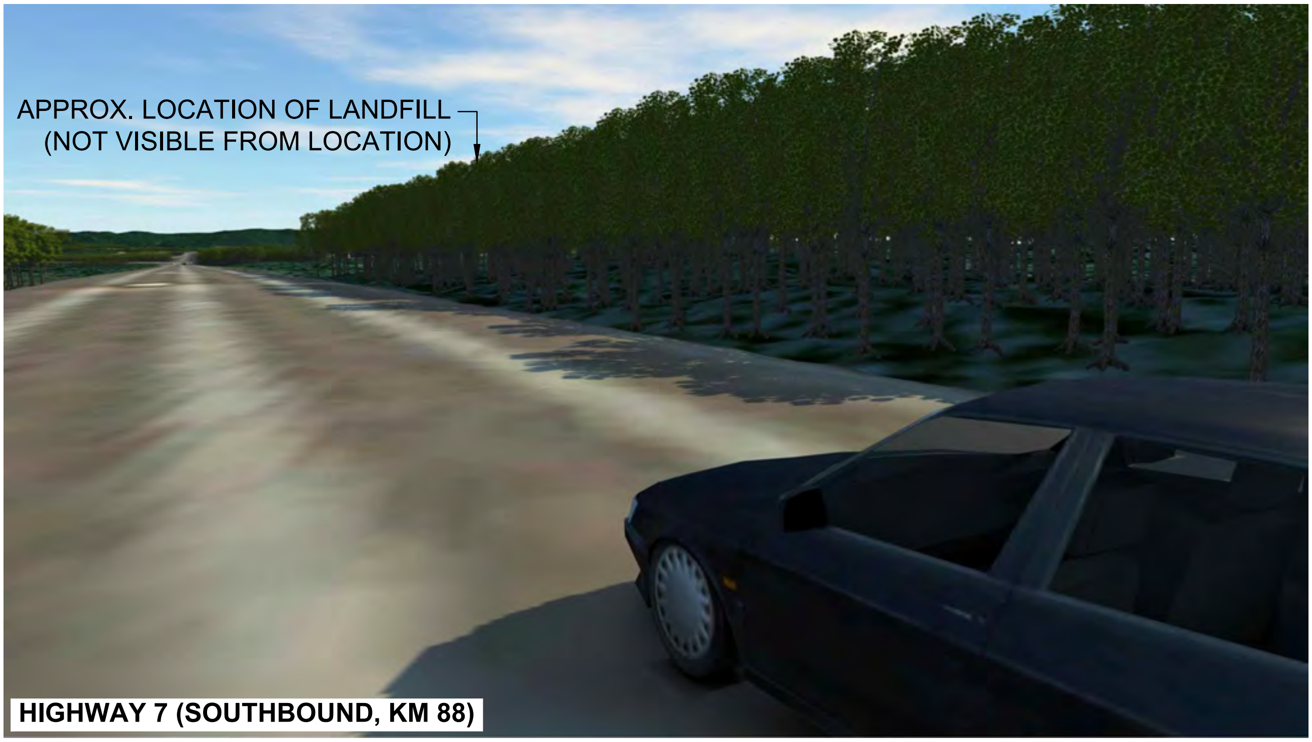
civil	civil
geotechnical	géotechnique
environmental	environnement
structural	structures
field services	surveillance de chantier
materials testing	service de laboratoire des matériaux

