



pennsylvania

DEPARTMENT OF TRANSPORTATION

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ÔUT T U Þ Y ÒœŠVP ÁÜØÁÜÒÞÞ ÙÿŠXœÞœÁ
ÖÒÚœÛVT ÒÞVÁÜØÁÜœÞ ÙÚUÜVœVQÞ

ÔUÞVÜœÖVÄÁ I €€€Fì í H
Y UÜSÁÜÜÖÖÜÄÁÜQVÁ UÁ€€



[illegible]

RKVV'Y Q'%242

F gr vj 'vq'Dgf t qemUgkuo k'O gcuw t kpi 'F gxleg

Rtgrko kpct { 'Hkpcn'Tgr qtv

Rtgr ctgf "d{ <

Uvgxgp'I 0Ucej u.'Rj 0F 0

F gr ct w gpv'qh'Ekxkl'c pf 'Gpxkt qpo gpwn'Gpi kpggt kpi

Wpkxgt ukyl "qh'Rkwudwt i j

Pqxgo dgt"4243

[illegible]

Vj g'eqpvwpw'qh'yj ku'tgr qtv'tghngev'yj g'xlgy u'qh'yj g'cwj qtu'y j q'ctg'tgur qpukdng'hqt 'yj g'hcevu'cpf " yj g'ceewtce{ 'qh'yj g'f'cvc'r t gupvgf 'j gtgkp0Vj g'eqpvwpw'f q'pqvpgeguuctkn{ 'tghngev'yj g'qhhlecn' xlgys u'qt'r rnekgu'qh'yj g'WUOF gr ctvo gpv'qh'Vtcur qtvcvkqp.'Hgf gtcdJ ki jy c{ 'Cfo kpkutcvkqp.'qt" yj g'Ego o qpy gcny 'qh'Rgpupu{ nkcplc'cv'yj g'vlo g'qh'r wdnecvkqp0Vj ku'tgr qtv'f qgu'pqv'eqpukswwg"c" ucpcf tf.'ur gekhlecvkqp.'qt'tgi wrvkqp0

Vj ku'y qtm'ly cu'ur qpuqtgf 'd{ 'vj g'Rgppu{ kcpk'F gr ctvo gpv'qh"Vtcur qtvc'kp"cpf 'vj g'WUU' F gr ctvo gpv'qh"Vtcur qtvc'kp.'Hgf gten'J ki j y c{ 'Cfo kpkutvc'kp0

30 Nkgt cwt g'T gxlgy

Vj g'r wtr qug'qh'vj ku'r tqlgev'ku'v'gxcnvcg'vj g'wug'qh'r cuukxg'ugkuo le'o gjv qf u'v'g'ugko cvg'vj g' f gr vj "vq'dgf tqen0Vj g'i qcnlqh'vj g'r tqlgev'ku'v'gucdrkuj "vj g'ceewtce{ "cpf "ghhece{ "qh'vj gug" o gjv qf u'cu'eqo r ctgf "vq'ewtgpv'cpf "j kvqtke'eqtg'dqtkpi "vcnnp'd{ "RgppF QV."y kj "vj g'i qcnldgkpi " vq'gko kpcvg'c'r qtvkqp'qh'vj g'eqtg'dqtkpi u'ewtgpv' "dgkpi "r gthqto gf "d{ "vj g'F gr ctvo gp0Vj g'htuv" ugr "kp'vj ku'r tqegu'ku'v'g'r gthqto "c'rkgtcwtg'tgxlgy 0Vj ku'rkgtcwtg'tgxlgy "y knlgzco kpg'vj g' wpf gtn' kpi "vgej pqmji { "qh'f gr vj "vq'dgf tqen'ugkuo le'o gcuwtkpi "f gxlegu'cpf "o gjv qf u'y j lej "ctg" vcf kkpccm' "r cuukxg'ugkuo le'o gjv qf u'0Vj gug'ugkuo le'kpxgunki cvkpu'ctg'wugf "vq'f gkpgcvg" f khtgtpv'i gqmi le'eqpf kkpku'wvej "cu'rc{ gt'i gqo gxt{ "y cvgt'cdng."cpf "vj g'dgf tqen'vqr qi tcr j { 0' Ekxk'gpi kpggtu'tgn' "qp'ceewtcvg'o gcuwtgo gpw'cpf "cuuguuo gpw'qh'dgf tqen'vq'dwrf "uchg."ucdrng" dwrf kpi u.'dtkf i gu."cpf "y gmu0Gpi kpggtu'cuq'tgn' "qp'dgf tqen'vq'o cng'wug'dtkf i gu'ctg'uchg"cpf " ugewtg'*Def cqwk'g'cr04232+0Vj g'tgxlgy "y kn'cuq'kpenf g'cp'kpxgunki cvkqp'qh'f khtgtpv'cxckdrng" o gjv qf u'y j lej "ctg'ewtgpv' "dgkpi "wugf "vq'r gthqto "kf gpv'ecnd'cpf "uko krt'hwpev'kpu0Cnuq."vj g' t gxlgy "y kn'gxcnvcg'cpf "tgeqo o gpf "vj g'vqr "f gr vj "vq'dgf tqen'ugkuo le'o gcuwtkpi "o gjv qf u'cu" y gni'cu'gxcnvcg'cpf "tgeqo o gpf "vj g'vgej pls wgu'cpf "r tqegf wtgu'vj cv'y kn'dg'dguv'hw'vj g'pggf u'qh' vj g'Rgppu{ kcpkc'F gr ctvo gpv'qh'Vtcpur qtvkqp"*RgppF QV+0

Vj g'htuv'r ctv'qh'vj g'tgxlgy "y kn'dg'c'dceni tqwpf "kp'v'f khtgtpv'i gqr j { ulecn'o gjv qf u'y j lej " j cxg'dggp'go r m{ gf "cu'y gni'cu'vj g'cr r necv'kpu0Cf f kkpccm' . "vj g'tgngxcpv'Co gtlecp'Uqekvg' "hqt" Vgukpi "cpf "O cvgtkcn'"*CUVO +ucpf ctf u'hqt "vj g'vgej pqmji kgu'y kn'dg'r tgu'pvgf 0Vj g'pgzv' ugevkqp'y kn'f gvck'vj g'r tlo ct { "f gr vj "vq'dgf tqen'gxcnvcg'v'vgej pls wgu'kp'o qtg'f gvck'0Rt gxlqwu" ci gpe{ "gzr gtlgpeg'y kn'dg'gucdrkuj gf "vj gp'vj g'tgeqo o gpf gf "vgej pls wgu'y kn'dg'r tgu'pvgf 0

3'0'I gqr j { ulecn0 gjv qf u

Crr rkgf "i gqr j { uleu'ku'c'xcu'ctgc'qh'f khtgtpv'o gjv qf qmji kgu'y j lej "ecp'dg'wugf "hqt"o cp{ " f khtgtpv'cr r necv'kpu'tcpi kpi "h'qo "gpgti { "gzr mtevkqp'v'gpi kpggtkpi "cpf "gpxkqpo gpw'0Gcej " o gjv qf "ku'ugr ctvgf "d{ "vj g'r j { uleu'r tkpkr ngu'y j lej "ctg'go r m{ gf 0Hqt "gzco r rg."o cvgtkcn' r tqr gt'v'ecp'dg'lpf kgevn' "o gcuwtgf "vj tqwi j "vj g'wug'qh'gpi kpggtkpi "i gqr j { ulecn'o gjv qf u'wvej " cu'ugkuo le."grgvt'ecnt'gukuxkx{."GO "cpf "i tqwpf "r gpgtcv'kpi "tcf ct'*I RT+*I tggpj qwug"cpf " Rgj o g'4223+0Vj g'vcti gw'qh'i gqr j { ulecn'r tqdngo u'ctg'tctgn' "f kgevn' "qdugt'cdng"cpf "vj gthqtg" tgs vktg'o cvj go cvlecn'lpv'gtr tgc'v'kqp'qh'r j { ulecn'o gcuwtgo gpw'0Vj g'cdk'kx{ "vq'eqpf wv' i gqr j { ulecn'kpxgunki cvkpu'kp'c'xctlgv' "qh'f khtgtpv'i gqmi le'eqpf kkpku'lpf kcv'gf "vj g'r qv'p'v'cn'v'q" uki p'k'ecpvn' "dgpgh'f guki p'cpf "eqpuw'v'kqp'cev'kxk'gu0Qpg'qh'vj g'o quv'ko r qtv'p'v'vj kpi u'y j lej " ecp'dg'i clpgf "d{ "go r m{ kpi "vj gug'o gjv qf qmji kgu'ku'v'g'f w'eg'tkumu'tg'v'gf "vq'w'pnpqy p" uwdw'htceg'eqpf kkpku'0J qy gxgt."k'ku'xkcn'vj cv'y g'cr r tqr tlc'v'vgej pls wgu'dg'wugf "hqt"vj g' ur gek'ke"gpi kpggtkpi "qdl'gev'kxgu0

Vgthqtf "gv'cr0*3; 98+q'w'v'k'p'gu'vj cv'cr r rkgf "i gqr j { uleu'ecp'dg'f kxkf gf "kp'v'vj g'hqmqy kpi "ugxgp" *9+fi gpgtcn'o gjv qf u'<o ci pgv'ke."grgvt'ecn'grgvtqo ci pgv'ke."ugkuo le."i t'cxk'cv'k'p'cn'tcf kqcev'kxg." cpf "y gni'qi i kpi 0Gcej "qh'vj gug'f khtgtpv'o gjv qf u'ecp'dg'wugf "hqt"xct { kpi "v' r gu'qh" kpxgunki cvkpu0C'uwo o ct { "qh'c'p'wo dgt'qh'f khtgtpv'i gqr j { ulecn'o gjv qf u'cpf "vj gkt'cr r necv'kpu" y gtg'r gthqto gf "kp'PEJ TR"U{ pjv guku'579"*Uk'rgu'4227+0Vj ku'r tqxkf gu'c'ux'v'kpi "r qkpv'hqt"

ugrgevkqp"qh'yj g'vgej pls wgu'y j lej 'ctg'o quv'cr r ncedng'vq'gxcnwcg'yj g'f gr yj 'qh'dgf tqen0Cm'qh' yj g'r tko ct { 'vgej pls wgu'kf gpvkhgf 'kp'PEJ TR'U{pyj guku'579'vq'f gvgto kpg'yj g'f gr yj 'qh'dgf tqen'ctg' ugkuo le'o gjy qf u0Vj gug'kpenwf g'ugkuo le'tghicevkqp'cpf 'ugkuo le'tghgevkqp'vqo qi tcr j { '.cpf " uwticeg'y cxg'*ur gevten'cpcn' uku'qh'uwticeg'y cxgu'*UCUY -'cpf "o wnk'ej cpgn'cpcn' uku'qh'uwticeg' y cxgu'*O CUY +0Vj gtg'ctg'cnuq'c'hgy 'ugeqpf ct { 'vgej pls wgu'y j lej 'y gtg'kf gpvkhgf 'y j lej " kpenwf g'vko g'f qo clp'grgevtqo ci pgvle'uqwpf kpi u.'grgevtkecn'tgukvkv{. 'kpf wegf 'r qm'tk' cvkqp.'cpf " i tcvkv{ 'o gjy qf u'*Uktngu'4227+0Vj ku'tgxkgy 'y knihqewu'qp'yj g'r tko ct { 'o gjy qf u'vq'kf gpvkh{ 'y j g" f gr yj 'vq'dgf tqen'y j lej 'ctg'v{r kecm{ 'go r m{ gf 'cpf 'y j g'yj k'f 'ugevkqp'qh'yj g'tgr qt v'y kn'qwkpg" yj gug'kp'f gvckf0

3'0'CUVO 'Ucpcf ctf u

C'pwo dgt'qh'f khgtgpv'CUVO 'ucpcf ctf u'cpf 'i wkf gu'ctg'cxckndng'hqt'i gqr j { ulecn' kpxguki cvkqpu'cpf 'ctg'uwo o ctk gf 'kp'Vcdng'40Qpg'qh'yj g'r tko ct { 'i wkf gu'y j lej 'j cu'dggp" cxckndng'y cu'CUVO 'F 864; 'y j lej 'y cu'yj g'Ucpcf ctf 'I wkf g'hqt'Ugrgevkpi 'Uwticeg'I gqr j { ulecn' O gjy qf u'*CUVO 'F 864; +0Vj ku'i wkf g'r tqxkf gf 'c'pwo dgt'qh'f khgtgpv'vgej pls wgu'kpenwf kpi " ugkuo le'tghicevkqp'cpf 'tghgevkqp.'y q'*4+'qh'yj g'r tko ct { 'o gjy qf u'vq'gxcnwcg'yj g'dgf tqen'f gr yj 0' Vj g'ucpcf ctf 'y cu'lwu'y kj f tcy p'kp'O ctej '4242'cpf 'y cu'pqv'tgpgy gf 'dgecwug'yj g'i wkf g'f qgu'pqv' f guetkdg'yj g'ur gekk'le'r tqegf wtu'ht'eqpf wevkpi 'i gqr j { ulecn'uwtxg{u'cpf 'kpf k'kf wcn'i wkf gu'ctg" dglkpi 'f gxgnr gf 'hqt'gcej 'i gqr j { ulecn'o gjy qf 0

Vj g'ucpcf ctf u'hqt'gcej 'qh'yj g'o gjy qf u'y j lej 'ecp'dg'wugf 'hqt'dgf tqen'f gr yj 'guvko cvkqp'qh' r tqxkf gf 'kp'Vcdng'30K'ku'ko r qtcvpv'vq'pqvg'yj cv'yj gug'ctg'ucpcf ctf 'i wkf gu'cpf 'pqv'ucpcf ctf 'vgu' o gjy qf u0Ucpcf ctf 'vgu'v'o gjy qf u'ctg'tki k'f 'r tqegf wtu'y j lej 'f q'pqv'cmqy "o wej . 'kh'cp{. " hgzkdkk{ 0Ucpcf ctf 'i wkf gu'qp'yj g'qy gt 'j cpf 'cmqy 'hqt'o qtg'hgzkdkk{ 'vq'ces wktg'yj g" kphqto cvkqp'cpf 'f cw'yj cv'y kn'o gg'v'yj g'i qcn'qh'yj g'kpxguki cvkqp0CCUJ VQ'j cu'uqo g'i wkf cpeg" hqt'i gqr j { ulecn'o gjy qf u.'gur gekm{ 'I RT.'j qy gxgt'yj gtg'ctg'pq'r wdrkuj gf 'ucpcf ctf u'hqt" ces wktkpi 'qt'r tqeguakpi 'f cw'hqt'o gjy qf u'vq'guvko cvg'yj g'f gr yj 'qh'dgf tqen0

Vcdng'30I wkf gu'hqt'F gr yj 'qh'Dgf tqen'I gqr j { ulecn'Kpxguki cvkqpu

I gqr j { ulecn'Vgej pls wg	CUVO 'I wkf g
Ugkuo le'Tghicevkqp	F 7999
Ugkuo le'Tghgevkqp	F 934:
Vko g'F qo clp'Grgevtqo ci pgvleu	F 8: 42

3'0'F gr yj 'vq'Dgf tqen0 gjy qf u

Vj ku'ugevkqp'cko u'vq'f kuewu'yj g'r tko ct { 'o gjy qf u'kf gpvkhgf 'vq'guvdrkuj 'y g'f gr yj 'vq'dgf tqen0' Cm'qh'yj gug'vgej pls wgu'ctg'ugkuo le'o gjy qf u.'y j lej 'ctg'yj g'o quv'eqo o qpn' 'eqpf wegf " i gqr j { ulecn'uwtxg{u'hqt'gpi kpggtkpi 'kpxguki cvkqpu0Ugkuo le'y cxgu'ctg'i gpgtcvgf 'h'qo "cp" ko r wug'ko r ctvgf 'vq'yj g'uwticeg0V{r kecm{. 'y ku'ku'xlc'c'j co o gt'qt'g'zr m'uk'gu'qt'o c{ 'dg" qdvclpgf 'h'qo 'xkdtcvkqp0Vj gp'gpgti { 'h'qo 'y j g'ko r wug'yj gp'tcxgu'yj tqwi j 'y j g'i tqwpf 'cu" y cxgu0Y j gp'yj g'y cxgu'tgcej 'c'o cvgtken'ic{ gt'y kj 'f khgtgpv'r tqr gt vku'*uwej 'cu'f gpuk{ 'qt" ukh'p'guu+. 'uqo g'qh'yj gug'y cxgu'ctg'tghgevgf 'dcen'vq'yj g'i tqwpf 'uwticeg'cpf 'qy gtu'ctg'tghicevgf "

cmppi "y g'lpvgtlceg."cpf "uqo g'eqpvkpwg"fggr gt "lpvq"y g'i tqwvf 0I gqr j qpgu'ctg"wguf "q'tgeqtf "y g" y cxgu'y j lej "ctg'tghngevf "cpf "tghtcevgf "dcen'q"y g'i tqwvf "uwlhceg"Rctcupku"3; 9; +0Vj g"pgzv" ugevkqp"y knlf gvckl'y g'v r gu'qh'gruule"y cxgu'y j lej "ctg'tcpuo kwgf "y tqwi j "y g'i tqwvf "uwlhceg" hqmjy gf "d{ "o qtg'f gvckltgi ctf kpi "y g'r tko ct{ "vej pls wgu'wguf "q'kf gpvkh{ "y g'f gr yj "q'dgf tqem" ur gekhkecm{ "ugkuo le'tghngevkqp."tghtcevkqp."cpf "uwlhceg"y cxgu"UCUY "cpf "O CUY +0

3050'Gruule'Y cxgu

Ki'c'utguu'ku'cr r nkf "q"cp"gruule"o gf kwo . "y g'gpgti { "ko r ctvgf "lpvq"y g'Gctvj "y knldg'lp"y g" hqto "qh'gruule"y cxgu0Gruule"y cxgu'r tqr ci cvg'y tqwi j "y g'i tqwvf "y kj qw'ecwulpi "cp{ " r gto cpgpvf ghqto cvkqp0Gruule"y cxgu'y cv'r tqr ci cvg'y tqwi j "y g'Gctvj "ctg'tghgttgf "q"cu" ugkuo le"y cxgu."y j lej "ecp'dg'ercuukhkf "cu'gkj gt "dqf { "y cxgu'qt "uwlhceg"y cxgu"Y cvgtu"3; 9: +0

Dqf { "y cxgu'ctg'gruule"y cxgu'y cv'r tqr ci cvg'y tqwi j "y g'lpvgtlqt "qh'y g'Gctvj 0Ugkuo le"dqf { " y cxgu'ecp'dg'hwty gt "f kxf gf "lpvq"y q"*4+"ercuugu<Nqpi kwf kpcn'qt "R/y cxgu"cpf "Vtcpxgtug"qt "U/" y cxgu0R/y cxgu"j cxg'y g'j ki j guv'xgmekv{ "qh'cm'ugkuo le"y cxgu."cpf "ctg'uqo g'ko gu'tghgttgf "q"cu" r tko ct{ "y cxgu0Vj g'r ctveng"o qvkqp"qh'R/y cxgu'ku'lp"y g'uco g'f kgevkqp"cu'y g'y cxg'r tqr ci cvkqp" cpf "r wuj "y g'r ctveng"u'qh'o cvgtkcn'cj gcf "qh'kx."ecwulpi "eqo r tguukqp"cpf "gzr cpukqp"qh'y g'o cvgtkcn' Cf f kxkpcmf. "R/y cxgu'ecp'tcxgn'y tqwi j "uqnf u."hks wkf u."cpf "i cugu0Vj g'xgmekv{ "qh'R/y cxgu'ku" i kxgp"d{ "Gs wcvkqp"3"*Eqtf kgt"3; : 7+0

$$\rho \sqrt[3]{\frac{6}{3}} + 1 \quad \text{Gs wcvkqp}^3$$

Y j gtg" ρ "? "xgmekv{ "qh'R/y cxg." "? "dwmlo qf wwu." "? "uj get"o qf wwu."cpf " "? "f gpukv{ "qh'y g" o gf kwo 0

Vtcpxgtug."qt "U/y cxgu."ctg'uqo g'ko gu'ecmgf "ugeqpf ct{ "y cxgu'dgecwug"y g{ "tcxgn'cv'c"umy gt" ur ggf "y cp'R/y cxgu0K"U/y cxgu."y g'r ctveng"u'ctg'f kur nceg"cv'tki j v'cpi ngu'q"y g'f kgevkqp"qh'y cxg" r tqr ci cvkqp0Vj g"ur ggf "qh"U/y cxgu"ku"i kxgp"d{ "Gs wcvkqp"4"*Eqtf kgt"3; : 7+0U/y cxgu'tcxgn'cv' cr r tqzko cvgn{ "82" "qh'y g"ur ggf "qh'R/y cxgu0Vj gug"y cxgu'ecp"qpnf "tcxgn'y tqwi j "c"o cvgtkcn' y j lej "j cu"uj get"utgpi yj 0Ukpeg."hwkf u"cpf "i cugu"fq"pqv"j cxg"uj get"utgpi yj . "U/y cxgu"fq"pqv" r tqr ci cvg'y tqwi j "y go "Y cvgtu"3; 9: +0

$$\sqrt[3]{\frac{6}{3}} + 1 \quad \text{Gs wcvkqp}^4$$

Y j gtg" "? "xgmekv{ "qh"U/y cxg." "? "uj get"o qf wwu."cpf " "? "f gpukv{ "qh'y g"o gf kwo 0

Uwlhceg"y cxgu'ctg'gruule"y cxgu'y j lej "r tqr ci cvg'cmppi "y g'Gctvj u'uwlhceg"qt "cv'y g'lpvgtlcegu" dgwy ggp"o gf k0Uwlhceg"y cxgu'r tqr ci cvg'cv'ur ggf u"y cv'ctg"umy gt"y cp"U/y cxgu0Uwlhceg"y cxgu" ecp'dg'f kxf gf "lpvq"y q"*4+f khtgtpv'ercuukhkecvkqp"lwu'cu"dqf { "y cxgu0Vj g'y q"*4+f khtgtpv'v r gu" qh'uwlhceg"y cxgu'ctg"Nqyg"cpf "Tc{ ngki j "y cxgu0Nqyg"y cxgu"j cxg'r ctveng"o qvkqp"y cv'ku'uko krt"

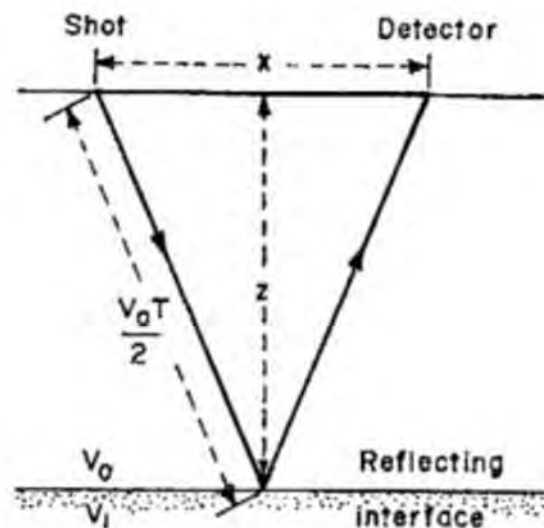
$v_q U/y \text{ cxgu} 0Tc \{ \text{ngki } j \text{ 'y cxgu' txcg n'lp'cp'gnkr ug'uko krc t'v'q'qegcp'y cxgu' }^*Rctcupku'3; 9; +0Nq xg'cpf "$
 $Tc \{ \text{ngki } j \text{ 'y cxgu'ctg'c'r qt'v'kp'qh'v'j g'uwth'ceg'y cxgu'lp'gct'v'j s wcn'gu'0Vj gug'y cxgu'ectt' } \{ 'i \text{ tgc'vgt'}$
 $gp'gti \{ 'v'j \text{ cp'dqf' } \{ 'y \text{ cxgu'cpf'ctt'k'xg'rc'vgt'uk'peg'v'j g' } \{ 'ctg'ur'qy \text{ gt'v'j cp'dqf' } \{ 'y \text{ cxgu'0U'peg'v'j g' } \{ 'ectt' } \{ "$
 $i \text{ tgc'vgt'gp'gti' } \{ . 'v'j \text{ g' } \{ 'ecwug'uki \text{ p'k'kecpw' } \{ 'o \text{ qtg'f'co ci g'v'j cp'dqf' } \{ 'y \text{ cxgu'f'wt'kpi'cp'gct'v'j s wcn'g0$

30504'Ugkuo le'Tghgevkqp

$Vj \text{ g'ugkuo le'tghgevkqp'o gy qf'ku'qpg'qh'v'j g'dgu'vi gqr } j \{ \text{ulecn'o gy qf'u'dgecwug'k'r tqf wegu'v'j g'}$
 $dgu'v'ko ci gu'qh'v'j g'u'wduw'lh'ceg'0C'uq'wteg.'i \text{ gqr } j \text{ qpg.'cpf'ugkuo qi tcr } j \text{ 'ctg'pggf gf'v'q'eqmgev'f'cvc'}$
 $hqt'c'ugkuo le'u'wtxg' } 0Vj \text{ g'uq'wteg'ecp'dg'c'j' co o gt'ut'kn'kpi'v'j g'i tqw'pf.'cnwo kpwo 'r nc'v'gt'}$
 $y \text{ gki } j \text{ v'gf'r'ncpm'y gki } j \text{ w'qh'xct' } \{ \text{kpi'uk'gu'v'j cv'ctg'cm'qy gf'v'q'f'tqr'qp'v'q'v'j g'i tqw'pf.'tk'ng'uj'qv.'}$
 $j \text{ cto qple'quekn'v'qt.'y cv'gtdqtp'g'o ge'j c'pkuo u.'qt'g'zr'm'uk'x'gu' }^*U'k'rgu'4227+0Vj \text{ g'uq'wteg'ku'}$
 $v'f'r'lecm' } \{ 'tgh'gt'gf'v'q'cu'c'uj'q'0Vj \text{ g'uq'wteg'y kn'xct' } \{ 'cu'c'h'w'p'ev'kqp'qh'v'j g'qdl'ge'v'k'x'g'qh'v'j g'u'wtxg' } \{ . "$
 $y \text{ j } \text{ kej'cnu'q'lp'en'w'f'g'v'j g'f'gr'v'j 'qh'lp'x'g'uki cv'kqp'cpf'v'j g'r'tqr'gt'v'kgu'qh'v'j g'tq'em'cv'v'j g'uk'xg' }^*Y \text{ cv'gtu'}$
 $3; 9; +0$

$Vj \text{ g'ugpuqtu'y j } \text{ kej' } \{ 't'ge'g'k'x'g'v'j g'uq'wteg'f'cvc'dcem'ct'g'g'k'j \text{ gt'ceeg'ngt'qo g'vgtu'qt'xgm'ek'v' } \{ "$
 $v'cpuf'wegtu'cpf'ct'g'ecm'gf' } \{ 'i \text{ gqr } j \text{ qpgu'0I' gqr } j \text{ qpgu'eq'p'x'gt'v'v'j g'o q'x'go gp'v'qh'v'j g'i tqw'pf' } \{ 'kp'v'q'c'}$
 $xq'nci \text{ g'y j } \text{ kej'ku't'ge'qtf'gf' } \{ 'd' \{ 'c'ugkuo qi tcr } j \text{ 'cpf' } \{ 'uq't'gf'v'j \text{ kj' } \{ 'v'ko g'0Vj \text{ g'r'nc'ego gp'v'cpf' } \{ 'qtl'gp'cv'kqp'}$
 $qh'v'j g'i \text{ gqr } j \text{ qpgu'qp'v'j g'i tqw'pf'ecp'dg'lp'x'ct'k'q'w'f' } \{ 'g'qo g'v'le'ctt'cpi \text{ go gp'w'v'j } \text{ kej'y kn'xct' } \{ "$
 $f'gr'gp'f'kpi'qp'v'j g'v'cti'gv'cpf' } \{ 'i \text{ qcn'qh'v'j g'u'w'f' } \{ ' }^*Uj \text{ g'tk'h'cpf' } \{ 'I' \text{ g'f'ctv' } \{ '3; ; 8+0$

$Vj \text{ g'v'ko g'tgs'w'kt'gf' } \{ 'hqt'v'j g'y \text{ cxgu'v'q' } \{ 't'cx'gn'f'it'qo 'c'p'g'ct'uw'lh'ceg'uq'wteg'v'q'v'j g'tgh'ge'v'qtu'cpf' } \{ 'dcem'}$
 $v'q't'ge'g'k'x'gtu'qp'v'j g'u'w'lh'ceg'ct'g'w'ug'f.'cm'p'pi'v'j \text{ kj' } \{ 'cm' } \{ 'cx'ck'nc'd'ng'lp'h'qto cv'kqp'v'q'f'g'v'gto \text{ kp'g'v'j g'}$
 $ut'w'ew'g'qh'v'j g'tgh'ge'v'kpi'uw'lh'ceg'0H'v'j g'gz'co \text{ kp'g'v'j g'uko r'ng'ecug'qh'c'tgh'ge'v'kqp'f'it'qo 'c'}$
 $j \text{ q'tk'qp'v'cn'uw'lh'ceg.'y g'ecp' } \{ 'ugg' } \{ 'qy'v'j g'f'gr'v'j 'cv'c'tgh'ge'v'kpi' } \{ 'kp'v'g't'lh'ceg' }^*u'w'ej'cu'cv'd'gf'tq'em' } \{ . 'ecp'}$
 $dg'g'u'nc'd'rkuj'gf'0H'v'j \text{ wt'g' } \{ '3'uj'qy \text{ u'c'ugkuo le'y cx'g'd'g'k'pi' } \{ 'tgh'ge'v'gf' } \{ 'qh'h'qh'cp' } \{ 'kp'v'g't'lh'ceg'y \text{ kj' } \{ 'ugkuo \text{ le'}$
 $xgm'ek'v' } \{ 'X_q'cd'q'x'g'v'j g' } \{ 'kp'v'g't'lh'ceg'cpf' } \{ 'X_3'd'gm'y'v'j g' } \{ 'kp'v'g't'lh'ceg'0Vj \text{ g'i gqr } j \text{ qpg' } \{ 't'ge'g'k'x'gt'ku'c'f'k'nc'peg'}$
 $z'cy \text{ c' } \{ 'f'it'qo'v'j g'uj'qv'v'j } \text{ kej'i gp'gt'cv'gf'v'j g'y cx'g0$



$Hki \text{ wt'g' } \{ '30Tgh'ge'v'gf'y \text{ cx'g'f'it'qo'uk'pi'ng' } \{ 'kp'v'g't'lh'ceg'0'X_q'ku'v'j g'eq'pu'w'cp'v'xgm'ek'v' } \{ 'qh'c'R'y \text{ cx'g'lp'}$
 $nc'gt'd'gwy \text{ ggp'uw'lh'ceg'cpf' } \{ 'tgh'ge'v'kpi' } \{ 'kp'v'g't'lh'ceg' }^*Ej \text{ c'wd'g' } \{ '4229+$

Gs wcvkp'70

Gs wcvkqp'5

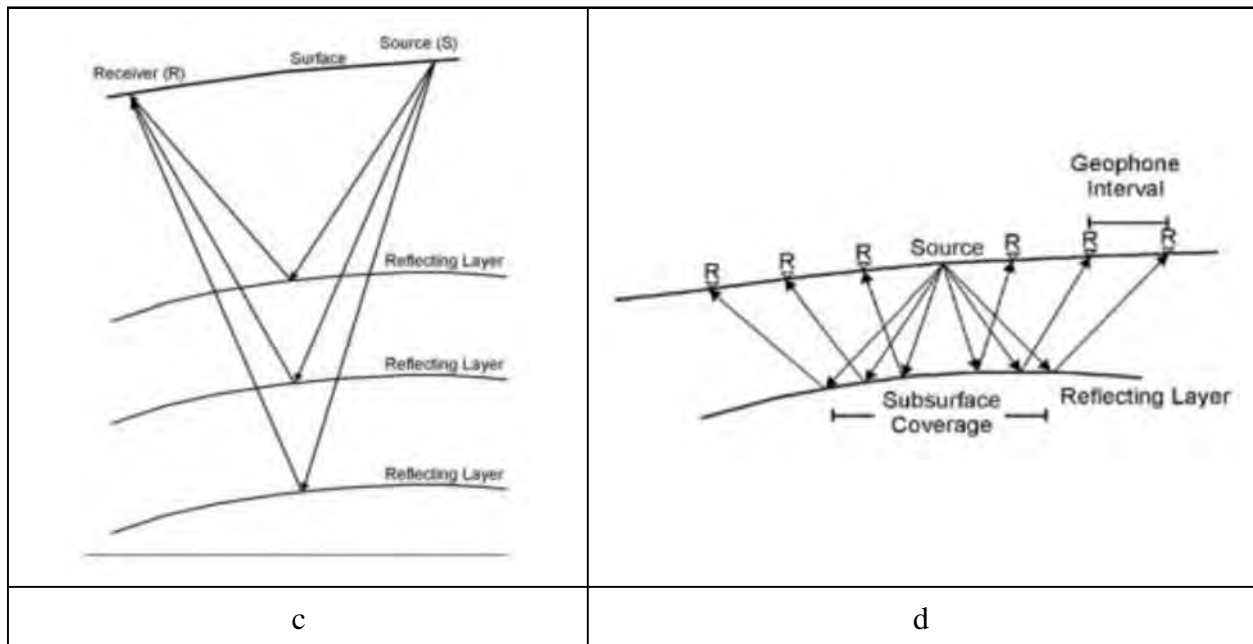
Gs wcvkqp'6

? "f kvcpeg"dgw ggp"uqwteg"cpf "tgegkxgt." " ? "f gr vj "qh"nc { gt0

Gs wcvkp'7

cpf "X_q"cpf "X₃"ctg"j g"ugkuo le"xgmekkgu"qh"j g"htuv"cpf "ugeqpf "nc {gtu'tgur gevkggn 0

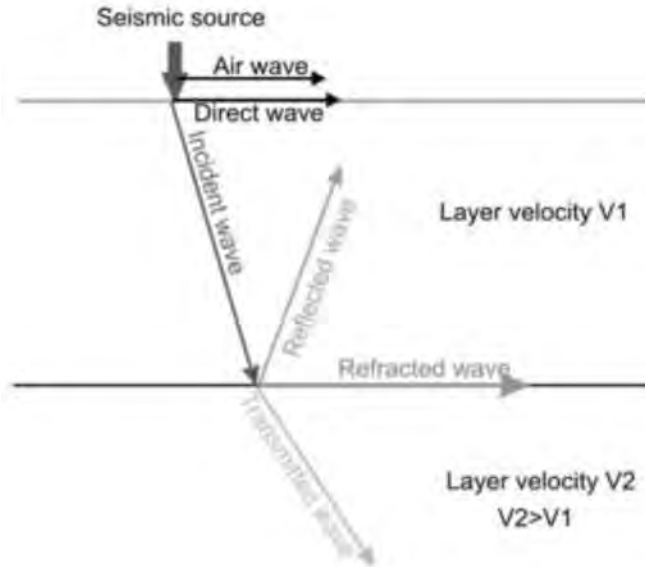
tgi kq "qh'kpwgtuv'cpf "vj cv'vj g'tguwu'h'go "vj g'v'guwu'ctg'kpwtr tgvf "eqttgevn(0



Hki wtg"4c0Ugkuo le'tghngevqp'hqt"o wnr ng'tghngevpi 'rc{gtu."4d00 wnk'i gqr j qpg'tgeqtf kpi 'cttc{0'
 *Uktngu"4227+

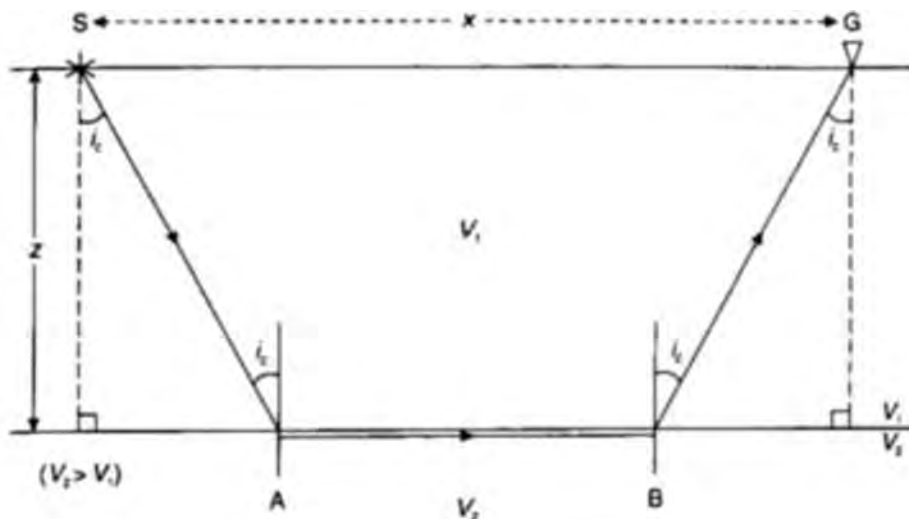
3055'Ugkuo le'Tghncevqp

Vj g'tghncevqp'ugkuo le"o gjv qf 'ku'wugf 'vq'o gcuwg'vj g'f gr vj u'cpf 'xgmeklgu'qh'uwdwthceg" rc{gtu'i qxgtpgf "d{ 'Upgma'rcy 0K'ku'r ctvwctn{ 'wughwihqt"o cr r kpi 'vj g'f gr vj "cpf 'vqr qi tcr j { "qh" vj g'dgf tqenlwthceg" *P lej qm'gv'cr04232+0K'ecp'cnuq'dg'wugf 'vq'hpf 'vj g'gruue'r tqr gtvgu'qh" vj gug'rc{gtu."y j lej "ctg'wughwihqt" gpi kpggtkpi 'r wtr qugu0K'vj g'ecug'qh'ugkuo le'tghncevqp."vj g" uwdwthceg"rc{gtu"o wuv'j cxg'uueguukxgn{ 'kpetgcupki 'rc{gt'xgmeklgu'y kj 'f gr vj "Vgthqtf "gv'cr0' 3; 98+0Cv'vj g'rc{gt'dqwpf ctkgu."r ctv'qh'vj g'kpekf gpv'y cxg'ku'tghngevf "dcenlv'vj g'i tqwpf "uwlhceg." r ctv'ku'tcpuo kwgf 'f ggr gt'lpv'vj g'i tqwpf."cpf 'r ctv'ku'tghncevf "cmipi 'vj g'uwlhceg'qh'vj g'rc{gt" dqwpf ct{ 'cu'kmwutcvgf 'kp'Hki wtg"50Vj ku'f tcy kpi 'cnuq'uj qy u'vj g'y cxg'vj cv'tcxgn'cmipi 'vj g" i tqwpf "uwlhceg."ecmgf "vj g'f kgev'y cxg."cpf 'vj g'ekt'y cxg0Cu'vj g'tghncevf 'y cxg'tcxgn'cmipi 'vj g" tghncevt "uwlhceg."ugkuo le'gpgti { 'ku'eqvkwqwn{ 'tghncevf "dcenlv'vj g'i tqwpf "uwlhceg" *Rctcupku" 3; 9; +0



Hki wtg'50Ugkuo le'y cxgu'cv'c'rc { gt'dqwpf ct { 0*Uktngu'4227+

Vj g'vko g'tgs wktgf 'hqt'yj g'y cxgu'v'v'cxgn'itqo "c"pgct'uwthceg'uqwtg'v'v'g'tghngevqtu'cpf "dcem' vq'tgegkxgtu'qp'yj g'uwthceg'ctg'wugf."cmppi 'y kj "cm'cxckndng'kphqto cvkqp'v'f gvgto kpg'yj g" utwewt'g'qh'yj g'kpvgtthceg'uwthceg0Y g'ecp'gzco kpg'yj g'uko r ng'ecug'qh'c'tghncev'kqp'itqo "c" j qtk qpvcn'uwthceg.'y g'ecp'ugg'j qy 'vj g'fgr vj 'cv'c'tghngev'kpi 'kpvgtthceg'uwej "cu'cv'dgf tqem:."ecp" dg"guvcdnkuj gf *Tg{pqrf u'3; ; : -0Vtcxgn'vko g'hqt'yj g'y q'4+rc {gtu'ecug'ku'yj g'vqvcn'v'cxgn'vko g" qdvckpgf 'itqo 'vj g'ugkuo le'uki pcn'r cyj 'vj cv'tcf kcvgu'dgmjy 'vj g'gctvj u'uwthceg'cu'uj qy p'kp'Hki wtg" 60Vj g'gs wcvkqp'hqt'kpf kpi 'v'cxgn'vko g'kp'y q'4+rc {gtu'ecug'ku'uj qy p'kp'Gs wcvkqp'80X3'ku'yj g" ugkuo le'xgmekv{ 'cdqxg'yj g'kpvgtthceg'cpf 'X4'dgmjy 'vj g'kpvgtthceg0Vj g'i gqr j qp'gegkxgt'ku'c" f kvcpeg'z'cy c{ 'itqo 'vj g'uj qv'y j kej 'i gpgtcv'gf 'vj g'y cxg0



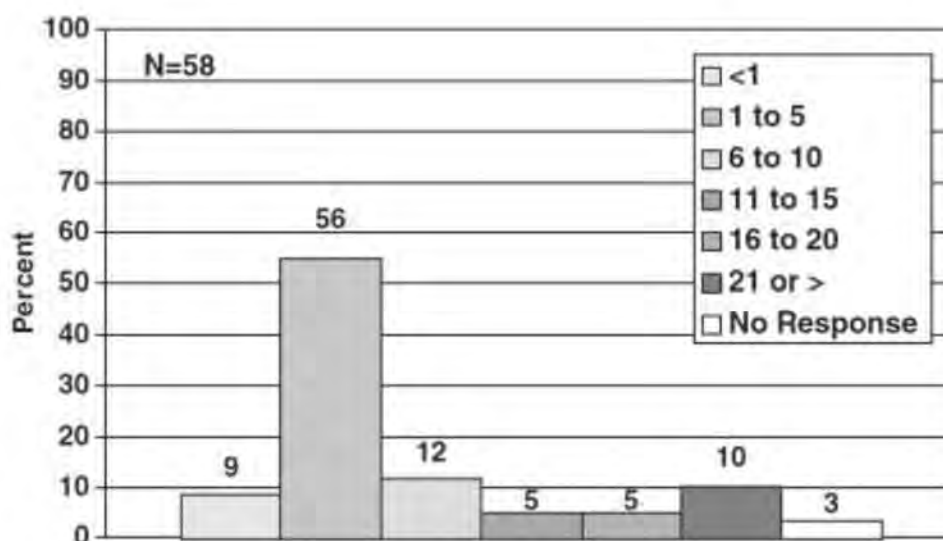
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ku'i gpgtcm{ "ecmgf "cttc{ "o gj qf u."qt'O wne j cpggn'Cpcn{ ulu'qh'Uwtlceg"Y cxgu"*O CUY +*Uktngu" 4227+0Cp"gzr cpf kpi "tgegkxgt"cttc{ "ku'wugf "vq'cxqkf "pgct/hkgrf "ghggu'cuuqekcvgf "y kj "Tc{ rgi j " y cxgu"cpf "uqwegótgegkxgt"i gqo gvt{ "ku'qr vko k gf "vq'o kpo k g'dqf{ "y cxg'uki pcn0O letqvtgo qt" uwtlceg"y cxg'vgej plk wgu'ctg'cnuq"dgeqo kpi "o qtg'y kf gn{ "wugf 0Rcuukxg'uqwegu"v{ r kcm{ "ecp"ugg" f ggr gt "vj cp"cevkxg'uqwegu0O CUY "wugf "lp"cf f kkpq"vq'O letqvtgo qt"ecp"dg"wugf "vq"qdvclp"dqj " uj cmqy "cpf "f ggr gt "lpvgr tgcvkqpu"*Mgucty cpl'gv'cr04234+0

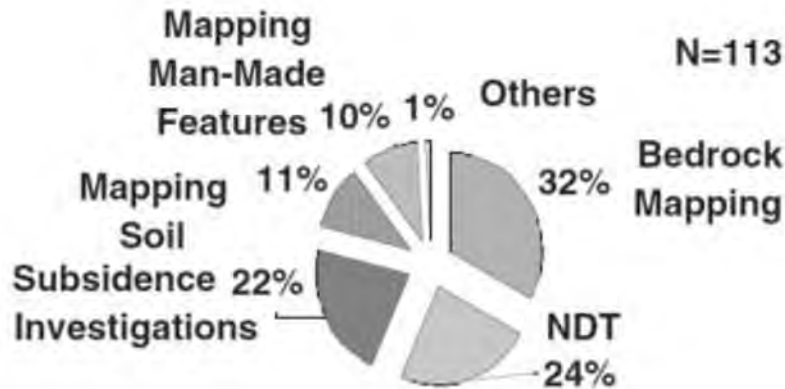
Vj g'f gr vj "qh'r gpgtvcvkq"ku'f gvtgo kpgf "d{ "vj g'mpi guv'y cxgrgpi vj u'lp"vj g'f cwc0I gpgtcm{ ." j gcxkgt "uqwegu"i gpgtcvg'mpi gt'y cxgrgpi vj u0Cnuq."vj g'f gr vj "qh'r gpgtvcvkq"cpf "tguqnwkq"ctg" j gcxkgt "ukg"f gr gpf gpw0Dceni tqwpf "pqkug'cv'c'ukg'o c{ "rko k'vj g'uki pcnlpqkug'tcvkq'cv'mqy " h'gs wgpeku0Vj g'hkgrf "ugwr "tgs wktgu'c'f kucpeg"dgy ggp "vj g'uqweg"cpf "o quv'f kucpvt'gegkxgt"qh" vy q"4+"vq"vj tgg"5+"vko gu'vj g'o czko wo "r gpgtvcvkq"f gr vj "Mgucty cpl'gv'cr04234+0

3'06'F QV'Gzr gtlgpeg

PEJ TR'U{pvj guku'579'r gthqto gf "c'uwtxg{ "qh'tcpur qtvcvkq"qti cpl'vkqpu"cpf "vj gkt" gzr gtlgpegu'y kj "i gqr j { ulecnlpxguki cvkqpu"*Uktngu'4227+0Y j kg'urki j vq "f cvgf "vj ku'uwf { "ugt xgu" cu'i qqf "uqweg"qh'lpqto cvkq"ht "qxgtcm'F QV'gzr gtlgpegu0Htqo "vj ku'uwf { "k'y cu'hqwpf "y cu" hqwpf "vj cv'cr r tqzko cvgn{ "34" "qh'ucvg'F QVu."47" "qh'Ecpclcp'vcpur qtvcvkq"ci gpeku'f q'pqv" wug'i gqr j { uleu'lp"vj gkt'r tqi tco u"*Uktngu'4227+0K'y cu'cnuq'hqwpf "vj cv'vj g'o clqtka{ "qh'ci gpeku" y j q'r gthqto "i gqr j { ulecnlpxguki cvkqpu"eqpf wev'dgy ggp"qpg"*3+cpf "hxg"*7+"gcej "{ gct"cu" uj qy p'lp"Hki wtg"70Kp'mqnlpi "cv'vj g'o quv'eqo o qp"cr r rlecvkqpu."dgf tqenlo cr r kpi "ceeqwpvgf "hqt" cr r tqzko cvgn{ "315"qh'vj g'o quv'eqo o qp"cr r rlecvkqpu"cu'uj qy p'lp"Hki wtg"80



Hki wtg"70V{ r kcnlpwo dgt "qh'i gqr j { ulecnlpxguki cvkqpu"eqpf wevgf "d{ "ci gpeku" gcej "{ gct0*Uktngu 4227+