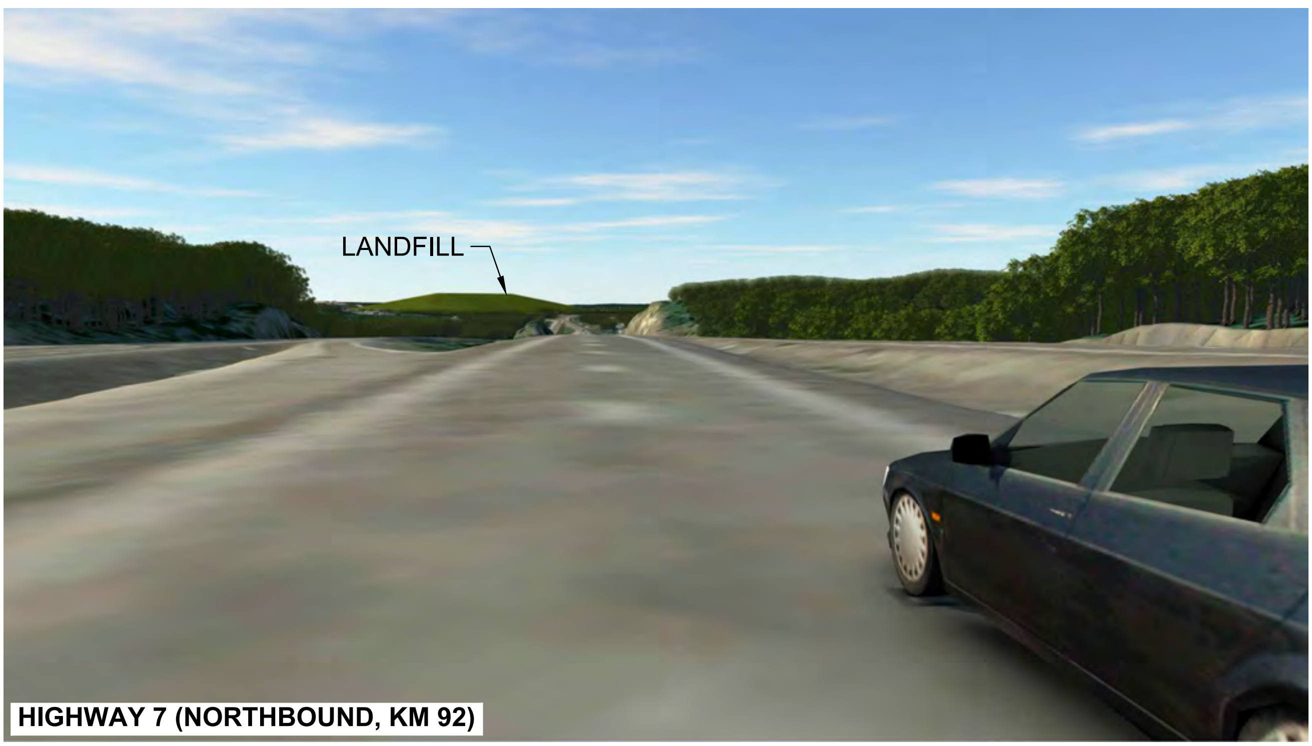
expérience • connaissance • intégrité

ANNEXE F

Panoramas futurs prévus et modélisation des plans de vue

Rapport présenté à : Department of Environment and Local Government
Projet GEMTEC : 100018.012 (June 21, 2023)





PROJECT		DRAWING		GEMTEC CONSULTING ENGINEERS AND SCIENTISTS
EIA AND ENGINEERING ASSESSMENTS, RAISING TOP OF LANDFILL ELEVATION, CRANE MOUNTAIN LANDFILL, SAINT JOHN, NB		FUTURE PROJECTED VIEWSCAPES (1 of 3)		
DRAWN BY	DATE	FILE NO.	DRAWING NO.	REVISION NO.
AGSD	OCT, 2022	100018012-02	FIGURE H-1	0

PROJECT	DRAWING
EIA AND ENGINEERING ASSESSMENTS, RAISING TOP OF LANDFILL ELEVATION, CRANE MOUNTAIN LANDFILL, SAINT JOHN, NB	FUTURE PROJECTED VIEWSCAPES (2 of 3)