Hli wtg'800 quv'eqo o qp'cr r decv'qpu'qh'i gqr j { uleu'Uktngu'4227+

Ugkuo le'o g'y qf u'y j lej 'ctg'yj g'o quv'eqo o qp'y c{ 'v'f g'vto kpg'yj g'f gr yj 'qh'dgf tqem'ctg' uwo o ct'k gf 'd{ 'v'f g'qh'u'gkuo le'o g'y qf 'wugf 'lp'Hli wtg'90Qpg'qh'yj g'yj kpi u'y j lej 'eqwrf 'dg' qdugt'xgf 'Htqo 'y' g'f c'v. 'ku'yj cv'yj gtg'ku'xgt { 'Hkwr'ci t'ggo gpv'qp'j qy 'y' g'v'f r g'qh'i gqr j { ulecn' o g'y qf 'uj qwrf 'dg'ej qugp0Cf f k'kqpcmf. 'cetquu'ci g'pekgu. 'y' gtg'ku'k'wr'eqpugpuwu'qp'y j q'ku' t'gur qpukdng'v'ugrgev'yj g'o g'y qf u'y k'j 'y' qug'f w'ku't'cpi kpi 'Htqo 'y' g'eqp'tcevqt. 'j k'j y c{ ' gpi k'pggt. 'r tqi tco 'o c'pci gt. 'cp'lp/j q'wug'i gqr j { uleku0Htqo 'y' ku'k'ku'engct'yj cv'o cp{ 'ci g'pekgu' r gthqto 'i gqr j { ulecn'k'pxguki cv'k'pu'qp'cp'cf 'j qe'dcuku'yj cv'f gr gpf u'qp'yj g'p'ggf u'qh'k'pf k'kf wcn' r tq'lgew0

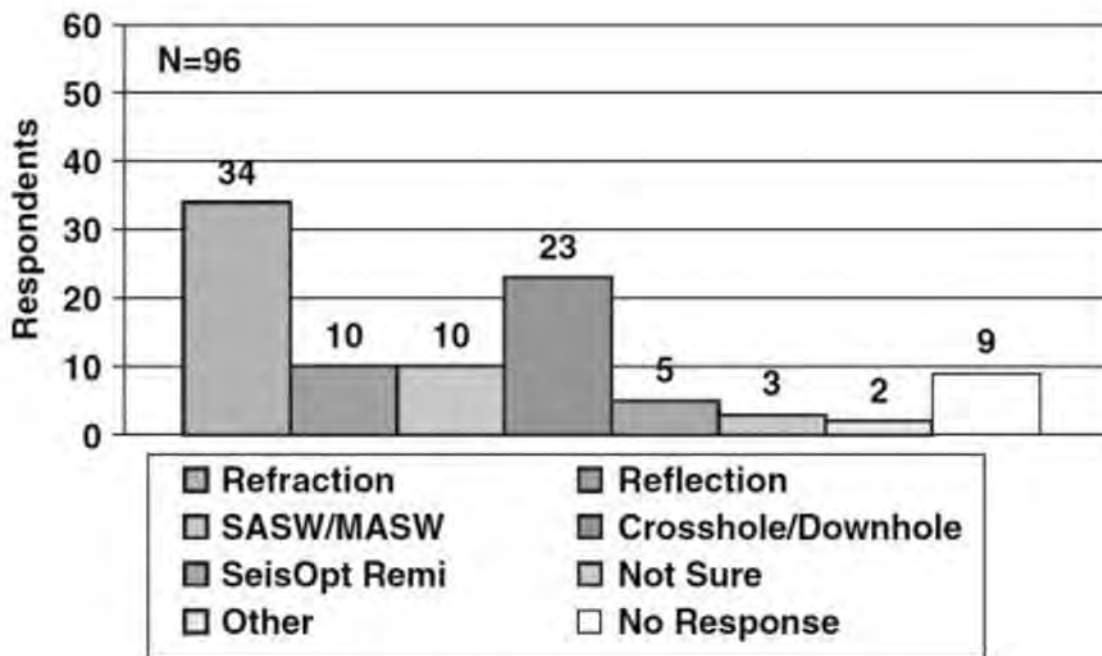


Figure 7. Seismic methods used (Sirles 2005)

3'W'Tgeqo o gpf gf 'Vgumpi

Kp'f'kuewukpu'y kj 'y g'uwdeqptcevt *TGVVGY IGpxktquecp+ 'y g'hqmy lpi 'r cuukxg'ugkuo le " o gj qf u'uj qwr 'dg'wkrk gf 'v'guko cvg'y g'f gr y 'qh'dgf tqem

30Tgltcevkqp'O letqitgo qt *TgO k+ 'y j lej 'wugu'c'o wnk/ey cpgnli gqr j qpg'cttc{ 'v'tgeqtf " uwticeg'y cxg'vckpu'itqo "co dkgpv'uwtegu0

40'O wnkur gevt cnCpcnf uku'qhiUwticeg'Y cxgu*O CUY + 'y j lej 'ku'uko kctt'v'q'TgO klp'f'cvc" eqmgevkvq. "dw'wugu'c'eqo r ngvgn{ 'f khtgtpv'uv' ng'qhi'ur gevt cn'cpcn{ uku0

50'J qtk qpwn/vq/XgtvecnUrgvt cnTcvkq *J XUT+ 'y j lej 'wugu'c'ukpi ng'y tgg/eqo r qpgpv' i gqr j qpg'v'q'o gcuwtg'j qtk qpwn'xgtuwu'xgtvecnli tqwvf "o qvkvq'f'wg'v'q'co dkgpv'gxgpxu0 Vj g'htgs wgep{ 'qh'y g'j qtk qpwn'o qvkvq'ku'utapi n{ 'f gr gpf gpv'qp'y g'y kempgu'qhi' wpequprkf cvgf "o cvgtkn'uq'y g'r gcnlk'y g'J qtk qpwn'XgtvecnTcvkq *J IX"co r rkwf g" xgtuwu'uki pcnhtgs wgep{ + 'ku'c'o gcuwtg'qhi'tqemf gr y j 0

Vj g'hqmy lpi 'uwdcumi'y knidg'lpemf gf 'y kj kp'y g'wkrk cvkvq'qhi'y g'tgeqo o gpf gf " o gj qf qmji kgu<

3"0Ugkuo le'f'cvc'hqt'cm'y g'y tgg'*5+o gj qf u'y knidg'eqmgevkvq'cmipi "qpg'*3+qt'y q"*4+'ugw'qhi' qtv'qi qpwn'r tqhkgu'cv'gcej 'ugmgevkvq'mecvkvq"*hqt'TgO k'cpf 'O CUY + 'cpf 'cv'y g" kpgvtugevkvq'qhi'y g'qtv'qi qpwn'r tqhkgu'hqt'J XUT0I gqr j qpgu'cmipi "gcej 'r tqhkg'hqt" TgO k'cpf 'O CUY + 'y knidg'ur cegf 'cv'32/"qt'42/hqpv'kpgvxcnu."f gr gpf lpi "qp'ukg" f ko gpukqu'cpf 'f gr y u'qhi'kpgvgu0P qv'g'y cv'emugt'ur celpi 'ku'r tghgtgf 'hqt'ukgu'y kj " uj cmjy "qxgtdwtf gp."y j kg'i tgcvt'ur celpi 'ku'dgwgt'hqt"cpvkekv cvgf 'f ggr gt "qxgtdwtf gp."dw' tgs wktgu'c'rci gt "ceeguukdrg'ukg'f ko gpukqp0

4"0Ugkuo le'v'cxgn'ko gu'y knidg'tgeqtf gf 'hqt'y g'TgO k'cpf 'O CUY "o gj qf u'wulpi "c" I gqo gvtkeu'I gqf g'ugkuo qi tcr j "cpf 'Q{q'60/'J gtv' 'i gqr j qpgu0Cv'gcej 'ugmgevkvq'mecvkvq." ugkuo le'pqkug'cmipi "c'i gqr j qpg'cttc{ 'y knidg'o gcuwtgf 'hkg'*7+'v'gki j v*: + 'v'ko gu "gcej " y kj "c'tgeqtf 'hpi y 'qh'37"ugeqpf u'qt'i tgcvt0

5"0Hqt'y g'TgO k'o gj qf . 'y g'o wnk/ey cpgnli cv'c'y knidg'cpcn{ | gf 'wulpi "UgkuQr vTgO k'd{ " Qr v'ko "Uqhy ctg0Htqo 'y g'o gcuwtgf "co dkgpv'ugkuo le'pqkug.'y g'uj gct/y cxg'f kur gtukqp" ewtxg'y knidg'f gtxgf . "cpf 'y knidg'o qf gngf 'v'f gvgto kpg'y g'uwduwiceg'uj gct/y cxg" xgmekv{ 'r tqhkg0Gcej 'r tqhkg'y knidg'r tguvpvgf "cpf 'f kur m{ gf "cu'o qf gngf 'uj gct/y cxg" xgmekv{ 'xgtuwu'f gr y j 0

6"0Hqt'y g'O CUY "o gj qf . 'y g'o wnk/ey cpgnli hgnf 'tgeqtf u'y knidg'cpcn{ | gf 'wulpi "y g" O CUY "cni qtkej o "f gxgnr gf "d{ 'y g'Mcpucu'I gmqi kecn'Uwtxg{ 'v'r tguvpv'uj gct/y cxg'xu0 f gr y 'r tqhkg0

7"0Hqt'y g'J XUT"o gj qf . 'y g'ur gevt cnTcvkq'qhi' qtk qpwn/vq/xgtvecnli tqwvf "o qvkvq'y knidg" ecrewvkvf . 'y kj 'y g'r gcnlk'y ku'r ctco gvt "k00cv'y g'htgs wgep{ 'r tqf welpi "y g'i tgcvgu' j qtk qpwn'o qvkvq+'ecnldtcvgf "v'y g'f gr y "v'i tgcvgu'ugkuo le'eqptcu'v*k00ugf ko gpw'xu0 dgf tqem0

Vj gug'tguwmu'y km'vj gp'dg'eqo r ctgf "q'vj g'eqtg'tguwmu0Vj gp'vj g'vj tgg"*5+f khtgpv'o gj qf u'y km'
 dg"gxcmwvzf "dcugf "qp'vj g'hqmvy kpi "etkgtk<hknf "ghqtv*vko g'cpf "gxr gpugu'hqt"gs wko o gpv+."
 r tqeguukpi "ghqtv*vko g'cpf "gxr gpugu'hqt"r tqeguukpi "uqlwy ctg'cpf "r gtuppgn+."ceewtce{ "j qy "y gm'
 gcej "o gj qf "o cvej gu'vj g'i tqwvf "twj "f cwc"q"dg"r tqxkf gf "d{ "RgppF QV+0

40 Vgunkpi 'Nqecvkqpu

Y kj "y g'hsgtcwtg'tgxkgy gf "cpf "y g'tgeqo o gpf gf "vgunkpi "guxcdnkuj gf . "y g'pgz v'ugr "ku'vq" kf gpvkhf "vcti gv'ukgu'y j gtg'y g'ecp'r gthqto "y g'eqo r ctkuqp0Vj gug'ukgu'pggf "q'dg'mqecvkqpu" y j gtg'RgppF QV"j cu'j kvqtkecn'dqtkpi "f cwc0Vj g'vgunkpi "ukgu'kf gpvkhf "d{ "RgppF QV"ctg'hqecvgf " kp'Hki wtg": "y kj "y g'mqecvkqpu'qh'y g'ukgu'f kur m{ gf "qp'y g'i qqi ng'o cr "kp'Hki wtg"; 0Vj gtg'ctg'37" ukgu'kp'vqcn'j cxkpi "dgt qtenlf gr yj u'tcpi kpi "htqo "70'h'vq'5608'h'kpenwf kpi "y q'ukgu'y j lej "j cf " pq"f luegtpcdrng'dgt qten0Vj g'vgunkpi "ukgu'ctg'ur tgc f "cetquw'Etcy hqtf . "Gtkg."Hqtguv."O gtegt." Xgpcpi q."cpf "Y cttgp'eqwpvku'y j lej "ctg'cnl'kpenwf gf "kp'RgppF QV'F kntlev'30Vj g'dgt qtenlv' r gu" kpenwf gf "uknuvpgg."ucpf uvqpg."cpf "uj crg'y j kg'yj g'qxgtdwtf gp'o cvgtkcn'eqpuku'qh'ukn."ucpf ." i texgn'cpf "em{ 0Vj g'xct{ kpi "v' r g'qh'dgt qtenlhkj qmji { "cpf "qxgtdwtf gp'o cvgtkcn'y km'dg'cp" gzegmgpv'vgu'qh'y g'r cuukxg'ugkuo ke'o gyj qf u0

Location	Project Location					Boring Information			Bedrock Information				Predominate Overburden Material
	County	County code	SR	SRV	Offset	Boring ID	Station / Section	Offset	Depth to bedrock (ft)	Elevation	Lithology of bedrock		
1	Crawford	20	6	850	820	RB-1	725+79.0	6.0 FT. LT.	11.2	1180.2	Siltstone		SILT and fine to coarse SAND
2	Crawford	20	122	80	1919	RB-1	190+62.0	9.0 FT. RT.	16.2	1004.8	Sandstone		SILT and fine to coarse SAND
3	Crawford	20	1006	110	1250	B-1		From C.L. 20' RT.			No Bedrock		CLAY, gray with trace of SILT
4	Erie	25	226	10	576	B-1	5+78.0	7.0 FT. RT.	14.8	943.1	shale		SILT and fine to coarse GRAVEL
5	Erie	25	1008	110	2972	B-1	343+61.0	5.0 FT. LT.	34.6		shale		SILT and fine to coarse SAND
6	Erie	25	19	80	692	B-1	320+68.4	8.0 FT. LT.			No Bedrock		CLAY and SILT, little fine Sand
7	Forest	27	82	30	0	RB-1	903		10.5 / 18.0	1022.7 / 1015.2	Sandstone/ SILTSTONE interbedded with SANDSTONE		UNSAMPLED
8	Forest	27	1001	80	1600	RB-2	141+15.0	6.0 FT. LT.	13.1	1190.8	Sandstone		SILT and fine and medium GRAVEL
9	Mercer	43	19	140	1131	RB-2	B-17	10.0 FT. RT.	19.5		Sandstone		Fine to coarse SAND
10	Mercer	43	2001	50	1819	RB-1	124+20.0	6.0 FT. LT.	26.7	1120.5	SANDSTONE interbedded with SHALE		Fine to coarse SAND
11	Verdugo	60	38	110	0	B-1	337+11.0	7.0 FT. LT.	21.5 / 24.5	1301.3 / 1298.3	Sandstone/ shale		Fine to coarse SAND and SILT, ORGANICS (wood) at 7.5'
12	Verdugo	60	3006	30	1554	RB-1	800	8.0 FT. RT.	15.8		SHALE interbedded with SANDSTONE		Fine to coarse SAND and SILT
13	Warren	61	27	490	2098	RB-1		8.0 FT. RT.	24.4	1266.9	Siltstone		Fine to coarse SAND, some fine to coarse Gravel, little SILT
14	Warren	61	1021	40	0	B-2	71+89.0	8.0 FT. RT.	5.7	1414.9	Sandstone		SAND and SILT
15	Warren	61	2020	20	1511	RB-2	9+10.0	8.0 FT. RT.	24		SILTSTONE interbedded with SANDSTONE		Sandstone boulder at LT 7, Fine to coarse SAND, little SILT, trace fine to coarse Gravel

Hki wtg": 0'Kf gpvkhf "ukgu'y kj "dqtkpi "f cwc'cxckrcdrng



Hk wtg'; OI qqi ng'o cr 'qh'qecvkpu'qh'vgvki 'uksu

50'Hlgrf 'Vgukpi 'čpf 'Tgumnu

Vj ku'ej cr vgt'owo o ctk gu'vj g'ghqtv'čpf 'hpf kpi u'y kj k'Vcun5"qh'vj g'r tqlgex0Vj ku'kpenmf gu'vj g'f c'c'eqmgev'k'p'čpf 'ukg'vgukpi 'cu'y gmi'cu'vj g'r tqegugf 'tguwmu'eqo r ctkpi 'vj g'f k'ghgtgpv' o g'vj qf u'q'eqpxgpv'k'p'čpf '0Hktuv'c'owo o ct { 'qh'vj g'hgrf "ghqt v'y kn'dg'r t'gugp'v'f 'h'mqy g'f " d { 'vj g'tguwmu0

50'Hlgrf 'Vgukpi 'Tgxkg

Vj g'hgrf 'vgukpi 'qh'vj g'r cuukxg'ugkuo le'o g'vj qf u'y cu'eqpf w'v'g'f "d { 'TGVVGY 0Vgukpi 'dgi cp' qp'Qevqdg't33' 'čpf 'ecttkgf "q'w'qxgt'vj tgg'y ggm'čpf 'y cu'eqpenmf g'f "Qevqdg't4; ' '42430Vj tgg' f k'ghgtgpv'vgukpi "o g'vj qf qm'i k'gu'y gtg'ecttkgf "q'w'cv'gcej "ukg0Vj gug'k'penmf g'f "Tgh'cevk'p' " O letq'tgo qt *TgO k' "O w'kur gev'tcn'Čpcn'f uku'qh'Uw'hc'eg'Y cxgu*O CUY +. 'čpf 'J qtk' qp'v'cn'v'q/ " Xgt'v'ecn'Ur gev'tcn'Čv'k' *J XUT +0Vj g'vgukpi 'r tqegf w'tg'y cu'ecttkgf "q'w'vukpi 'vj g'r tqegf w'tg'čpf " gs w'kr o gp'v'ur g'ek'k'gf "k'p'Ugevk'p'3070

K'y cu'k'p'k'k'cm' { 'f gukt g'f "v'q'eqmgev'f c'c' "egp'v'gt g'f "f k'gevn' { "qp'v'qr "qh'vj g'h'qecvk'p'qh'vj g'i tqw'pf " v'w'j "eqtgu0J qy gxgt. "w' qp'x'kuk'k'pi 'vj g'ukgu. 'k'y cu'f g'v'gt o k'p'g'f "vj c'v'vj ku'y q'w'f "p'q'v'dg'r quukdr'g'0 Gxgt { "ghqt v'y cu'o c'f g'v'q'r g'ghqto "vj g'vgukpi 'cu'em'ug'cu'r quukdr'g'v'q'vj g'h'qecvk'p'qh'vj g'eqt'g. "dw' ect'g'p'ggf g'f "v'q'dg'v'cn'p'v'q' "g'p'w't'g'vj c'v'v'ch'g'v'f "y cu'o c'k'p'v'k'p'g'f 0Vj ku'q'h'g'p' "t'guw'ng'f "k'p'vj g'vgukpi " dgk'pi "uj k'h'g'f "q'w'k'p'v'q'vj g'uj q'w'f gt'čpf "o q'x'k'pi "cm'pi "vj g't'q'cf "urki j v'q' "v'q' "g'p'w't'g'vj c'v'cf g's w'c'v'g' " u'j q'w'f gt' "gz'k'v'g'f "cu'y gmi'cu'cxq'k'f k'pi "dr'k'p'f "ew't'x'gu0Vj g'h'qecvk'p'qh'vj g'vgukpi "eqo r ct'g'f "v'q'vj g' i tqw'pf "v'w'j "eqt'g'h'qecvk'p'v'y gt'g't'geq'tf g'f "h'qt'eqo r ctk'k'p'r v'w'r qugu0

C'f'f'k'k'p'cm' { 'k'y cu'f gukt g'f "v'q'eqmgev'f c'c' "k'p'qt'vj q'i qp'cn'f k'gevk'p'v'h'qt "dq'vj "vj g'TgO k'čpf " O CUY "o g'vj qf u'0Uk'peg'vgukpi "j c'f "v'q'dg'r g'ghqto g'f "k'p'vj g'uj q'w'f gt' "k'y cu'cm'q'p'q'v'r quukdr'g'v'q' " q'd'v'k'p'vgukpi "k'p'qt'vj q'i qp'cn'f k'gevk'p'v'0Hkt "dq'vj "vj g'TgO k'čpf "O CUY "vgukpi ".i g'qr j qp'gu'ct'g' " r'k'f "q'w'k'p'c' "h'p'g'v'q' "t'geg'k'x'g'ugkuo le'y cxg'f c'c'0Hkt'f c'c' "y gt'g'v'q' "dg'eqmgev'f "k'p'4'f gr m' { o gp'w'v'y k'j " v'j g'i g'qr j qp'gu'r'k'f "q'w'r g't'r g'p'f k'ew'r'ct'n'f "v'q'qp'g'čp'q'vj gt. "vj ku'y q'w'f "cm'qy "h'qt "c' "i t'ge'v'gt "f q'o c'k'p'qh' " k'p'v'gt'g'v'q' "dg'gz'co k'p'g'f "čpf "cm'q'cm'qy "h'qt "c' "vj t'gg'f k'o g'p'uk'qp'cn't'gr t'gug'p'v'k'p' "dq'vj "f k'gevk'p'v' " j qtk' qp'v'cm' { "čpf "f gr v'j "x'gt'v'ecm' { +qh'vj g'u'd'w'hc'eg'h'g'c'w't'gu0Dw'uk'peg'y g'ct'g'r t'k'o c't'k' { "qp'n' { " k'p'v'gt'g'v'f "k'p'eqo r ctk'pi "vj g'i tqw'pf "v'w'j "f gr v'j "v'q'c' "f gr v'j "q'd'v'k'p'g'f "h'q'o "vj g'r cuukxg'vgukpi ". 'k'ku' u'w'h'k'eg'p'v'q' "qp'n' { "vgu'v'y k'j "vj g'i g'qr j qp'gu'h'qec'v'f "cm'pi "qp'g'h'k'p'g'0

Qh'vj g'37"v'q'v'cn'uk'gu. "qp'n' { "qp'g'y cu'v'p'cd'rg'v'q' "dg'v'g'v'f 0C'v'uk'g'; "k'p'O g'tegt. "vj g't'g'y cu' " k'p'w'h'k'eg'p'v't'q'q'o "v'q'eqmgev'v'j g'f c'c' "k'p'vj g'uj q'w'f gt' "k'p'vj g't'k' j v'q'h'y c { 0Y j k'g'v'j ku'ku'p'q'v'k'f g'cn' " v'j g't'g'y g't'g'o w'kr'g'v'q'vj gt' "uk'gu'y j k'ej "j c'f "uko k'ct' "f gr v'j u'čpf "dg'f t'qen'k'k'j q'm'i { "u'q'vj ku'y cu' " f g'go g'f "ce'egr v'cd'rg'0Vj g'h'mqy k'pi "r k'ew't'gu'k'p' "Hk'i w't'g'32"ct'g'h'q'o "vj g'h'grf "vgukpi 0Y k'j "vj g'f c'c' " eqmgev'f. "k'o w'v'p'qy "dg'čpcn' { g'f "čpf "k'p'v'gr t'g'v'f 0



*c+I gqr j qpg"cttcpi go gpv



(d+Q{q'60"J gtv 'i gqr j qpg



*e+Ungf i g" co o gt"cpf"dqctf"wguf"q"i gpgtcvg"
uki pcn



*f +Vtqo kpq"i gxleg"wguf"q"r gthqto "J XUT
vgukpi

Hki wtg"320Hki wtgu"ltqo "hgrf"vgukpi

504 'F c w 'C p c n f u k i ' c p f ' T g u w n u

C "u w o o c t { " q h ' g c e j " q h ' y g ' o g y q f u ' r t q x k f g f ' d { ' T G V V G Y " * 4 2 4 3 + " k u ' r t g u g p v g f . ' h q m q y g f ' d { " y j g ' t g u w n u ' h t q o " y j g ' u g w k p i ' h t q o " T G V V G Y " u w o o c t k f g f ' k p ' H k i w t g ' 3 3 0 F g w k n g f " o c r u " q h ' y g " u w x g { ' h q e c v k p u ' c p f ' r n q u " q h ' y j g ' t g u w n u ' h t q o " g c e j " o g y q f " f g x g n q r g f ' d { ' T G V V G Y " c t g ' r t g u g p v g f " k p ' C r r g p f k z ' C " * T G V V G Y . " 4 2 4 3 + 0

T g h t c e v k p p ' O l e t q v t g o q t ' * T g O k -

T G V V G Y " * 4 2 4 3 + " u w c u g u ' y c v ' k p ' q t f g t ' v q ' e j c t c e v g t k g ' y j g ' u g k u o l e " u j g c t / y c x g ' x g n q e k v { ' r t q h k g . " T g O k f c w ' y g t g ' e q m g e v g f ' d { ' u g w k p i " c t t c { u ' q h ' O c t n l R t q f w e w ' 6 0 / J g t v ' x g t v k e c n l g q r j q p g u " u r c e g f " c v ' e q p u v c p v 3 2 / h q v l p v g t x c n u 0 H q t " g c e j " h k p g . " f c w ' e q p u k u k p i " q h ' c o d l e p v ' u g k u o l e " u w t h c e g " y c x g ' v t c k p u ' y g t g ' o g c u w t g f ' h q t " h k h g g p 5 2 / u g e q p f " t g e q t f u ' c v ' c ' u c o r n k p i " k p v g t x c n l q h ' 4 " o k n k u g e q p f u 0 " V j g ' u g k u o l e " u w t h c e g / y c x g ' f c w ' y g t g ' c p c n f | g f " w u k p i " U g k u Q r v T g O k d { " Q r w o 0 U w t h c e g " Y c x g " C p c n f u k i " o c n g u ' w u g ' q h ' y j g ' h c e v ' y c v ' o w e j " q h ' y j g ' u g k u o l e " p q k u g ' c v ' y j g ' i t q w p f " u w t h c e g ' e q p u k u u ' q h " T c { n g k i j " y c x g u 0 T c { n g k i j " y c x g u ' c t g ' x g t v k e c m { / r n q t k g f " u w t h c e g ' y c x g u ' y c v ' v { r l e c m { " e q p v c l p " c " d t q c f " u r g e v t w o " q h ' h t g s w g p e { " e q p v g p v . " y k j " n q y g t ' h t g s w g p e k u u ' c o r n k p i " r t q i t g u k x g n { " i t g c v g t " f g r y j u 0 D { " f g e q o r q u l p i " y j g ' h t g s w g p e { " e q p v g p v ' q h ' c " T c { n g k i j " y c x g ' v t c k p ' c p f " o g c u w t k p i " y j g " x g n q e k v { " c v ' y j k e j " g c e j " e q o r q p g p v ' r c u u g u ' y t q w i j " y j g ' i g q r j q p g " c t t c { . ' k / k u ' r q u u k d r g ' v q ' e c r e w r c v g " y j g ' u g k u o l e " u j g c t / y c x g ' x g n q e k v { " c u ' c ' h m p e v k p p ' q h ' f g r y j " d g p g c v j " y j g ' i g q r j q p g " c t t c { 0 H q t " g c e j " u g k u o l e " r t q h k g . " y j g ' k p f k k f w c n l u g k u o l e " t g e q t f u ' y g t g ' f g e q o r q u g f . " c p f " y j g k t " u r g e v t c " c x g t c i g f " v q " f g x g n q r " c " h k p g / c x g t c i g ' u j g c t / y c x g ' x g n q e k v { " f k u r g t u k p p ' e w t x g ' y c v ' y c u ' l p x g t v g f " v q ' r t q x k f g " c " d g u v / h k ' u q w p f k p i " q t " x g t v k e c n l r t q h k g " q h ' u j g c t / y c x g ' x g n q e k v { " x g t u w u ' f g r y j " * T G V V G Y . " 4 2 4 3 + 0 V j g " k p v g t r t g v k x g ' u j g c t / y c x g ' x g n q e k k g u ' x g t u w u ' f g r y j " c t g ' r t g u g p v g f " c u ' 3 / F " r t q h k g u " c u ' u j q y p ' k p ' H k i w t g u " f g x g n q r g f ' d { ' T G V V G Y " k p ' C r r g p f k z ' C O

O w n k u r g e v t c n l C p c n f u k i ' q h ' U w t h c e g ' Y c x g u ' * O C U Y +

T G V V G Y " * 4 2 4 3 + " u w c u g u ' y c v ' y j g ' r t k p e k r n g " q h ' O C U Y " k u ' d c u g f " q p ' y j g ' f k u r g t u k p p ' q h ' u g k u o l e " u w t h c e g ' y c x g u ' y j g t g ' y j g ' f k h i g t g p v ' h t g s w g p e { " e q o r q p g p w " q h ' u w t h c e g ' y c x g ' v t c k p u ' u c o r n g ' f k h i g t k p i " g h i g e v k x g ' f g r y j u . " e c w u k p i " y j g ' u w t h c e g ' y c x g ' v t c k p ' v q ' e j c p i g ' u j c r g ' q t " f k u r g t u g u " c u ' k ' r t q r c i c v g u 0 " V j g t g h i g t g . " y j g ' u w t h c e g ' y c x g ' v t c k p ' t g e q t f g f " c v ' g c e j " i g q r j q p g " k p " c " h k p g c t " c t t c { " e c p " d g " H q w k g t / " v t c p u h i q t o g f . " c p f " y j g ' x g n q e k v { " q h ' k p f k k f w c n l y c x g n g p i y j u ' f g v g t o k p g f " v q ' r t q x k f g ' u j g c t / y c x g " x g n q e k v { " c u ' c ' h m p e v k p p ' q h ' h t g s w g p e { . " y j k e j " k u ' k p ' w t p ' k p x g t v g f " v q ' f g v g t o k p g " U / y c x g ' x g n q e k v { " c u ' c " h m p e v k p p ' q h ' f g r y j " c v ' g c e j " i g q r j q p g " h q e c v k p u 0 H q t " p w o g t q w u " q h ' u g v " h i q t y c t f " c p f " t g x g t u g + " u j q w " c p f " t g e g k x g t u . " k / k u ' r q u u k d r g ' v q " e q p u t w e v ' c " e t q u u / u g e v k p c n l k o c i g " q h ' u j g c t / y c x g ' x g n q e k v { " c u ' c " h m p e v k p p ' q h ' f k u c p e g " c p f " f g r y j . " q t . " c u ' k p ' y j k u ' l p x g u k i c v k p p . " c 3 / F " r t q h k g " r t g u g p v k p i " u j g c t / y c x g " x g n q e k v { " x g t u w u ' f g r y j " c p f " y j g ' e g p v g t " q h ' y j g " c t t c { 0 H q w t " q h ' u g v ' u j q w u ' y g t g " v c n g p " c v ' g c e j " q h ' y j g " O C U Y " c t t c { u ' * y k j " c 3 8 / m l " u n g f i g j c o o g t " c p f " e q o r q u k g " u w k n g " r n e v g + " v q ' i g p g t c v g " u g k u o l e " u w t h c e g ' y c x g u ' h q t " X u " c p f " f g r y j " g u k o c v g u 0 O C U Y " k u ' p q v u w t k e v n { " c " r c u u k x g ' u g k u o l e " o g y q f = " j q y g x g t . " k ' e c p " u k m i d g " c p " g h i g e v k x g " o g y q f " c n q p i " t q c f y c { u ' q t " k p " q y j g t " c t g c u ' y k j " j g c x { " p q k u g 0

J q t k q p w c n X g t v k e c n l U g k u o l e " T c v k j " * J X U T +

Vj g'J XUT"ugkuo le'o g'v qf "ku'c'pqp/kpxcukxg."r cuukxg"ugkuo le'gej pls wg'yj cv'wugu'c'ulpi rg." dtqcf/dcpf "vj tgg/eo r qpgpv'ugkuo qo g'vgt *Vtqo kpq+'q'tgeqtf "co dlqpv'ugkuo le'pqkug'OTGVVGY " *4243+uwo o ctk gu'J XUT"y kj "vj g'hqmy kpi "o g'v qf "f guetkr vkp0Vj ku'o g'v qf "o gcuwtgu'y q" j qtk qpvcn'pqtj /uqwj "cpf "gcu'v y guv'eqo r qpgpw'cpf "c"vj kf . "xgt'v'ecr'eqo r qpgpv'qh'co dlqpv' ugkuo le'uki pcn'y j lej "qeewt'gxgt { y j gtg'kp'pcwtg0Vj gug'ugkuo le'uki pcn'qt "o letqvtgo qtu+'ctg" etgcvgf "htqo "c"o wkwf g'qh'cevkxk'gu'wej "cu'qegcp'y cxgu."y kpf . "cpf "cp'y tqr qi gple'cevkxk'0 Vj g'tcvq'qh'yj g'cxgtci g'j qtk qpvcn/vq/xgt'v'ecr'htgs wgep { "ur gevwo "ku'wugf "vq" f gvgto kpg'yj g" hwpf co gpvcn'uksg'tguqpcpeg'htgs wgep { . "y j gtg'ugf ko gpv'yj kempguu'gdgt qenif gr yj u+'ecp'dg" guko cvgf 0Vj g'r tko ct { "tguqpcpeg'htgs wgep { "ku'f gf wegf "htqo "vj g'r tqo kpgpv'r gcmi'qp"vj g'J IX" ewtxg"y kj "cuqekcvgf "qecr'bo kpo wo u'qp"vj g'xgt'v'ecr'eqo r qpgpv'ewtxg+'cpf "ku'f k'gew' "tgrcvf" vq"vj g'utqpi guv'cequwle'ko r gf cpeg'eqptcu."y j lej "ku'kp'vtr tgvf "cu'c'uki p'k'ecpv'utcvki tcr j le" dqwpf ct { "v'f r kcm { "vj g'ugf ko gpv'dgf tqenikp'vgt'ecg+0Vj g'r tqeguulpi "eqpuku'qh'guko cvkpi "vj g" tcvq'dgwy ggp"vj g'Hqwt'kt'co r rkwf g'ur gevwo'qh'yj g'j qtk qpvcn/vq/xgt'v'ecr'eqo r qpgpw'vq" f gvgto kpg'tguqpcpeg'htgs wgep { "cpf "cp"guko cvg'qh'uj gct/y cxg'xgmek { . "y j lej "ctg'wugf "vq"o cng" ugf ko gpv'yj kempguu'cpf "dgf tqenif gr yj "guko cvgu'OC'v'ukgu'y j gtg'dgf tqenif gr yj u'ctg'wmpqy p." ugf ko gpv'yj kempguu'ecp'dg'ecrewcvf "k'ic'Xu'xcnw'ku'npqy p"uwej "cu'cp'cxgtci g'Xu'o gcuwtg" htqo "OCUY "qt'TgO k'OC'v'ukgu'y j gtg'dgf tqenif gr yj u'ctg'npqy p."tgi tguakp"gs wcvkpu'ecp'cuq" dg'wugf "vq"uqk'g'ht'f gr yj "d { "wulpi "c'r qy gt'rcy "hwpv'kp"vq'hk'htgs wgep { "f gtxgf "htqo "vj g" J XUT"ewtxg+'xgtuwa'yj g'f gr yj "vq'tqen0Vj g'r tqeguugf "f cv'ctg'v'f r kcm { "f kur m { gf "cu'c'3/F" xgt'v'ecr'htqk'g'uj qy kpi "uj gct/y cxg'xgmek { "xgtuwa'f gr yj "cu'uj qy p'kp'Cr r gpf kz'CO

K'ku'ko r qtcvpv'vq'pqv'vj g'uk' g'cpf "uecr'qh'yj g'vj tgg'f k'htg'gpv'gej pqm' kgu0Vj g'TgO k'cpf " OCUY "o g'v qf u'wug'c'ugt'ku'qh'i gqr j qpgu'vj cv'ctg'eqppgevgf "kp'cp'cttc { "vj cv'r m' u'lpv'c'rcr vqr " wulpi "uqhy ctg'vq'tgeqtf "vj g'y cxghqto u'htqo "vj g'i gqr j qpgu0Vj g'i gqr j qpgu'ctg'qpn { "c'hgy " kpej gu'cetqu'y kj "y q'y k'g'ngcf u0Vy gpv' /h'wt' i gqr j qpgu'y gtg'r nregf "kp'c'utck j v'kpg'cttc { " cr r tqzko cvgn { "32'h'cr ctv'y kj "vj g'tgegk'gt'cpf "ugkuo qi tcr j "tgeqtf kpi "f k'gew' "kp'yj g'o k'f r g0 Vj g'J XUT" f gxleg'ku'c'ugr'eqpv'kpgf "dqz'ugxgtcn'kpej gu'kp'ngpi yj . "y k'f yj . "cpf "f gr yj "cpf "ku'r nregf " kp'yj g'o k'f r g'qh'yj g'cv'yj g'uco g'r nreg'cu'yj g'ugkuo qi tcr j 0Vj g'f cv'ku'f qy p'ncf gf "f k'gew' "htqo " yj g'f gxleg'vq"vj g'eqo r wgt'vq'dg'r tqeguugf 0

H'ki wtg'33'r tguqpv'vj g'tguwu'qh'yj g'v'gukpi "kp'eqo r ctuqp"vq"vj g'dqtkpi u0kp'qtf gt "vq" f gvgto kpg'yj g'o quv'ceewt'vg."gh'ek'gpv."cpf "equv'gh'gevkxg"o g'v qf "h'qt"qdv'k'kpi "dgf tqenif gr yj u" yj tqwi j qw'vj g'uwf { "ctgc."c'ucv'v'ecr'ncpn { uku'y cu'eqo r r'v'gf "cpf "c'tcpn'kpi "u { ugo "cr r r'k'gf "vq" eqo r ctg'yj g'o gf kcp'r gtegpv'gttqt *ceewtce { +qh'ecrewcvf "f gr yj u'v'npqy p" f gr yj u. "v'qcn'v'ko g'ht" f cv'eqngev'kp'cpf "r tqeguulpi . "cpf "equv'j'ctvg'z"v'qcn'v'ko g_ " "gs wkr o gpv'yj j gtg'yj g'hqy guv'wo " tgr tguqpv'vj g'qxgtcm'o quv'ceewt'vg."gh'ek'gpv."cpf "equv'gh'gevkxg"cr r tqcej "TGVVGY . "4243+0' Dgm'y "ku'c'f cv'cdrg'uj qy kpi "vj g'tguwu'qh'yj g'ucv'v'ecr'ncpn { uku'0Dcu'gf "qp"vj g'h'grf "uwtxg { " tguwu'cpf "cpn { uku'kp'H'ki wtg'33."vj g'J XUT"o g'v qf "t'cpngf "3"qt'dguv'."h'qmy gf "d { "TgO k'cpf " OCUY "kp'gcej "qh'yj g'vj tgg'ecv'gi qt'ku'ceewtce { . "gh'ek'gep { . "cpf "equv'."t'gur gevkxg { 0

P'qvg."j qy gxgt."vj cv'yj g'J XUT" f cv'htqo "Ukg'4'y cu'h'k'ng { "ch'gevgf "d { "y kpf 0Vj g'J XUT" r gtegpv'gttqt'ecrewcvf "ht'Ukg'4'y cu'c'uki p'k'ecpv'q'w'k'gt'cpf "y q'w'f "h'k'ng { "dg'tgf wegf "k'h'yj g" uwtxg { "y cu'tgr gcvf "wpf gt'ecm gt'eqpf k'k'pu'OC'cu'pqv'vj cv'yj g'J XUT"o g'v qf "ku'c'ulpi rg/ ej cpgn'ugr'eqpv'kpgf "u { ugo "vj cv'ecp'dg" f gr m { gf "kp'yj g'h'grf "d { "qpg'r gtuqp'kp'tqwi j n { "7"

o kpwgu. 'y j gtgcu'j g'TgO k'cpf 'O CUY 'o gj qf u'tgs wltg'c'y q/r gtup'etgy 'cpf 'c'tqwi j n' '3/'
 j qwt'ugwr 'ko g'y j lej 'cniq'chigew'equv'ONcumf. 'eqphk'o cvqt { 'dqtłpi u'cv'j g'egpvt'qh'gcej "
 ugkuo le'cttc { '%qt'Vtqo kq'qecv'kp+'cu'uj qy p'qp'j g'fcv'eqxgtci g'o cr'u'y qwf 'cmqy 'hqt'c'o qtg"
 f ktgeveqo r ctkuqp'qh'j g'tguwnu'qh'j ku'uwf { 'cpf 'y qwf 'hwtj gt'tghkpg'j g'ceewtce { 'cpf "
 ghigev'xgpguu'qh'gcej 'ugkuo le'o gj qf '*TGVVGY .'4243+0

	TqeniF gr yj '*m+				Gttqt '* +		
Ukg	TgO k	O CUY	J XUT	Dqtłpi	TgO k	O CUY	J XUT
3	370	380	340	330	490	540	: 0
4 ³	380	380	80	380	20	30	3630
5	670	650	680	P qv'Gpeqwpvtgf			
6	390	390	330	360	380	360	550
7	570	580	590	560	40	70	90
8	780	P C	78	P qv'Gpeqwpvtgf			
9	430	390	430	430	20	430	20
:	3: 0	390	360	350	4: 0	470	: 0
32	470	450	490	480	70	360	50
33	470	450	480	460	40	70	90
34	440	450	390	370	4: 0	540	320
35	480	450	460	460	90	50	20
36	90	90	360	70	450	470	820
37	3: 0	450	480	46	540	40	320

ceewtce { 'dcugf "qp"o gf kcp" Gttqt"
 ghelkpe { 'dcugf "qp"Vqwn'Vko g"
 equv"? 'tcvg'z' 'qwn'Vko g'z' 'gs wko gpn

O gf kcp" 'Gttqt	340	360	: 0
F cv'E qngev'kp"j t+	380	430	70
F cv'Rtqegukpi "j t+	320	320	60
Vqwn'Vko g"j t+	480	540	320
Ceewtce { 'Tcpm	5	4	3
Ghelkpe { 'Tcpm	4	5	3
Equv'Tcpm	4	5	3
Ceewtce { GHelkpe { IEquv TcpmUwo	9	:	5
QXGTCNN'TCPM'I	4	5	3

Hki wtg'330Tguwnu'qh'TgO k'O CUY. 'cpf 'J XUT'ugkuo le'o gj qf u'*TGVVGY .'4243+

³Vj g'xti g'gttqt'y kj 'j g'J XUT'gej pls wg'hqt'ukg'4'ku'cwtkdwgf 'q'j g'y kpf { 'eqpf kkpup'cv'j g'ko g'qh'gukpi 0Vj g'
 vej pls wg'ku'j ki j n' 'ugpukkg'q'xkdtcv'kpup'cpf 'k'ku'gzr gevgf 'j cv'j g'gttqt'y qwf 'dg'tgf wegf 'h'j g'guv'y cu'tgr gcvgf "
 wpf gt'ecm gt'eqpf kkpup0

60Eapenwukpu'čpf 'Tgeqo o gpf cvkpu

Y j krg'vj g'J XUT'o g'j qf 'y cu'xgt { 'i qqf 'lp'c'pwo dgt 'qh'lpucpegu 'y g'tguwmu'cv'Ukg'4'cpf '36' r tqf wegf 'y g'rti guv'gttqtu'gpeqwpvgf 'cetquu'cm'ij tgg'o g'j qf qm'j kgu'0Vj g'J XUT'o g'j qf 'ku' gztgo gn { 'ugpukxg'cpf 'y g'co d'kpv'eqpf k'kpu'ecp'i tgcw { 'kphwpeg'vj g'tguwmu'uq'k'uj qwf 'qpn { 'dg'f gr m { gf 'lp'ecm 'eqpf k'kpu'y k'j 'cu'k'wng'p'q'kug'cpf 'dcem tqwpf 'lpvgt'htgpeg'cu'r quukdng'0Vj ku' ku'c'xgt { 'ko r qtcvp'v'kuwng'cu'rti g'f kuetgr cpekgu'ecp'dg'qdvckpgf 'lp'y g'tguwmu'cpf 'o wmk'rg' o gcuwtgo gpw'uj qwf 'cny c { u'dg'cngp'cpf 'kf gcm { 'etquu'tghgtgpegf 'y k'j 'i tqwpf 'twj 'dqt'kpi u'qt' cpq'j gt'o g'j qf qm'j { 0

Vj g'J XUT'o g'j qf qm'j { 'y qwf 'cf f k'kpcm { 'dg'vj g'gcu'guv'o g'j qf qm'j { 'hqt'RgppF QV'vq' cf qr v'cu'k'tgs wkt'gu'y g'gcu'co qwpv'qh'gs wkr o gpv'vq'go r m { . 'ko g'vq'vgu'cpf 'lpvgr tgv'vj g' tguwmu'0Vj g'ugr'eqp'ckpgf 'f gxleg'ecp'dg'xgt { 's wkm { 'f gr m { gf 'd { 'qpg'r gtuqp'y k'j 'o l'ko cn' ugwr 'cpf 'vgukpi 'ko g'0Vj g'r tko ct { 'kuwng'y qwf 'dg'vj g'lpvgr tgv'vq'qh'vj g'f c'v'y j k'j 'kf gcm { 'y qwf 'dg'r gthqto gf 'd { 'c'vckpgf 'ugkuo qm'j ku'0J qy gxgt. 'k'uj qwf 'dg'r quukdng'vq'lpvgr tgv'vj g' tguwmu'y k'j 'vck'kpi . 'qt'vq'eqp'tcev'q'w'vj g'cpcn { uku'cpf 'lpvgr tgv'vq'vq'c'eqo r cp { 'y k'j " i gqr j { ukecn'gzr gt'vkg0

Vj g'equv'qh'vj g'Vtqo k'p'q'f gxleg'vq'r gthqto 'y g'J XUT'vgukpi 'ecp'j cxg'c'y k'f g'tcpi g' f gr gpf k'pi 'qp'vj g'hgcw'gu'cpf 'uqhy ctg'ej k'legu'cpf 'y g'r tleg'y cu'er r tqzko cvgn { '&32/42' y qwucpf '*O qj q. '4239+0Y j gp'vj g'equv'qh'c'dqt'kpi 'ecp'twp'htqo 'j wpf tgf u'vq'c'hgy 'y qwucpf " f qmctu.'y g'qxgtcm'wr htqpv'equv'qh'vj g'v'ej pqm'j { 'ku'o l'ko cn'k'p'eqo r ct'kuqp'y k'j 'o wmk'rg' dqt'kpi u'0Vj ku'f gxleg'eqwf 'dg'xgt { 'gcu'k { 'go r m { gf 'd { 'RgppF QV.'j qy gxgt. 'vck'kpi 'y qwf 'dg' pggf gf 'vq'cpcn { | g'vj g'f c'v'0

Y j krg'vj g'TgO k'čpf 'O CUY 'o g'j qf u'cnuq'r tqf wegf 'tgcupcdng'tguwmu.'k'y qwf 'dg'o wej " o qtg'f k'hewn'hqt'RgppF QV'vq'go r m { 'cu'vj g'gs wkr o gpv'čpf 'ugwr 'ku'o wej 'o qtg'k'pxq'k'gf 0' Cf f k'kpcm { . 'y g'vgukpi 'ko g'čpf 'f c'v'cpcn { uku'cngu'o qtg'ko g'tguwmu'lp'c'rti gt'qxgtcm'equv'0' J qy gxgt. 'y gug'v'ej pls wgu'ctg'cnuq'xckf 'cpf 'r tqf wegf 'tgcupcdng'tguwmu'0K'g'k'j gt'TgO k'qt " O CUY 'y gtg'vq'dg'go r m { gf 'k'y qwf 'dg'tgeqo o gpf gf 'vq'j cxg'c'i gqr j { ukecn'eqo r cp { 'r gthqto " y g'vgukpi 'cpf 'cpcn { uku'0

Cu'vj g'hqewu'qh'vj ku'uwf { 'y cu'vq'f gyev'vj g'f gr vj 'qh'dgf tqem'f gr'kpgcvkpi 'y g'y cvgt'vcdng'y cu' pqv'qh'r tko ct { 'ko r qtcpeg'0Cu'c'tguwmu.'y g'y cvgt'vcdng'f gr vj 'y cu'pqv'hqwpf 0Vj gug'v'ej pqm'j kgu' uj qwf 'cmqy 'hqt'y cvgt'vcdng'vq'f g'f k'uegtpgf . 'dw'o qtg'tgugctej 'uj qwf 'dg'eqpf wegf 'vq'xgt'kh { " y cv'vj ku'ku'vj g'ecug0