DRAWN BY	DATE	FILE NO.	DRAWING NO.	REVISION NO.
AGSD	OCT, 2022	100018012-02	FIGURE H-2	0

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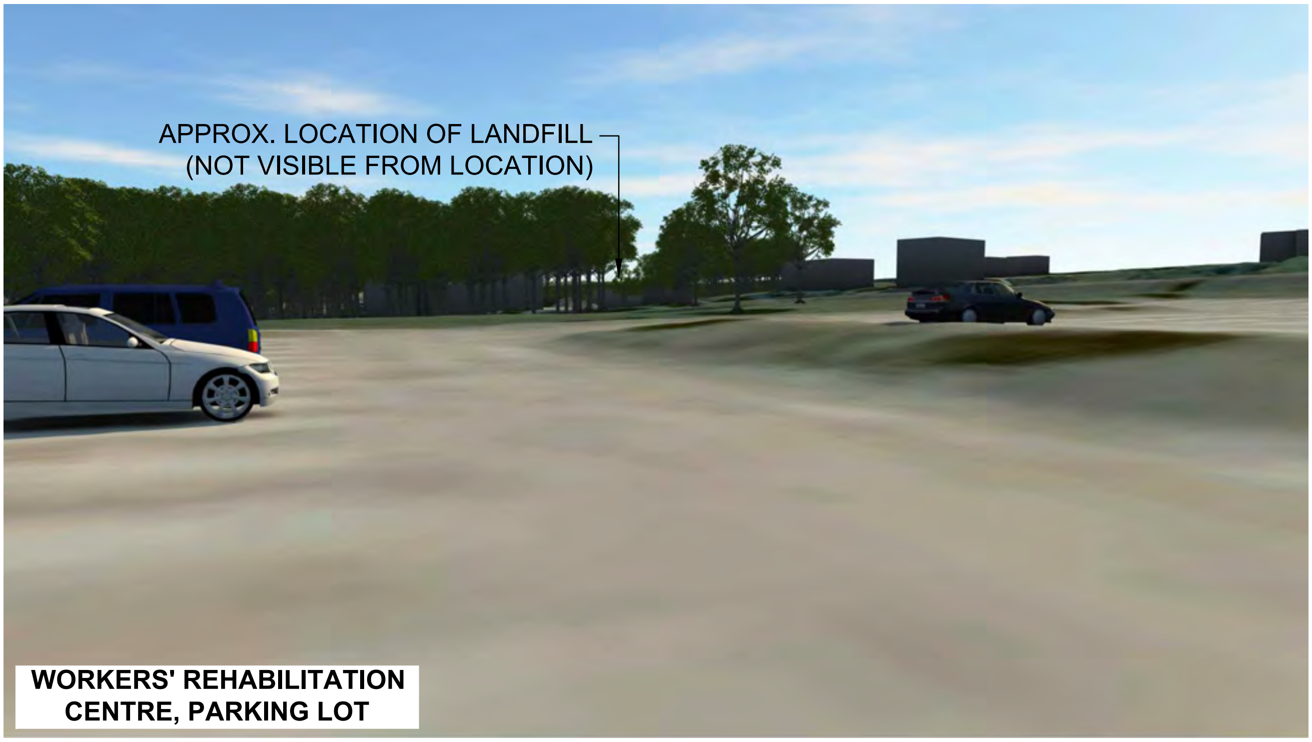
Plotted: Oct 20, 2022 09:23 AM - by: ANDREW DEMERCHANT - File: n:\projects\100000\100018.012\drafting\sheets\100018012-02-viewscapes.dwg



PROJECT			DRAWING	
EIA AND ENGINEERING ASSESSMENTS, RAISING TOP OF LANDFILL ELEVATION, CRANE MOUNTAIN LANDFILL, SAINT JOHN, NB			FUTURE PROJECTED VIEWSCAPES (3 of 3)	
DRAWN BY	DATE	FILE NO.	DRAWING NO.	REVISION NO.
AGSD	OCT, 2022	100018012-02	FIGURE H-3	0

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experience • knowledge • integrity

civil	civil
geotechnical	géotechnique
environmental	environnement
structural	structures
field services	surveillance de chantier
materials testing	service de laboratoire des matériaux

expérience • connaissance • intégrité