Vj gtg'cr r gctu'vq'dg'pq'f k'uegtpcdng'tgpf 'y k'j 'y g'f k'htgtpv'tqen'v' r gu'gpeqwpvgf 'lp'vj ku' uwf { 'uwej 'y cv'qpg'hk'j qm'j { 'qh'qxgtdwtf gp'qt'dgf tqen'f k'f 'pqv'f getgcug'vj g'gttqt'dgy ggp'vj g' i tqwpf 'twj 'dqt'kpi 'cpf 'y g'r cu'k'g'ugkuo le'o g'j qf u'0K'p'o { 'qr k'kqp.'y g'cewcn'v' r g'qh'o cvgt'kcn' ku'pqv'cu'ko r qtcvp'vq'r tqf wekpi 'ceewtcvg'tguwmu'0K'ku'o qtg'ko r qtcvp'vq'cv'vj gtg'dg'c'o gcuwtcdng' *f gygevcdrng'+f k'htgpeg'lp'uk'hpguu'dgy ggp'vj g'qxgtdwtf gp'čpf 'dgf tqen'uwej 'y cv'vj g'v'ej pqm'j { " ecp'f gygevc'f k'htgpeg'lp'uj gct 'y cxg'xgmekv { 'cv'vj g'nc { gt'dqwpf ct { 0K'p'hcev.'y g'i gqm'j { 'qh' F k'ut'ev'3'o c { 'dg'o qtg'f k'hewn'vq'f gyto k'pg'vj g'f gr vj 'qh'dgf tqen'vj cv'q'j gt'ctgcu'qh

Rgppu{ncplc'y kj 'fkhgtgpvi gqmi { 'y j gtg'vj gtg'ku'c'nti gt 'fkhgtgpeg'kp'ukhpguu'dgwy ggp'vj g" dgf tqem'ncpf 'qxgtdwtf gp'o cvgtkcn'Vj gtghqtg.'k'ku'o { 'tgeqo o gpf cvkqp'vj cv'r cuukxg'ugkuo le" o gj qf u'eqwf 'dg'wugf 'cetquu'vj g'ucvg'tgi ctf nguu'qh'vj g'i gqmi { 'y kj 'vj g'ecxgc'vj cv'uko knt" o cvgtkcn'ukhpguu'pgct 'vj g'dgf tqem'qecv'kp'y kn'o cng'vj g'kpvgtr tgc'v'kp'qh'vj g'xwgo'f gr vj 'o qtg" f khkewno

Kp'eqpenwukqp.'ugkuo le'o gj qf u'r tqxkf g'tgcuqpcdr'rtgf levkpu'qh'vj g'f gr vj 'vq'dgf tqem'hqt" c" xctkgv' 'qh'i gqmi kecn'eqpf kkp'puOCm'vj tgg'o gj qf u'vugvf *TgO k'O CUY . "cpf 'J XUT +ecp'dg" wugf 'vq'r tgf lev'vj g'f gr vj 'vq'dgf tqem'OCf f kkp'pcmf . "c'dgpgkh'qh'vj gug'vej pqmi kgu'ku'vj cv'i tgcvt" f gr vj u'ecp'dg'r tqdgf 'vj cp'y gtg'r quukdr'vq'qdv'kp'y kj 'vj g'dqt'kpi OHqt'gzco r ng.'cv'Ukgu'5'cpf '8" y j gtg'vj g'dqt'kpi 'f kf 'pqv'gpeqwpvg'tdgf tqem'f gr vj u'y gtg'qdv'kp'gf 'htqo 'vj g'r tqegf wtgu'ctqwpf " 67'cpf '78'hggv'tgur gev'xgn' OH'c'f gr vj 'y cu'pqv'cdrg'vq'dg'qdv'kp'gf 'htqo 'c'dqt'kpi . 'r cuukxg'ugkuo le" o gj qf u'y qwf 'tguwn'kp'vj g'cdk'k'v' 'vq'cr r tqzko cv'vj g'xcnwg'kp'kpucpegu'y j gtg'vj g'f gr vj 'vq" dgf tqem'ku'etk'k'cni

Y j kg'v'gukpi 'y cu'pqv'cdrg'vq'dg'ectt'kgf 'qwf'k'gevn' 'cv'vj g'dqt'kpi 'qecv'kpu.'i qqf 'eqtt'g'v'kqp" y cu'ukn'hqwpf 'cu'tgcuqpcdr' 'emug'cu'r quukdr'vq'vj g'cewcn'qecv'kpu'Y j kg'v'guu'qh'vj ku'pcwtg" ecp'dg'gzegf kpi n' 'wug'wn'k'ku'ukn'p'qv'c'tgr n'ego gpv'hqt'i tqwpf 'xwv' 'dqt'kpi 'tguwn'OH qy gxgt." d{ 'go r m' { kpi 'dqt'kpi 'kp'eqplwpev'kqp'y kj 'c'r cuukxg'ugkuo le"uecp.'qpg'y qwf 'dg'cdrg'vq'r qv'p'kcm' { o cr "c'o vej 'nti gt'ctgc'y kj 'tgcuqpcdr'ceewtce{ OH'ku'vj gtghqtg'tgeqo o gpf gf 'vj cv'vj ku" vej pqmi { 'ecp'dg'go r m' { gf 'kp'ctgcu'y j gtg'f gr vj 'vq'dgf tqem'ku'pggf gf 'cu'c'o k'pko cm' { 'ko r qtvcpv" xctkdr'OH'k'pcmf . "dqt'kpi u'uj qwf 'ukn'dg'cn'gp'cv'etk'k'cni'qecv'kpu'hqt'nti g'r tq'lgew.'j qy gxgt.'k' ku'vj g'cwj qtu'qr k'p'kp'vj cv'r cuukxg'ugkuo le"o gj qf u'ecp'dg'go r m' { gf 'kp'eqplwpev'kqp'y kj 'dqt'kpi u' cv'utcvgi le'qecv'kpu'vq'tgf weg'vj g'v'cn'pwo dgt'qh'dqt'kpi u'pggf gf 0

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Tghgt gpegu

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Dtqy p.'N0V0'Ego r c t k u p ' q h X ' U r t q l k g u ' i q o ' U C U Y ' c p f ' d q t g j q r g ' o g c u m t g o g p u i ' c v ' i m t q p i / o q v k p p ' u k g u ' k p ' U q w j g t p ' E c r i k g t p k c 0 0 c u v g t a i ' V j g u k u . ' W p k x g t u k f ' q h ' V g z c u . ' C w u k p . ' 3 ; ; : 0

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Eqtf kgt'LR0'Xgrnekkgu'kp'Tghgevkqp'Ugkuo qmgi {0F 0T gkf gniRwdrkuj kpi 'Ego r cp{ . 'J qmcpf . '3; : 7. " 3; 9'r r 0

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Nqwkq.'L0P0'Hcwtg.'Dgwgt<Uj gct/Y c x g ' X g r n e k f ' y ' 3 2 2 ' O g v g t u ' F g r y j ' i q o ' T g h c e v k p p " O k e t q t g o q t ' C t t c { u 0 D w n g v k p ' q h ' y j g ' U g k u o q m i k e c n ' U q e k g v ' q h ' C o g t k e c . ' 4 2 2 3 . " ; 3 * 4 + . ' 5 6 9 / 5 8 6 0

O c t v k p . ' C 0 L 0 ' U j c y x g t . ' L 0 D 0 ' c p f ' F k g j n ' L 0 I 0 ' E q o d k p g f ' w u g ' q h C e v k x g ' c p f ' R c u k x g ' U m h e g ' Y c x g ' V g e j p k s w g u ' i q t ' E q u w ' G h g e v k x g ' W D E I K D E ' U k g ' E r u u k h e c v k p . ' R t q e g g f k p i u ' q h ' y j g ' : ' y ' P c v k q p c n ' E q p h g t g p e g ' q p ' G c t y j s w c n g ' G p i k p g g t k p i " . ' U c p ' H c p e k u e q . ' E c r i k g t p k c . ' 4 2 2 8 0

O c t v k p . ' C 0 L 0 ' C p c n f u k i ' q h ' U C U Y . ' O C U Y . ' c p f ' R c u k x g ' U m h e g ' Y c x g ' F c w ' e q n g e v g f ' c v ' y j g " P c v k q p c n ' I g q v g e j p k e c n ' G z r g t k o g p w c v k p ' U k g u ' c v ' V g z c u ' C (O ' W p k x g t u k f 0 I g q T k u m ' 4 2 3 3 " < " I g q v g e j p k e c n ' T k u m ' C u u g u o g p v ' c p f ' O c p c i g o g p v . ' C o g t k e c p ' U q e k g v ' q h ' E k k i ' G p i k p g g t u . ' 4 2 3 3 0

O q j q ' U e k p e g ' c p f ' V g e j p q m i { . ' G z r q t v ' R t k e g ' N k u ' 4 2 3 9 0 4 2 3 9 0

O q q p g { . ' J 0 0 ' J c p f d q q m i q h ' G p i k p g g t k p i ' I g q r j { u l e u . ' X q r 0 3 < U g k u o k e . ' D k u p p ' K p u t w o g p u . " O k p p g c r q r k u . ' O k p p 0 ' 3 ; : 6 0

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e j c t c e v g t k c v k p 'c v'j g'D q k u g'J.{f t q i g q r j.{u k e c n T g u g c t e j "U k g.'I g q r j { u k e c n R t q u r g e v k p i ."7: ."
32336"3244."42320

Q m f c.'J 0"V j g'O k e t q t g o q t 'U m x g{'O g y q f'0I g q r j { u k e c n O q p q i t c r j "U g t k g u'P w o d g t"34"."
U q e k g v{'q h'G z r m t c v k p'I g q r j { u k e k u."42250

R c m g t.'F 0'c p f 'M 0 D w t n g.'V j g'i g p g t c r k g f 'i g e k r t q e c n l o g y q f "q h l i g k u o k e't g l t c e v k p"
k p v g t r t g w c v k p 0 U q e k g v{'q h'G z r m t c v k p'I g q r j { u k e k u."V w u c."Q m e j q o c."3; : 20

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86*5+:. 22/: 2: . '3; ; ; 0

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R t q l g e v'P q 03272: 42240P q x g o d g t"42430

T g{p q r f u.'L 0 0'C p'k p t q f w e v k p'v q'C r r r k g f'c p f'G p x k q p o g p w c n l g q r j.{u k e u 0 P g y 'I q t m'Y k n g{."3; ; 90

U k r n g u.'R 0 E 0'P E J T R'U p v j g u k u'579<W u g'q h'I g q r j.{u k e u'f u t'V t c p u r q t w c v k p'R t q l g e u 0'
V t c p u r q t w c v k p'T g u g c t e j'D q c t f.'P c v k q p c n T g u g c t e j'E q w p e k n'Y c u j k p i v q p'F 0 E 0'42270

U j g t k h.'T 0 G 0'c p f 'I g r f c t v.'N R 0'J k n q t{.'j g q t{'c p f'f c v'c e s w k u k k p 0 E c o d t k f i g'W p k x g t u k v{"
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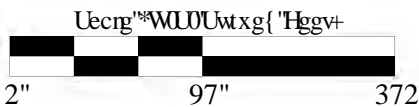
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i g q v g e j p k e c n l i k g u'd{'U C U Y "o g y q f'.I g q r j { u k e c n E j c t c e v g t k c v k p'q h'U k g u."V g e j p k e c n l e q o o k w g g"
h q t'Z K K K E U O H G.'C 0 C 0 D c m g o c'R w d r k u j g t.'T q w g t f c o . 'P g y g t r c p f u."3; ; 6.'9: 7/: 380

V g r i q t f.'Y 0 0'N R 0 I g r f c t v.'T 0 G 0'U j g t k h'c p f'F 0 C 0 M g{u.'C r r r k g f'T g q r j { u k e u 0 E c o d t k f i g"
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ukg'tguwmu'uj qy kpi "vj g'uj gct'y cxg'xgmekw{ 'xgtuwu'f gr vj . "vj g'r tgf levgf "dgtqenlf gr vj u."cpf "vj g"
fcv"eqngevkqp"cpf "rtqeguukpi 'vko g'hqt"gcej "o gy qf "TGVVGY ."4243+0



P qgu<

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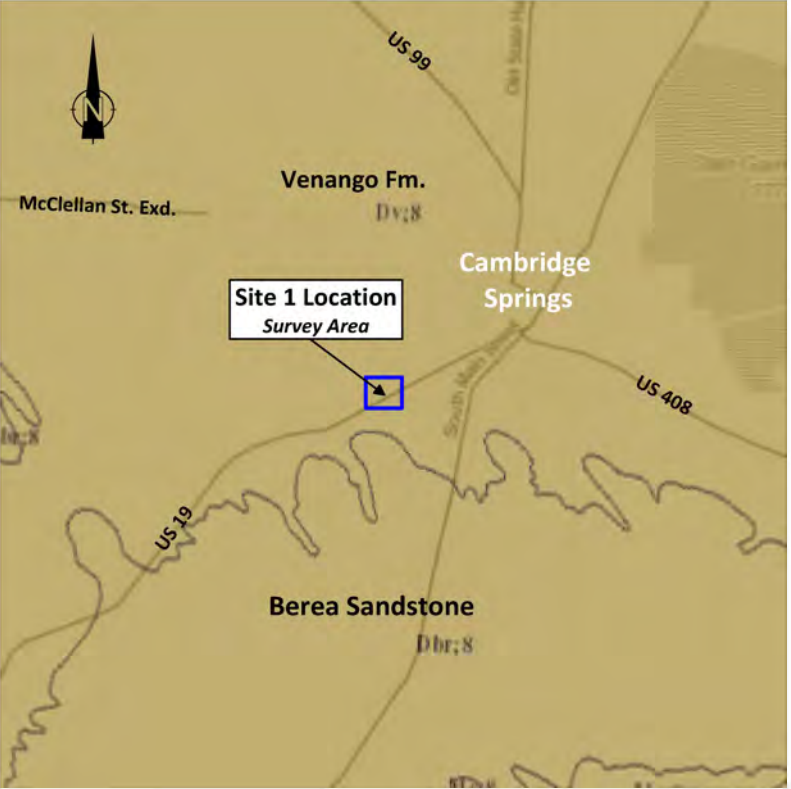
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I gqr j { ulecn'Uwtxg{ 'Ngi gpf

I gqr j qpg'Nqecvkqp

Ugkuo qi tcr j "I gqf g lvtqo lpg+



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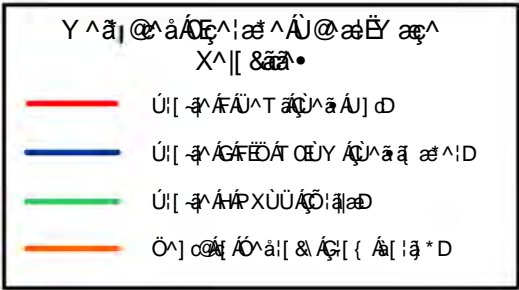
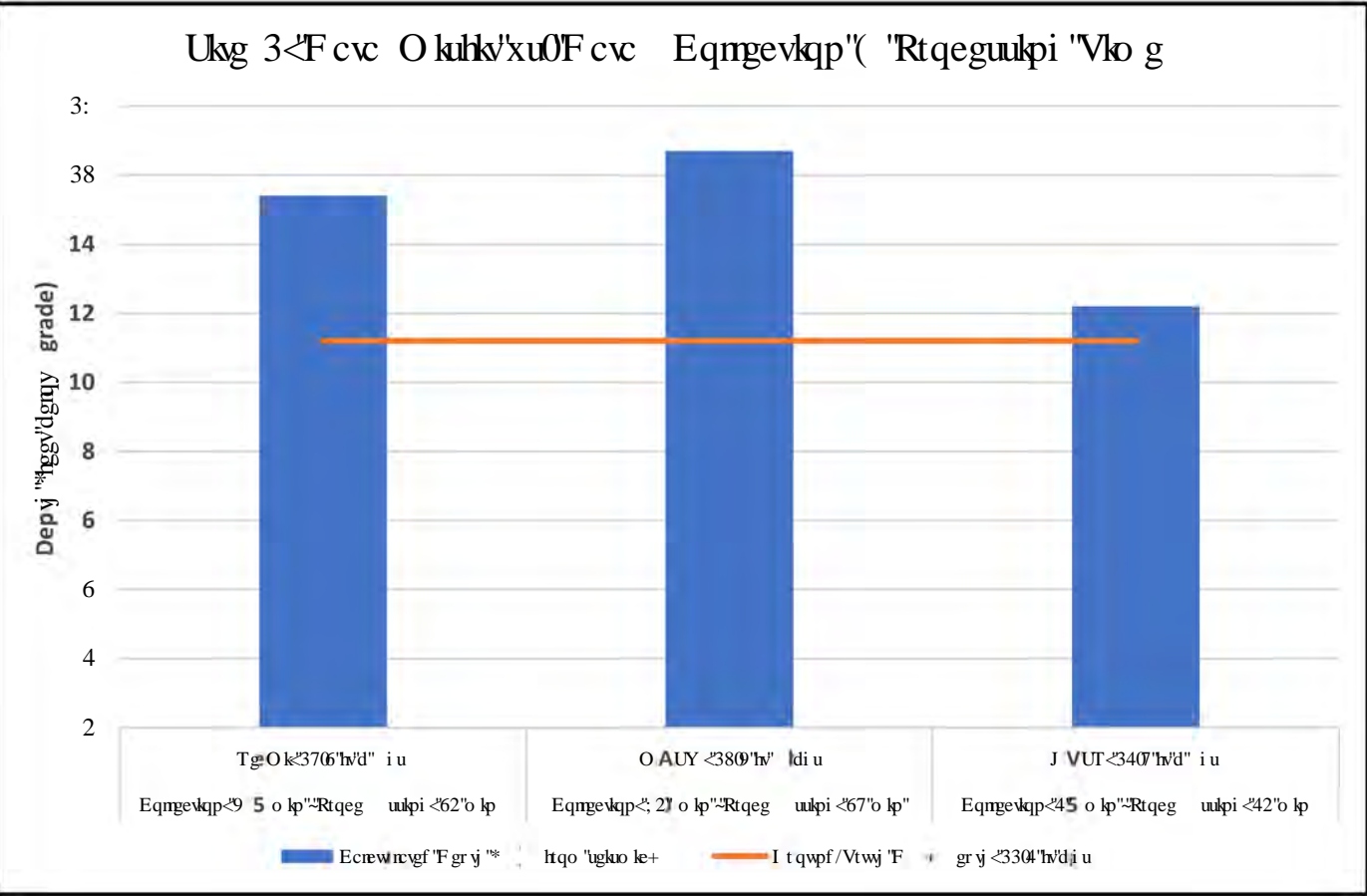
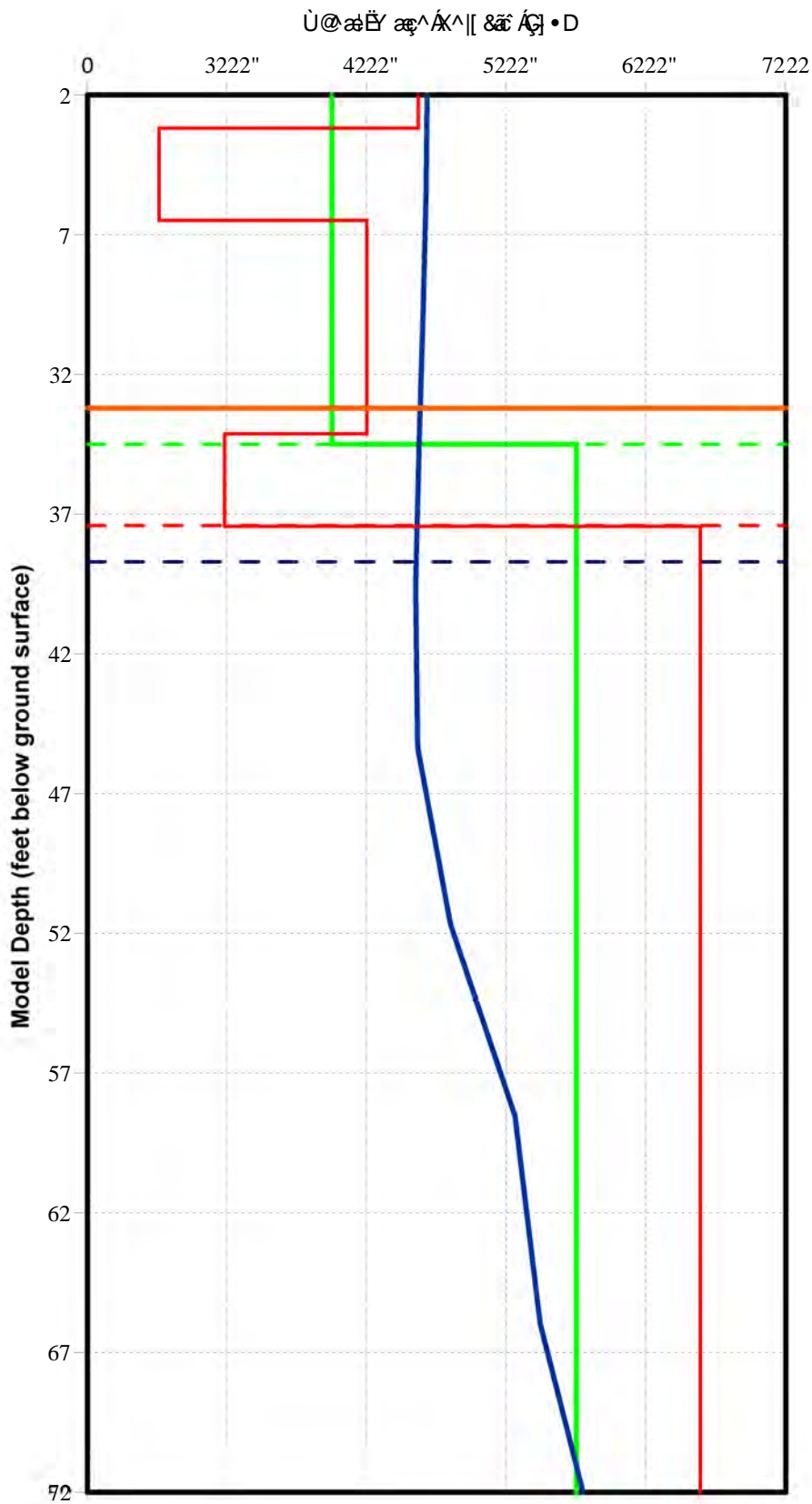
RETTEWSM

RETTEW Field Services, Inc.
3020 Columbia Avenue, Lancaster, PA 17603
Phone 1-800-788-8395

Figure 1A: Data Coverage and Geologic Setting Site 1

An Evaluation of Unconsolidated Overburden Thickness
PENNDOT Site 1

SURVEY DATE:	10/28/2021
RETIEW No.:	105082002
REVIEWED BY:	CHR/FKB
DRAWN BY:	CTM
REVISION DATE:	11/12/2021
SCALE:	Graphical
FIGURE NO.	1A



P qvgu<

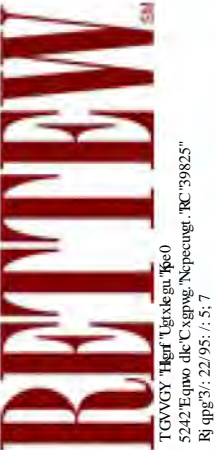
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I gqf g'y kj "60"J | "I gqr j qpqu'cv'c"32/hq qv'ur celpi 0

O CUY "y gki j vgf "cxgtci g"uj gct/y cxg"Xg'hqekkgu"Xu+ltqo
I gqo gvtleu"Uguko ci gt0'TgO k'cxgtci g"X'li'xcnvgu'ltqo "Ugku"
Qr vTgO Kd{ "Qr vko 0J XUT"cxgtci g"Xu'ltqo "I tnc"d{ "O QJ QO

Eqmtgf "f cuj gf "npgu"eqttgur qpf "vq"lpheltgf "tqenlf gr vj u
ltqo "gcej "Vr g'qh'lwtxg{0

Hl w g'3D<"Ugko le"T guvnu'Ukø 3"

Cp'Gxcnvcklp"qht'Wpququkf cvgf "Qxgtdwlf gp"Vj kempgu
RGP P F QV"Ukø 3"



UWTXGj 'FCVQ< 32 B6 H243
TGVVGY 'P q0< 3272-4224
TGXKGY GF 'Dj < E L T H M D
F T C Y P 'Dj < E V O
TGXKJQP 'F C V Q < 33 B4 H243
UECNG< " I tci j keon
Hk Wt'GP Q0' 3D



P qvgu<

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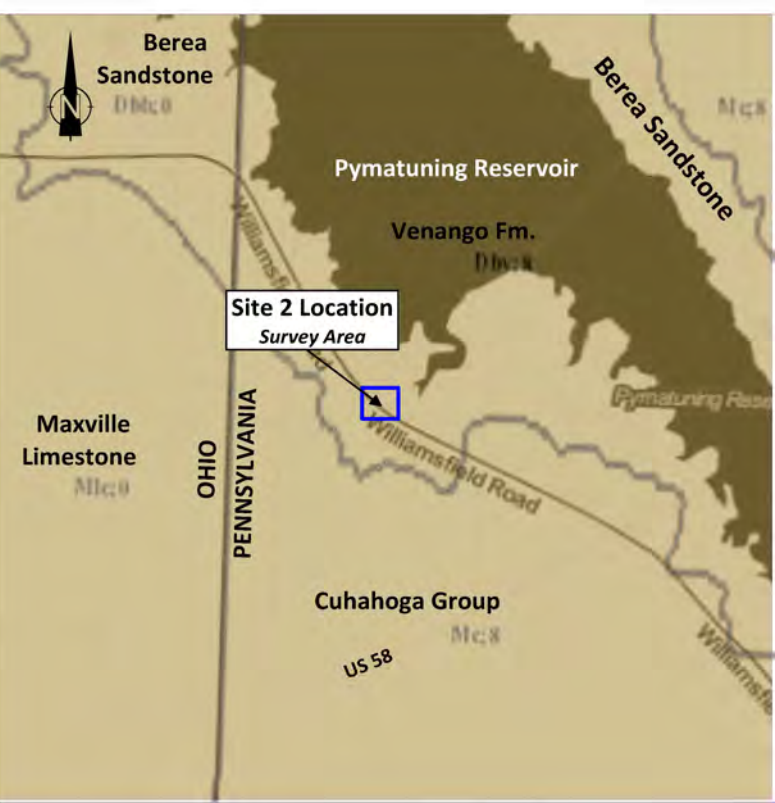
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I gqr j { ułecnl'Uwtxg{ "Ngi gpf

I gqr j qpg"Nqecvłqp

Ugłuo qi tcr j "i gqf gIVtqo łpq+



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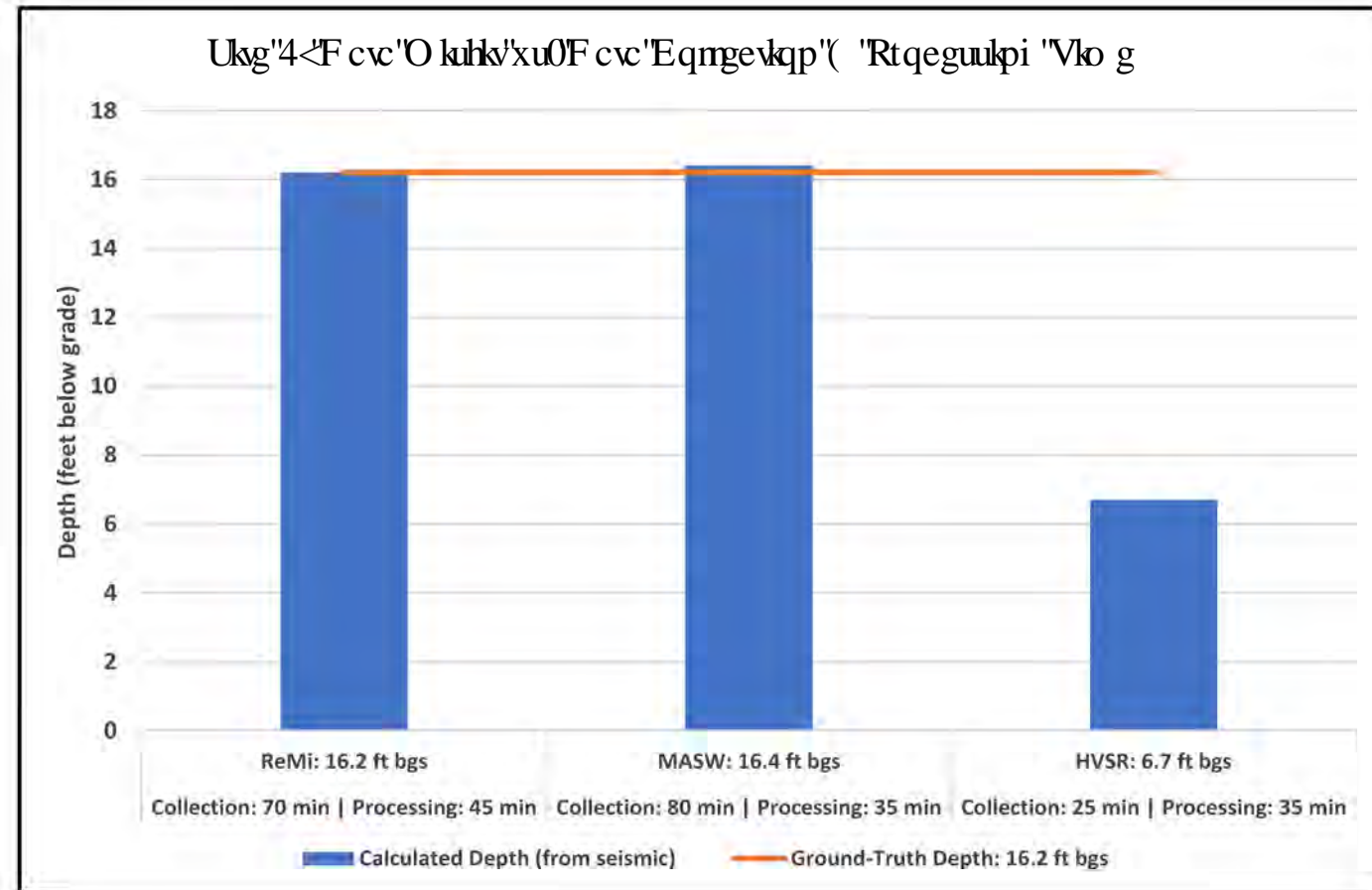
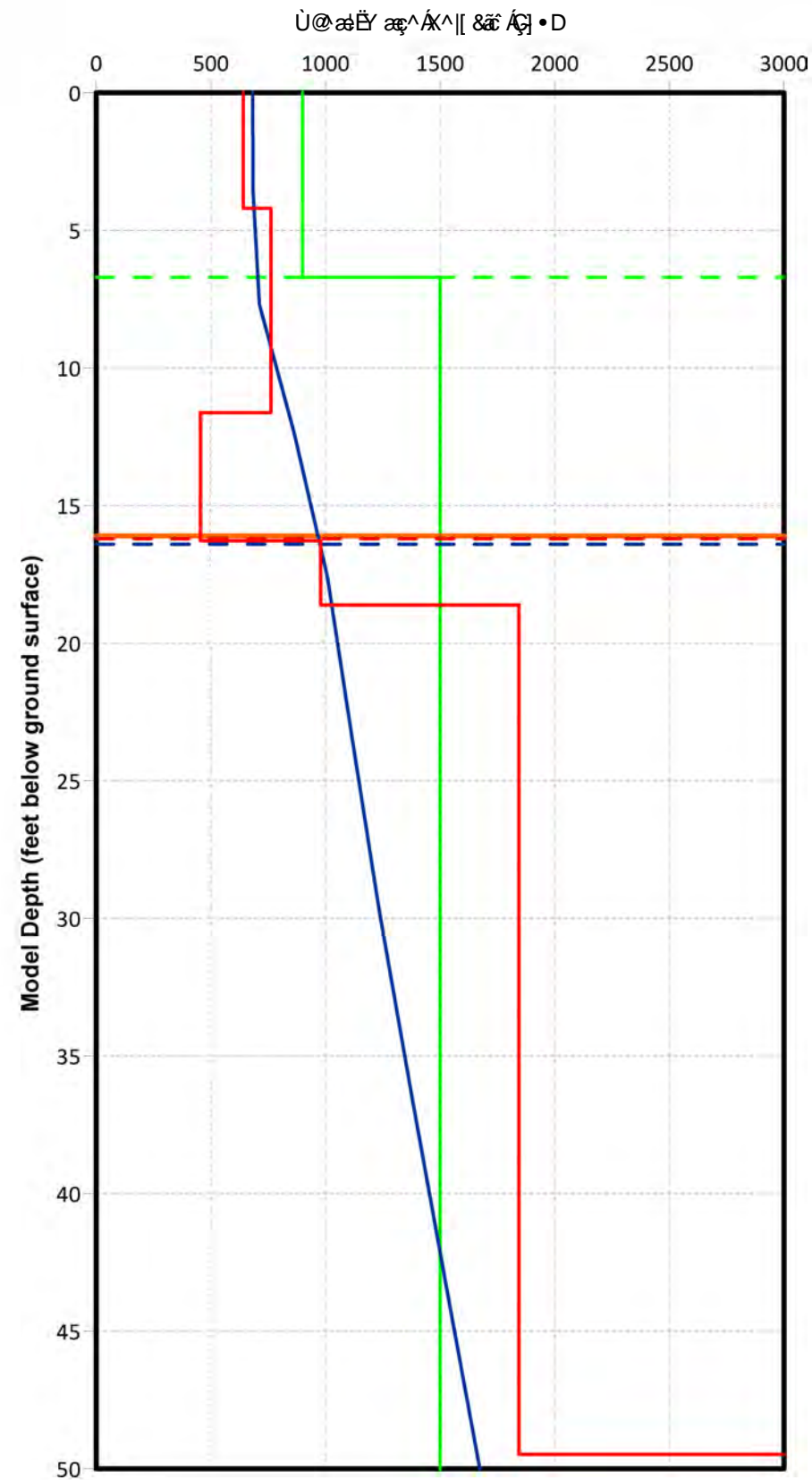


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Figure 2A: Data Coverage and Geologic Setting Site 2

An Evaluation of Unconsolidated Overburden Thickness
PENNDOT Site2



P qvgu<

OCUY 'cpf 'TgO k'ugkuo le'f'cvc'htqo 'I gqo g'tleu'46/ej cpggn'
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O CUY "y gli j w f "cxgtci g"lj gct/y c xg"xgmekkgu"xu+ltqo "
I gqo gvtleu"UgkuK ci gtOTgO K'cxgtci g"Xu'xcwgu"ltqo "Ugku"
Qr vTgO K'd "Qr wo OJ XUT"cxgtci g"Xu"ltqo "I tkm'd' "O QJ Q0

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Figure 2B: Seismic Results Site 2

An Evaluation of Unconsolidated Overburden Thickness PENNDOT Site 2

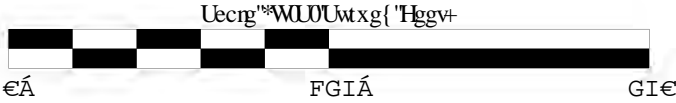
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DRAWN BY:	CTM
REVISION DATE:	11/12/2021
SCALE:	Graphical
FIGURE NO.	2B



P qvgu<

Deugo cr "lo ci g"ltqo "RCUFC"K ci gt{ "P exli cvqt"423: +0

I gqmqi le"cpf"i gqi tcr j le"lphqto cvkqp"ltqo "RCUFC"Y O U"Ugtxgt0

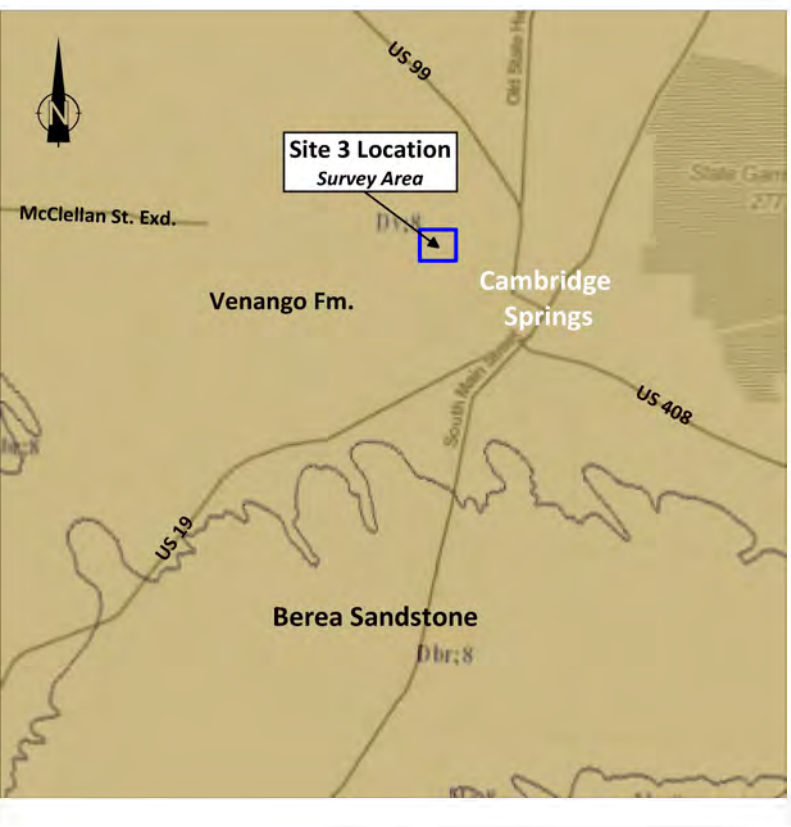
Eqqtf kpcvgu"lp"RC"Ucvg"Rrcpg"pqtvj +.P CF: 5."WU0Uwtxg{ 'hgg0

Uwtxg{ 'rtqhgulucvqpu"ltqo "hgrf"uwtxg{ "cpf"TVMD{ "TGVVGY 0

I gqr j { ulecnUwtxg{ 'Ngi gpf

I gqr j qpg"Nqecvklp

Ugkuo qi tcr j "I gqf gIVtqo kpq+



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Figure 3A: Data Coverage and Geologic Setting Site 3

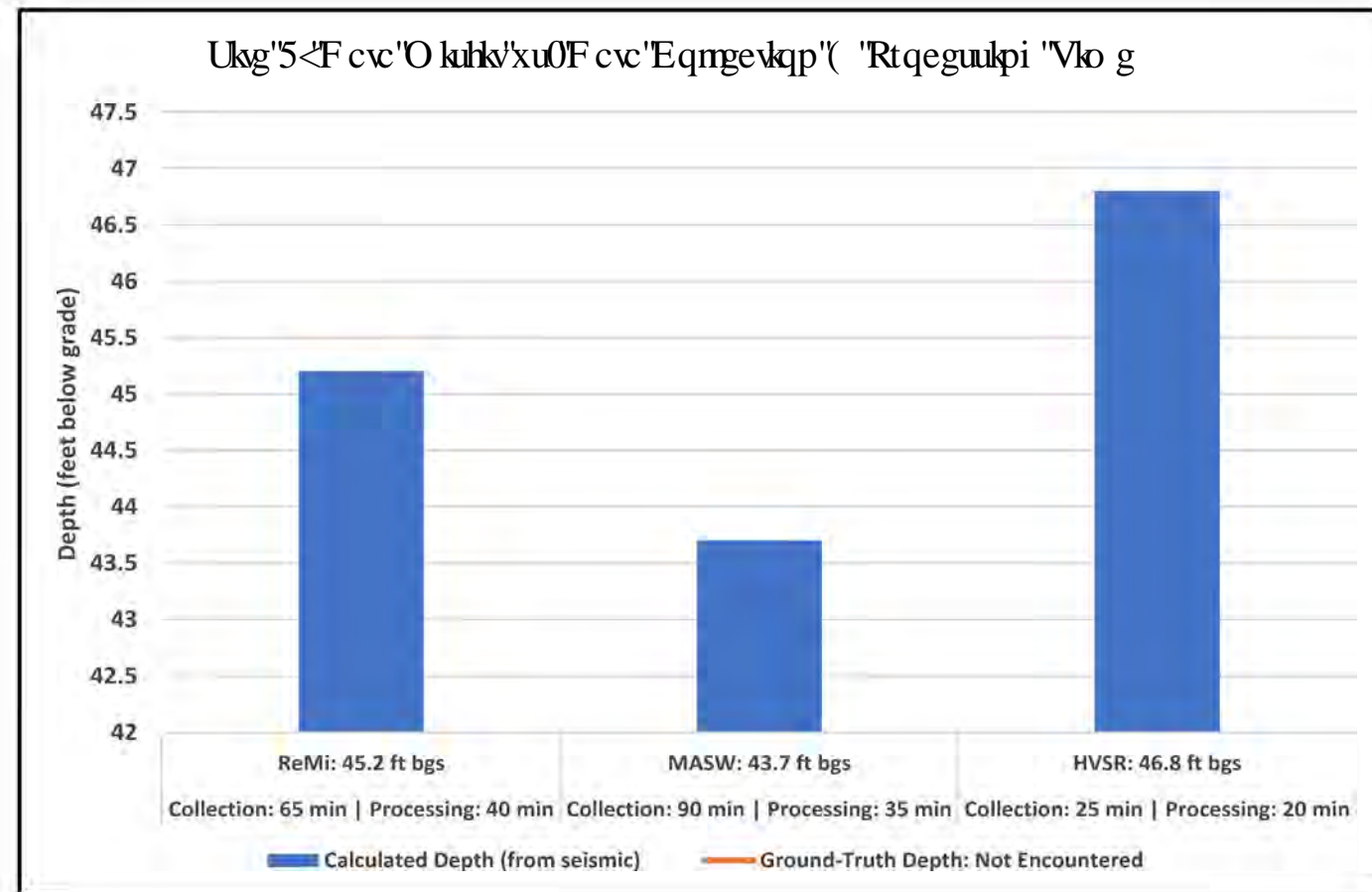
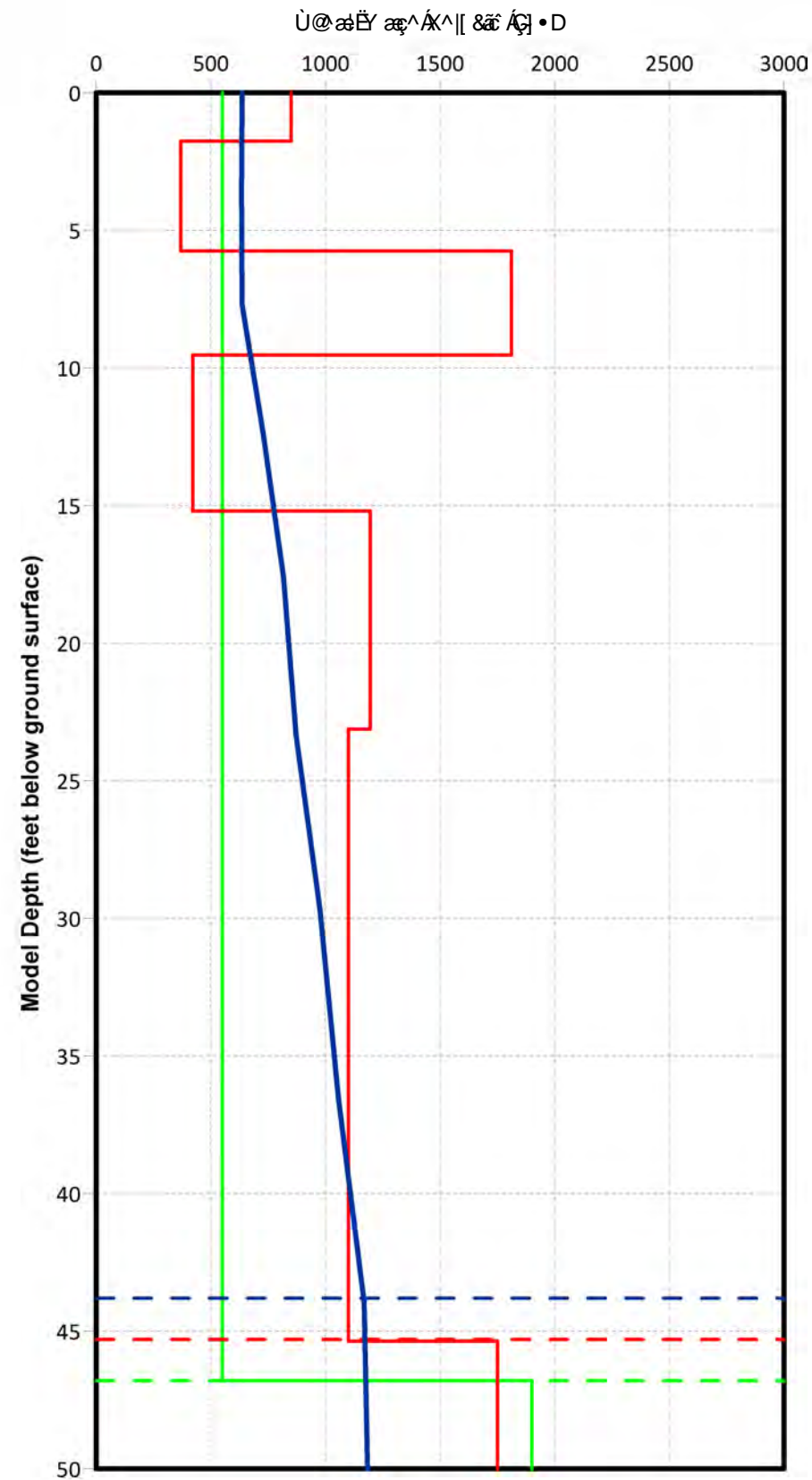
An Evaluation of Unconsolidated Overburden Thickness

PENNDOT Site 3

SURVEY DATE:	10/28/2021
REVIEW No.:	105082002
REVIEWED BY:	CHR/FKB
DRAWN BY:	CTM
REVISION DATE:	11/12/2021
SCALE:	Graphical
FIGURE NO.	3A

CRAWFORD COUNTY

CAMBRIDGE SPRINGS, PA



P q v g u <

OCUY "cpf'TgO k'ugkuo le'f'cvc'htqo 'I gqo gtleu"46/ej cppgn'
I gqf'g'y kj '60'J | i gqrj qpqu'cv'c'32/hqyv'ur cekpi 0

O CUY "y gli j w f "cxgtci g"lj gct/y cxcg"xgmekkgu"xu+ltqo "
I gqo gvtleu"Uguk6 ci gt0TgO'k'cxgtci g"Xu'xcwgu'ltqo "Ugku"
Qr vTgO'k'd "Qr wo 0J XUT"cxgtci g"Xu'ltqo "I tkm'd' 'O QJ Q0

Eqmtgf "f cuj gf "hpgu"eqttgur qp{ "vq"lphgttgf "tqemlf gr y u"
htqo "gcej "v{r g"qh"uwtxg{0

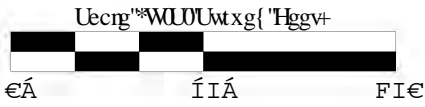
Figure 3B: Seismic Results Site 3

An Evaluation of Unconsolidated Overburden Thickness PENNDOT Site 3

CRAWFORD COUNTY
CAMBRIDGE SPRINGS, PA

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DRAWN BY:	CTM
REVISION DATE:	11/12/2021
SCALE:	Graphical
FIGURE NO.	3B



P qvu<

Deugo cr "lo ci g"ltqo "RCUFC"K ci gt{ "P cxli cvqt"*423: +0

I gmqi le"cpf "Mctuvlphqto cvkqp"ltqo "RCUFC"Y O U'Ugtxgt0

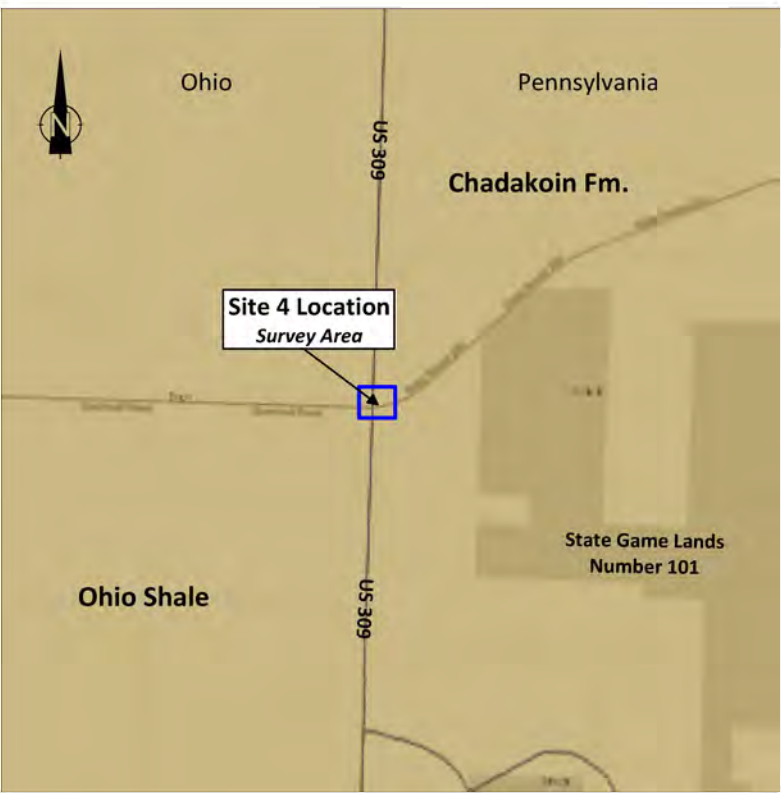
Eqqtflpcvgu'lp"RC"Ucvg'Rncpg*pqtvj + 'P CF: 5."WU0Uwtxg{ 'hgg0

Uwtxg{ 'r tqhrgulucvqpu'ltqo "hgrf"lwtxg{ "cpf"TVM'd{ "TGVVGY 0

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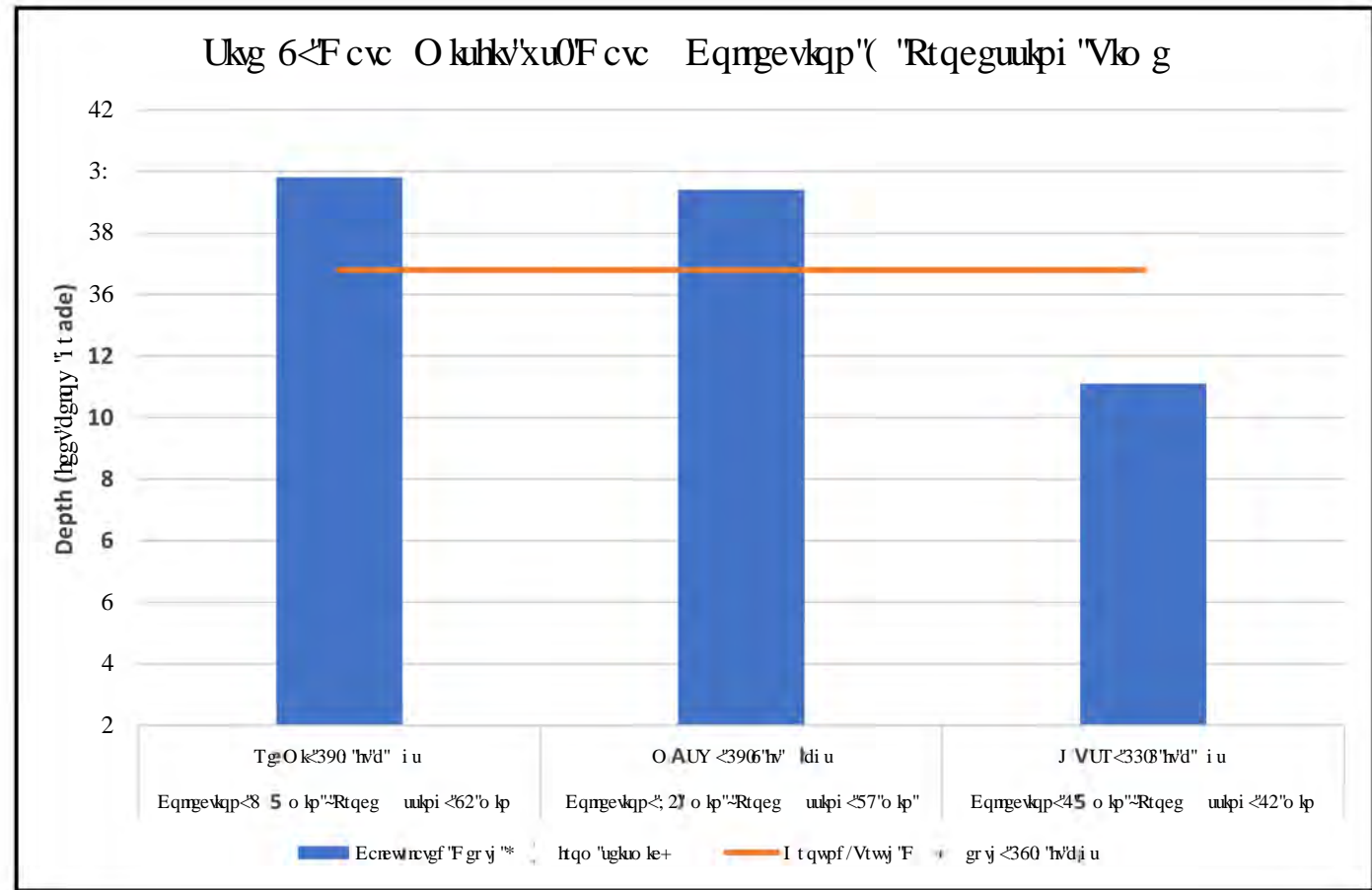
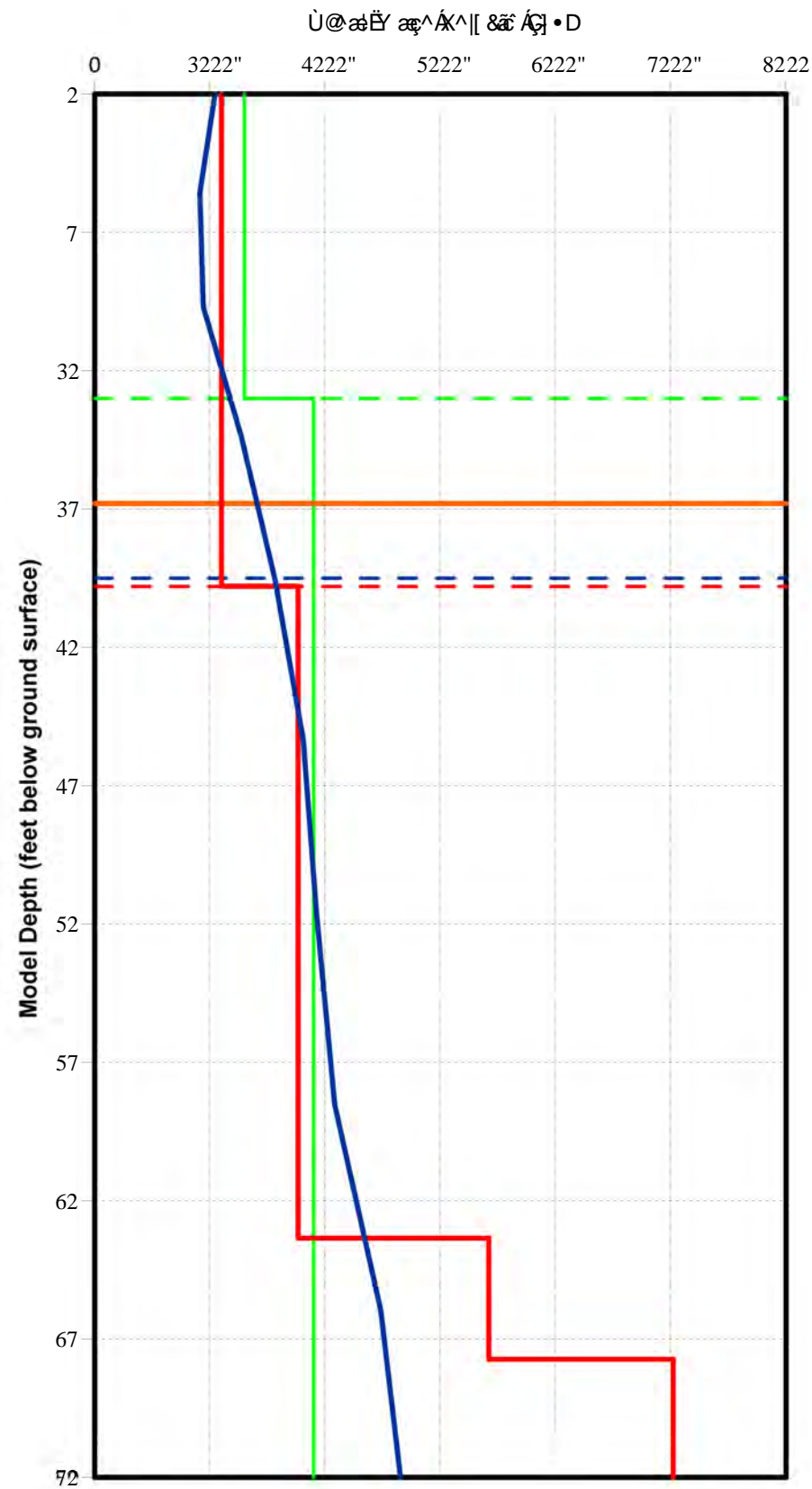
Figure 4A: Data Coverage and Geologic Setting Site 4

An Evaluation of Unconsolidated Overburden Thickness
PENNDOT Site 4

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REVISION DATE:	11/12/2021
SCALE:	Graphical
FIGURE NO.	4A

ERIE COUNTY

ERIE, PA


$$P \leq q \vee u \leq v$$

O CUY "cpf" T gO k'ugluo ke'f'c'v' "tqo" I gqo g't'keu'46/ej cpgpi'
I gqf g'y kj '607"J | 'i gqr j qpgu'c'v'32/hqyv ur celpi 0

OCUY "y gki j vgf "cxgtci g"uj gct/y cxg"xgm^utklgu"^uXu+htqo "
I gqo gvleu"Ugluk^u ci gt0TgO k'cxgtci g"Xu"x'bnv^uhtqo "Uglu
Qr v'TgO k'd' "Qr v^u0J XUT"cxgtci g"Xu+htqo I tkm'd' "O QJ Q0

Eqmrgf"fcujgf"npgu"eqttgurqpf"vq"lphgttgf"tqemfgrvj u
hrgo "gcej"vrg"qh'lwtxg{0

Hi wt_g "6D<Ugkwo le 'T guwmu "Ukg "6"

Cp'Gx cncw'kqp "qh'Wbequqrf cvgf "Qxgtdwtf gp "Vj kempuu
RGP P F Q V "Ukg'6"

GTKG, "RC"

GTGG'EQWP VI

TGVGVY "Herf" Uqrxlegu Yfo0
 BETHW

UWTXG ¹ FCVG ²	3213614243	32727-42724	ELTHMD	EXO	338484243
TCXWGY ¹ Pq0 ²					I tcr] kecn
TCXKGY ¹ GF ² D ³					UECNG ² -
FTCY ¹ P ² D ³					6D
TCXKUP ¹ FCVG ²					
HK WTG ¹ PQ ²					



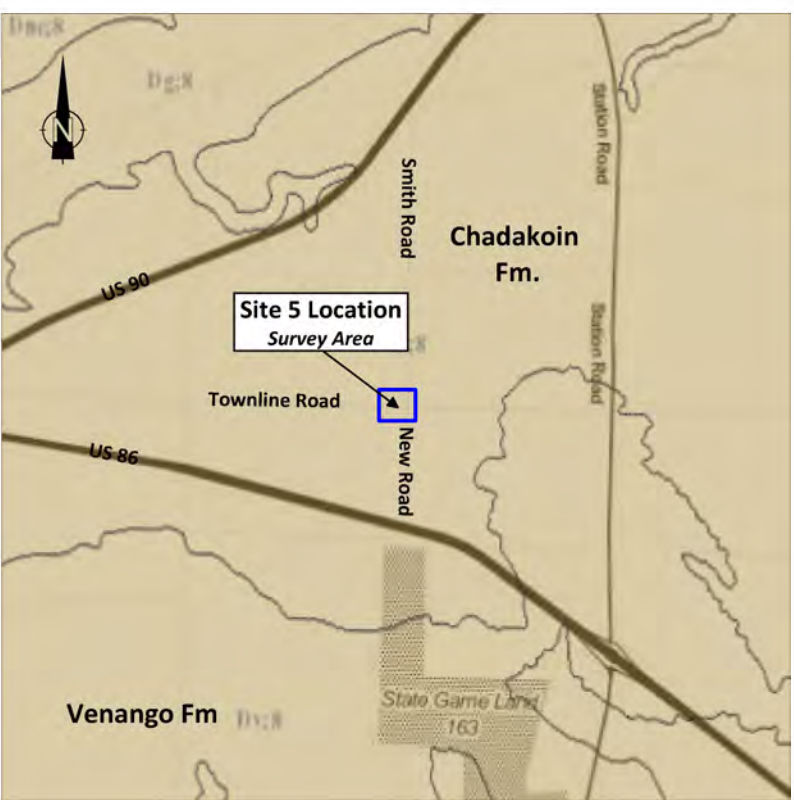
P qv<

Deugo cr "lo ci g"ltqo "RCUFC"K ci gt{ "P cxli cvqt"%423: +0

I gmqi le"cpf "Mctuv'lpqto cvkq'ltqo "RCUFC"Y O U'Ugtxgt0

Eqqtflpcvgu'lp"RC"Ucvg'Rncpg"*pqtj + 'P CF : 5."WUOWtxg{ 'hgv0

Uwtxg{ 'r tqhrgulncvqpu'ltqo "hgrf"bwtxg{ "cpf"TVM'd{ "TGVVGY 0



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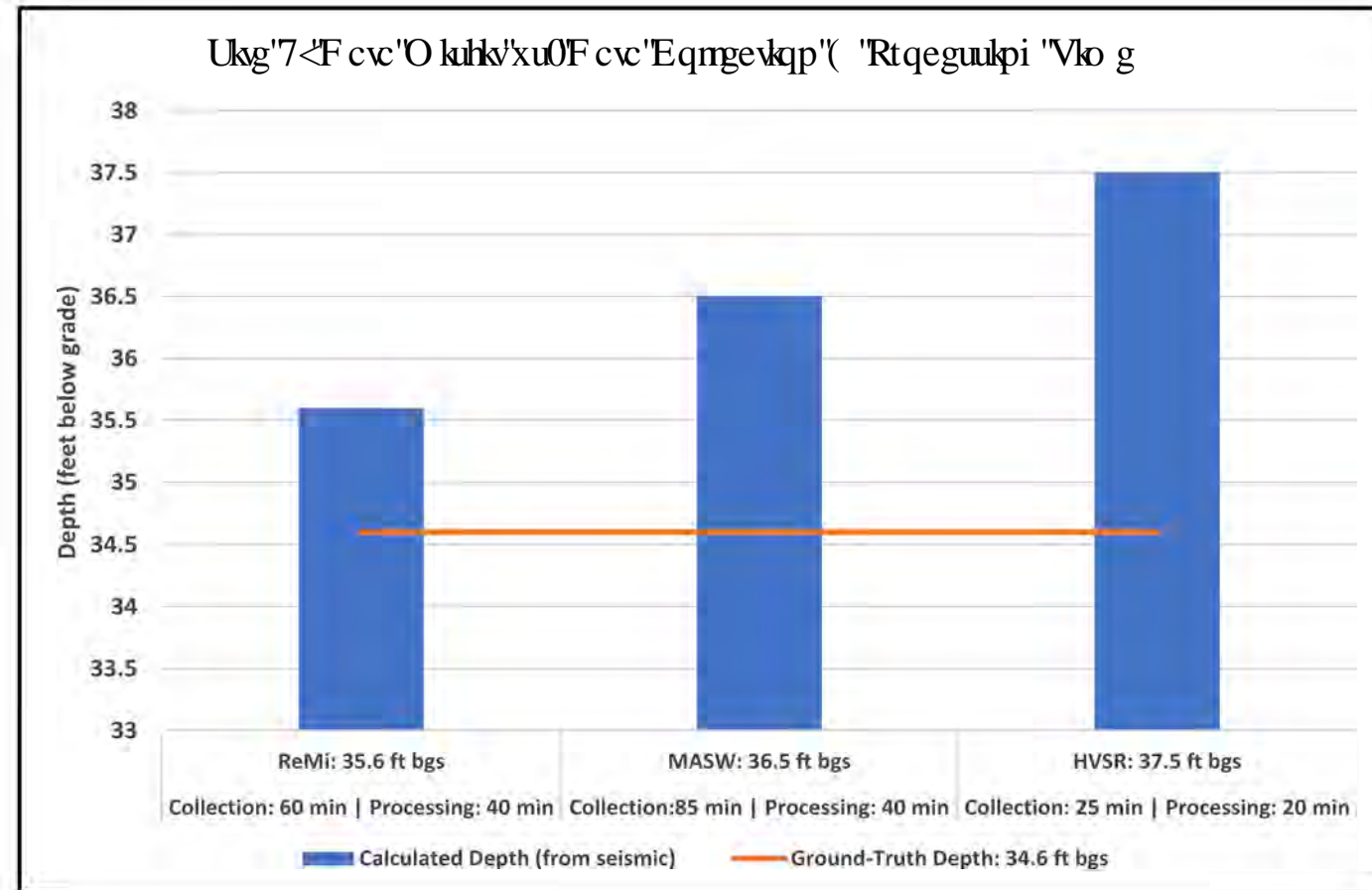
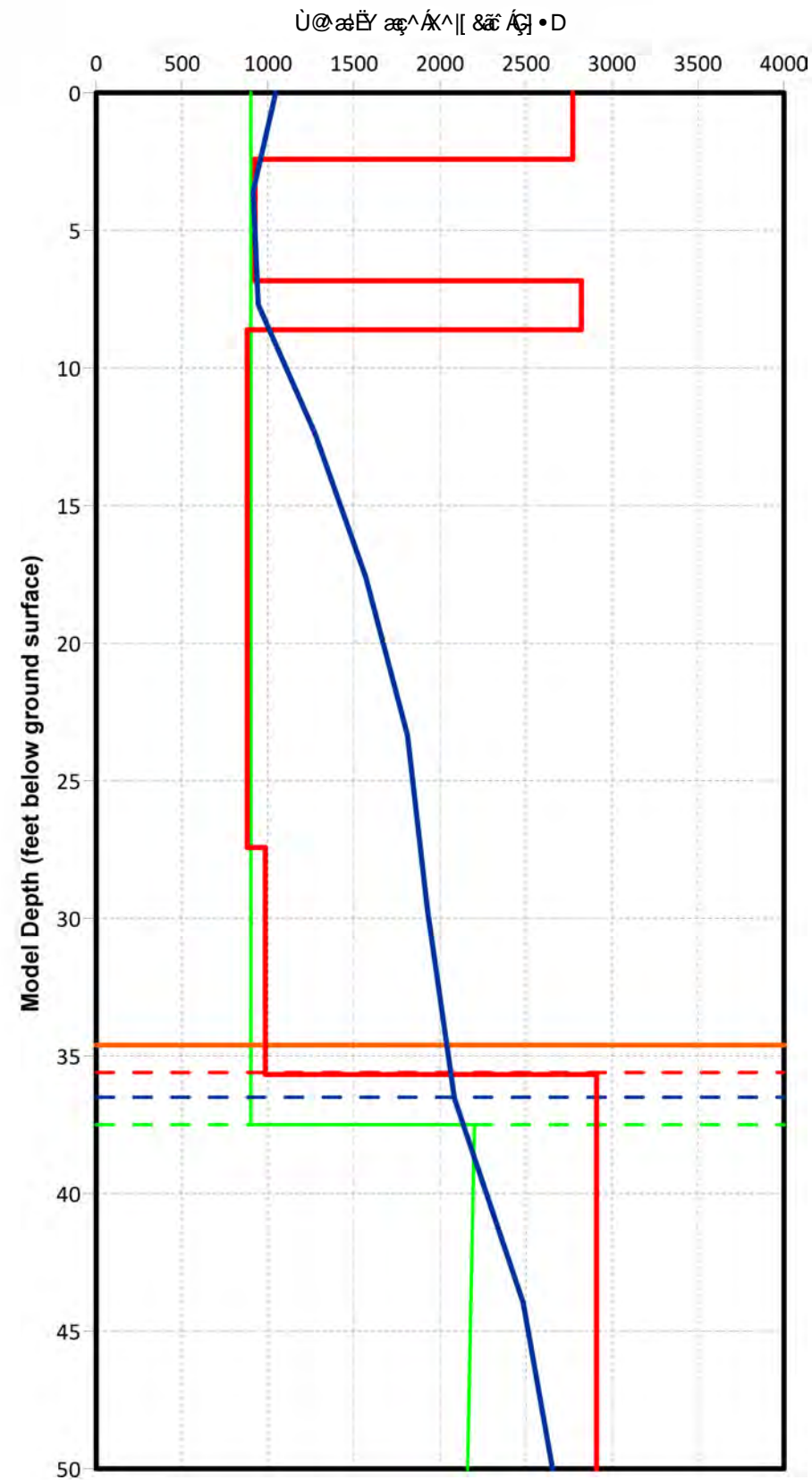
Figure 5A: Data Coverage and Geologic Setting Site 5

An Evaluation of Unconsolidated Overburden Thickness

PENNDOT Site 5

ERIE COUNTY

SURVEY DATE:	10/25/2021
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SCALE:	Graphical
FIGURE NO.	5A

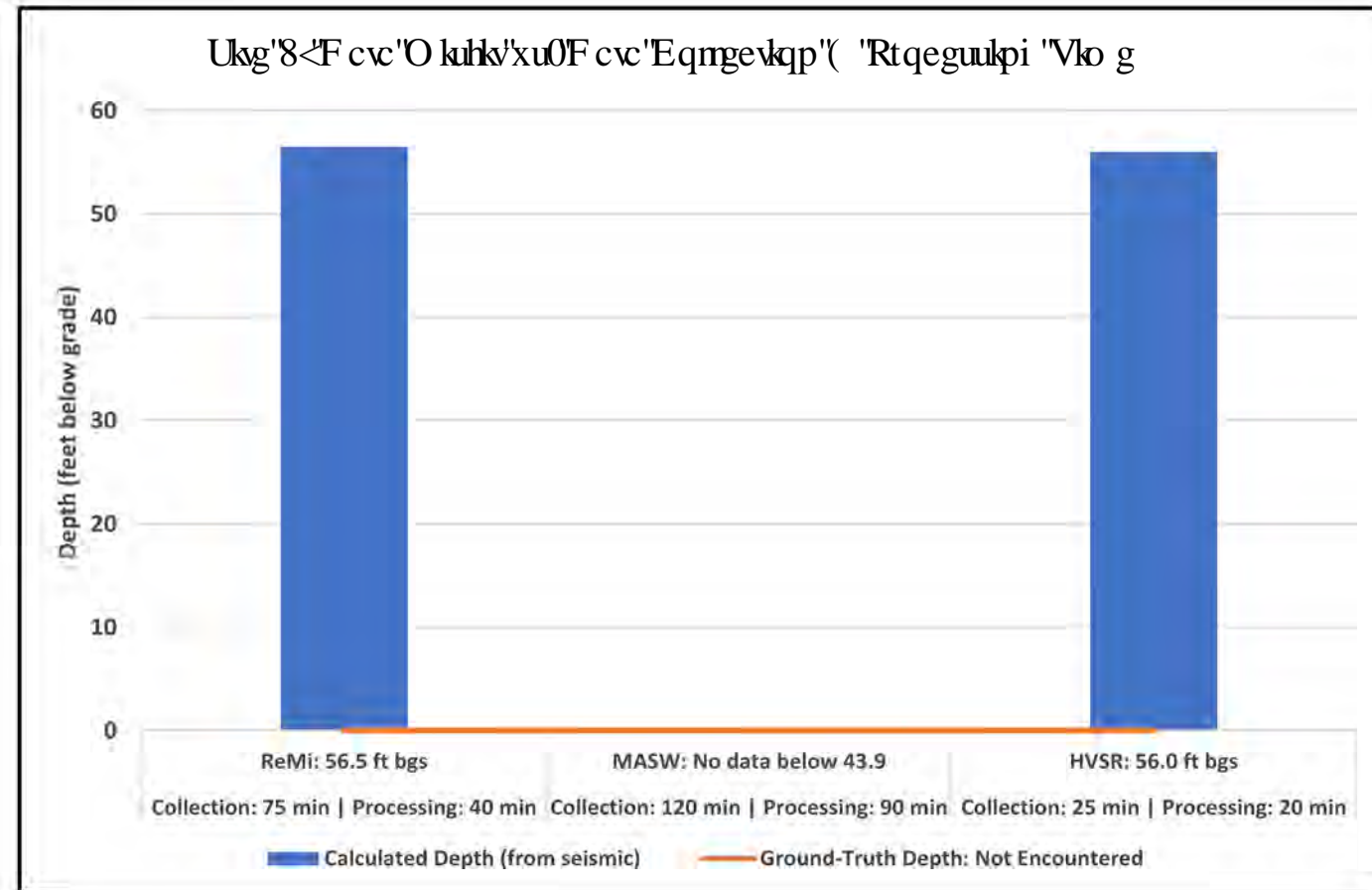
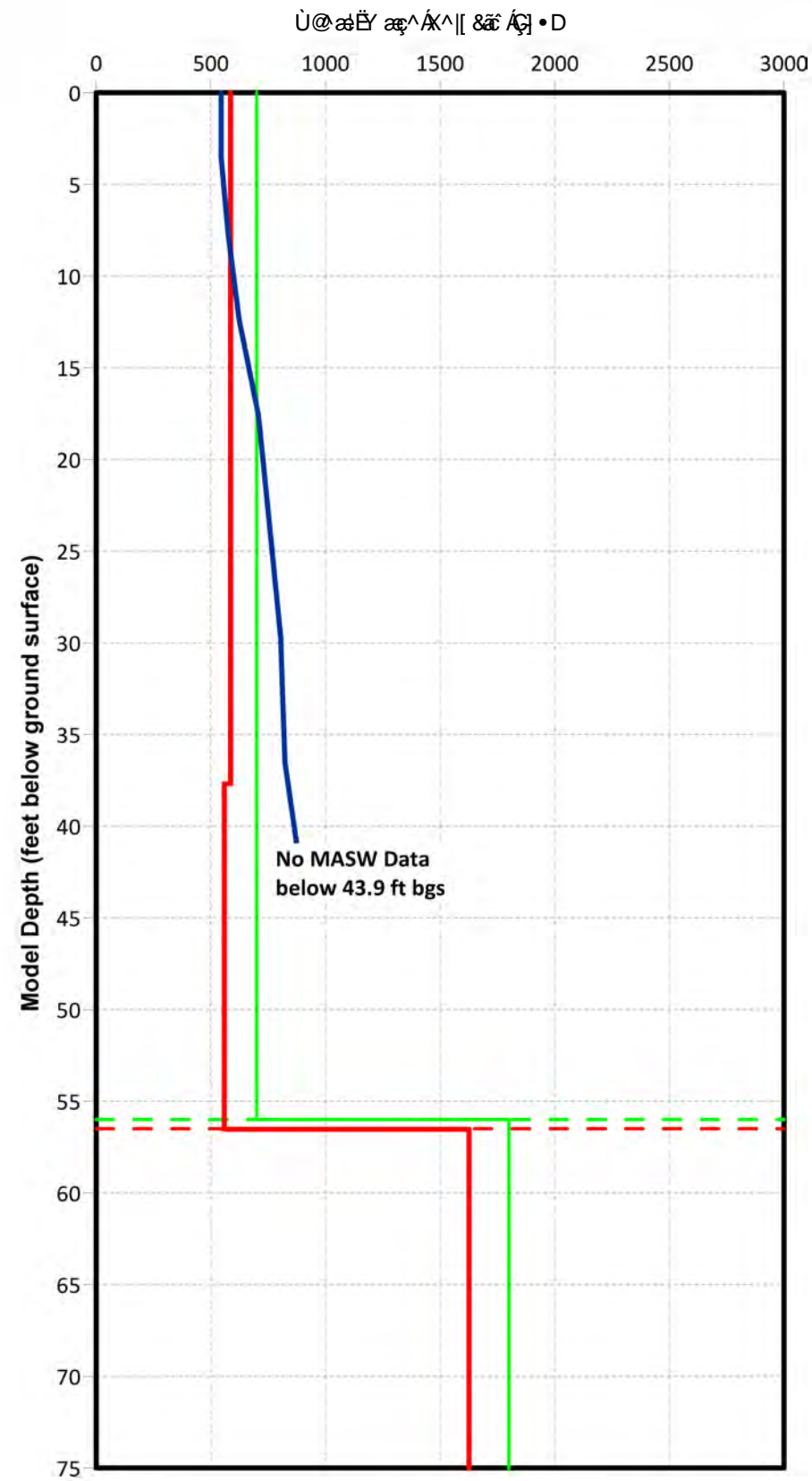


P qvgu<

OCUY "cpf'TgO k'ugko le'f'cv'htqo 'I gqo gtleu"46/ej cppgn'
I gqf'g'y kj '60'J | 'i gqr j qpqu'cv'c"32/mqv'ur celpi 0

O CUY 'y gli j vɣf'cxgtci g'liɣ gct/y cɣg'xgmɛkɛgu⁵Xu⁶htqo "
I gqo gvtɛu'Ugukɔ ci gt0TgO'k'cxgtci g'Xu⁶xcmgu⁶htqo 'Uguk"
Qr⁷vTgO'k'd{'Qr⁷wo 0J XUT'cxgtci g'Xu⁶htqo 'I tkm'd{'0QJ Q0

Eqmrtgf "f cuj gf "hpgu"eqttgur qpff "vq"lphgttgf "tqemlf gr yj u"
htqo "gcej "v{r g"qh'uwtxg{0



P q v g u <

OCUY 'cpf'TgO k'ug'kwo le'f'cv'ht'qo 'I gqo g'v'leu'46/ej c'ppgn'
I gqf g'y' kj '60'J | 'I gqr j q'pgu'cv'c'32/hq'v'ur c'epi 0

O CUY 'y gli j yf "cxgtci g'lj gct/y cxg'xgmekleu⁸Xu'htqo "
I ggo g'kleu'Uguk⁶ ci gtOTgO'lx'cxgtci g'Xu'xcngu'htqo 'Ugku"
Qr'VTgO'kd'{"Qr'wO OJ XUT"x'cxgtci g'Xu'htqo 'I tkm'd'{"O QJ QO

Eqmrtgf'f cuj gf "hpgu'eattgur qpff "v'lphegttgf 'tqemlf gr y u"
htqo "gcej "v{r g'qh'uwtxg{0

Figure 6B: Seismic Results Site 6

An Evaluation of Unconsolidated Overburden Thickness PENNDOT Site 6

ERIE, PA.

ERIE COUNTY

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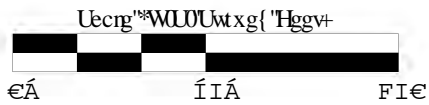
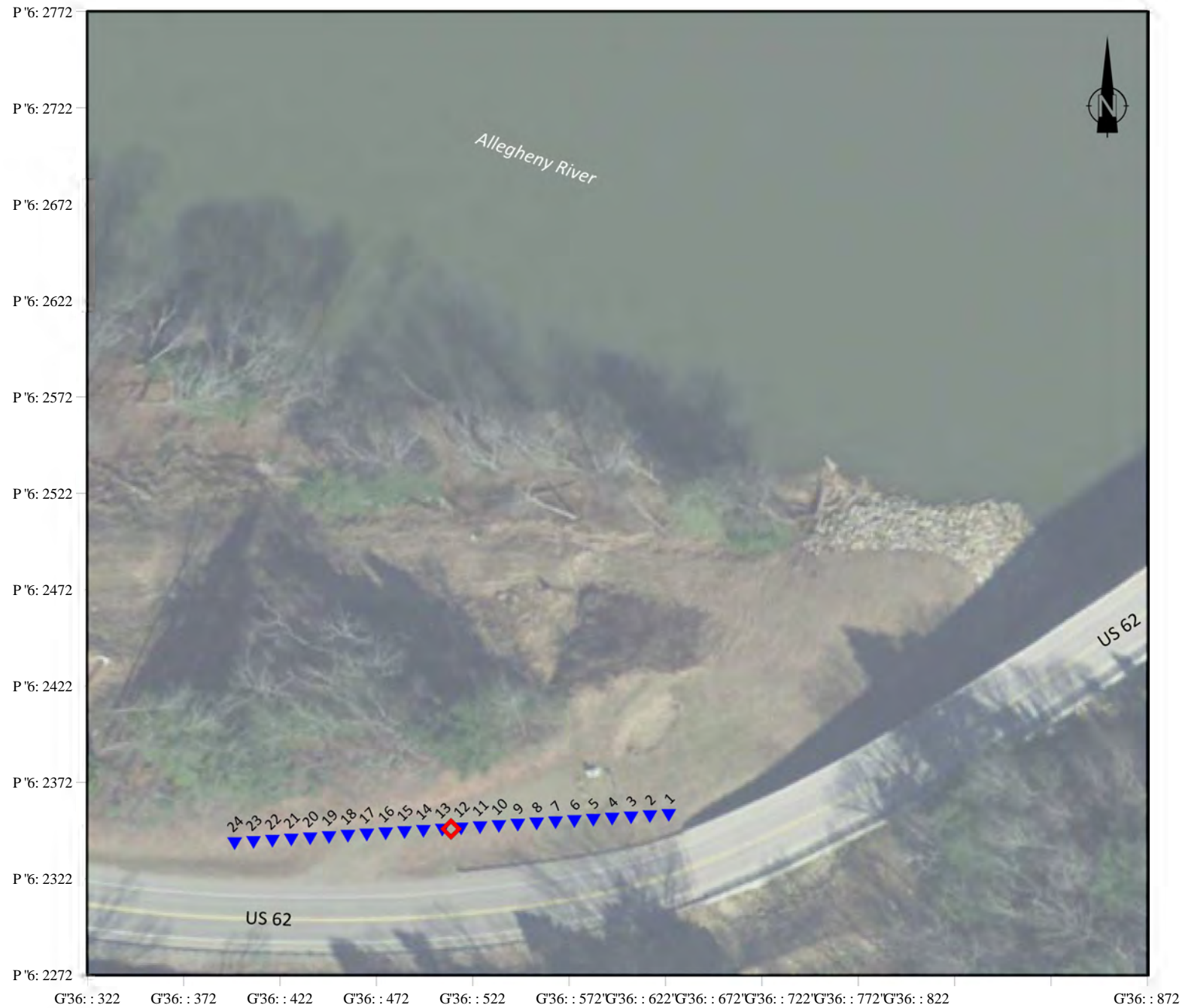
DRAWN BY: CTM

REVISION DATE: 11/12/2021

REVISION DATE: _____
SCALE: _____ Graphical

SCALE: _____

FIGURE NO. 6B



P qvgu<

Dcugo cr 'lo ci g'ltqo 'RCUFC'K ci gt{ 'P cxli cvqt'%423: +0

I gqmj ke'cpf 'Mctuv'lpqto cvkqp'ltqo 'RCUFC'Y O U'Ugtxgt0

Eqqtf kpcvgu'lp'RC'Ucvg'Rncpg'pqtj + 'P CF : 5.'WLUUwtxg{ 'hgv0

Uwtxg{ 'r tqhkg'lnv'kpu'ltqo 'TVM'd{ 'TGVVGY 0

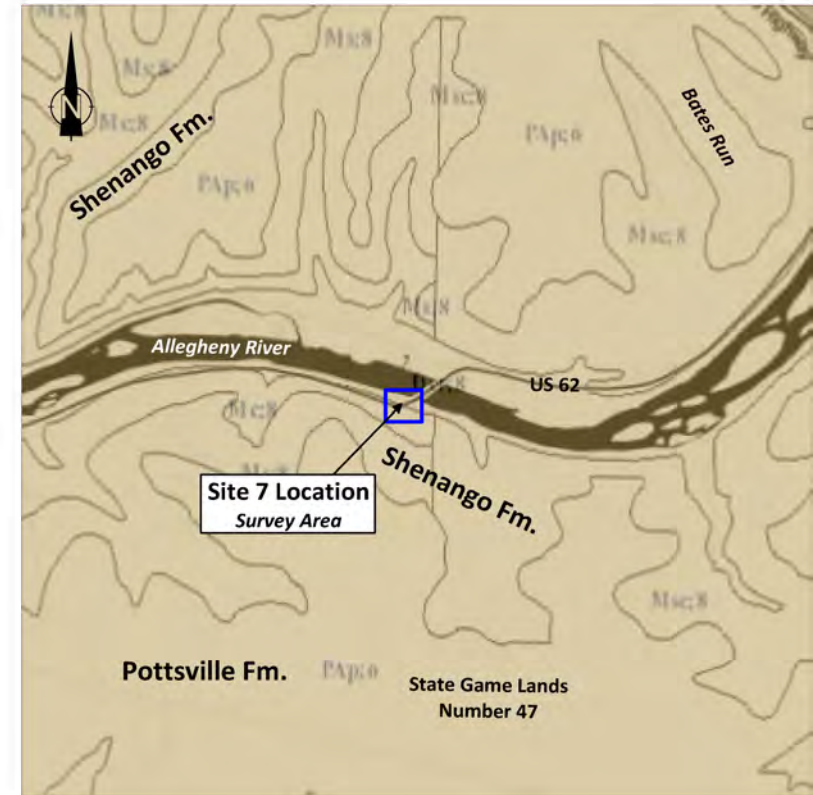
I gqr j { ulecri'Uwtxg{ 'Ngi gpf



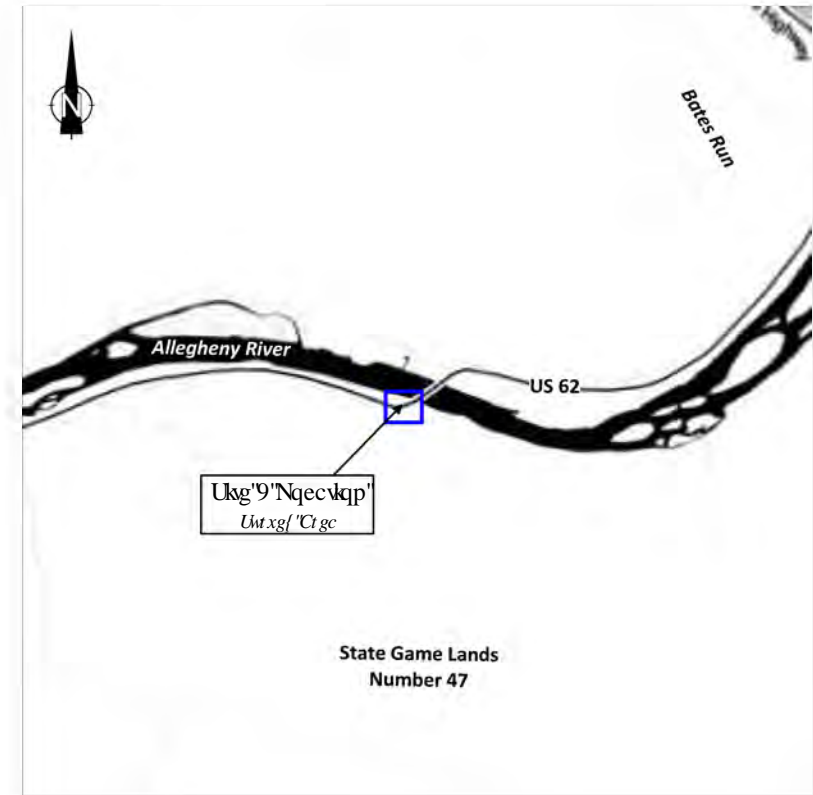
I gqr j qpg'Nqec'kqp



Ugkuo qi tcr j '%I ggf gIVtqo kpp+



I gqmj ke'Ugwkpi 0 I e e e e A F e e e e
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Ukg'Nqec'kqp e A I e e e e A F e e e e
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Figure 7A: Data Coverage and Geologic Setting Site 7

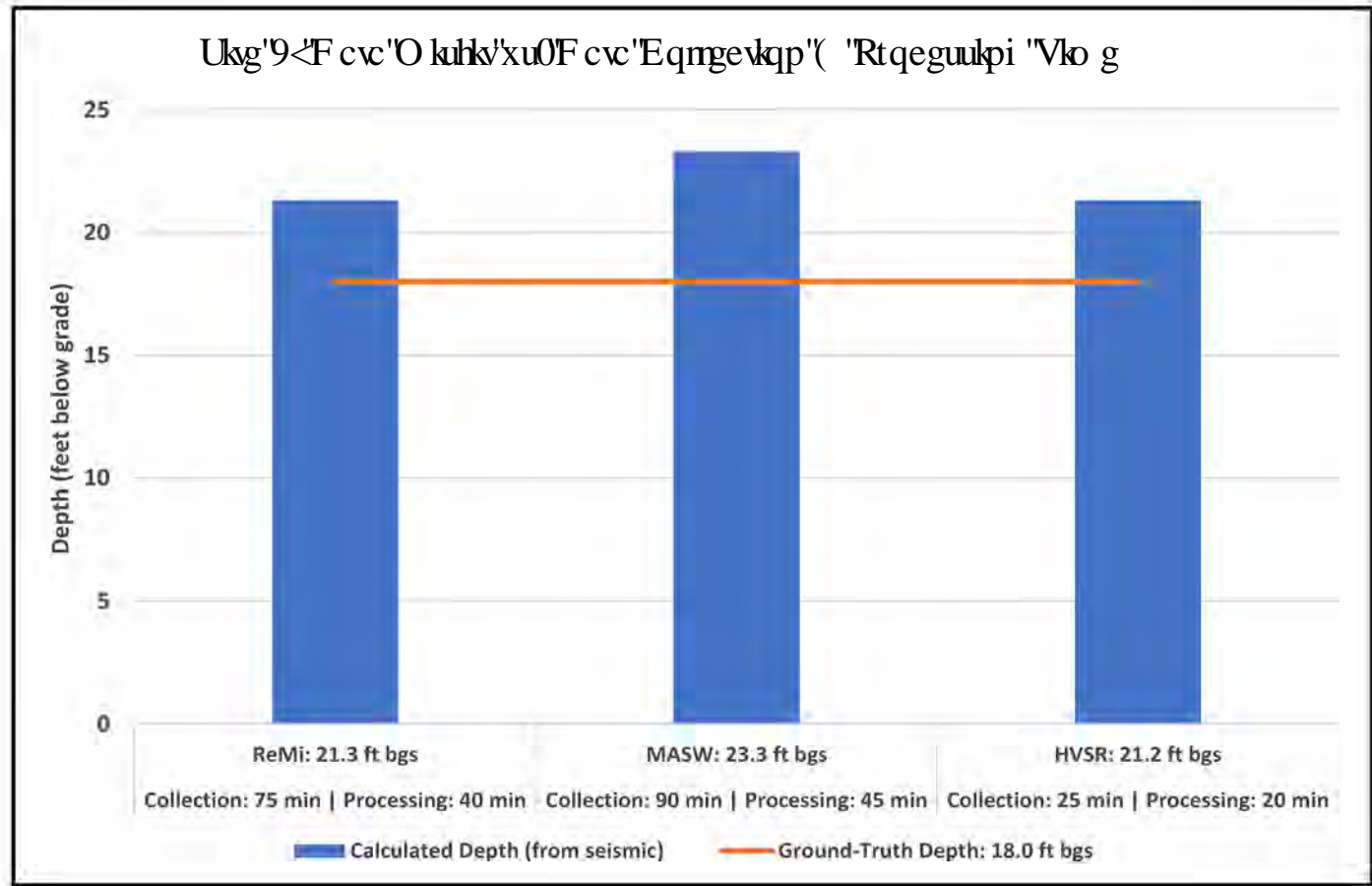
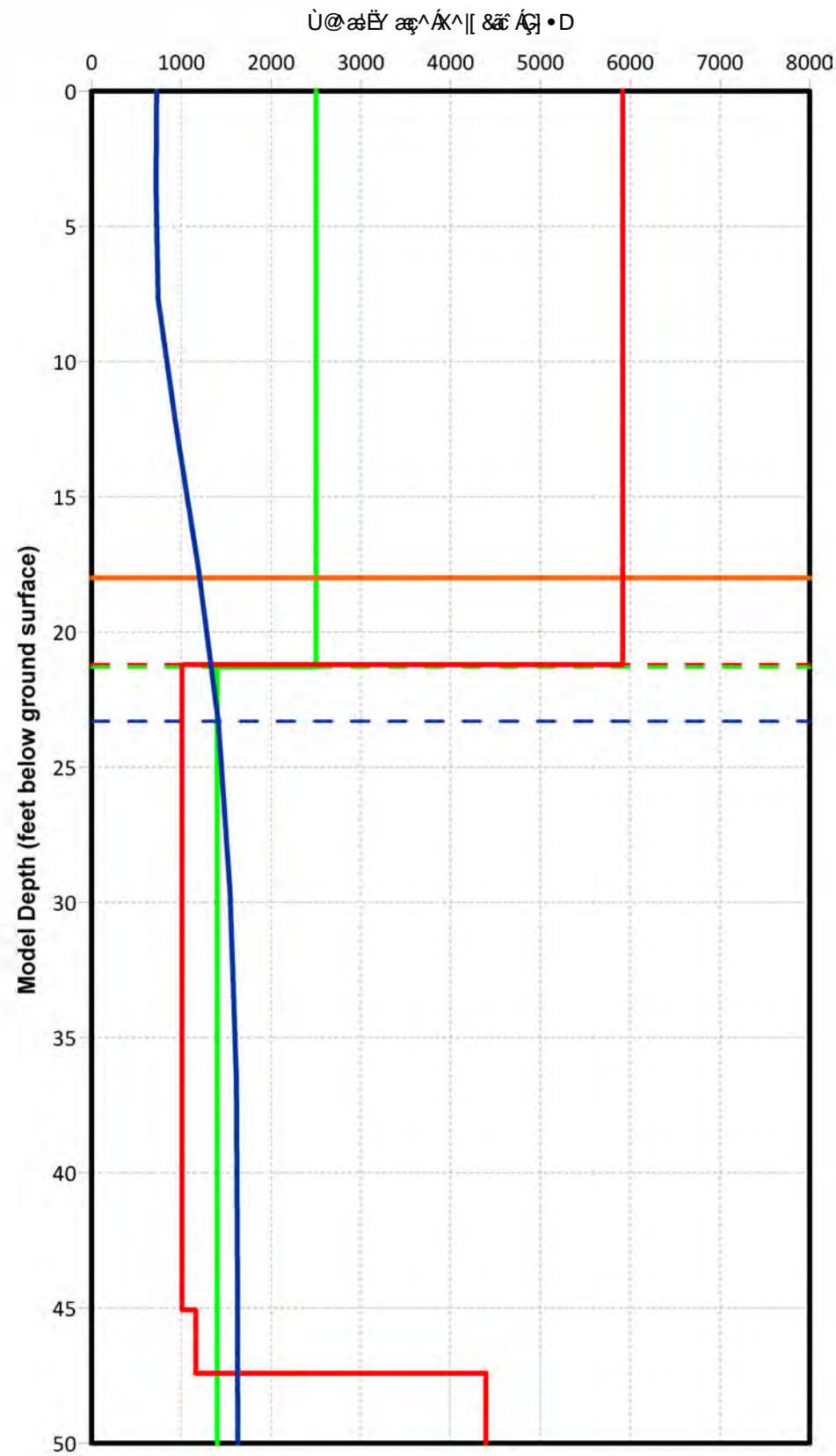
An Evaluation of Unconsolidated Overburden Thickness
PENNDOT Site 7

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RETIEW No.:	105082002
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DRAWN BY:	CTM
REVISION DATE:	11/12/2021
SCALE:	Graphical
FIGURE NO.	7A

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FOREST COUNTY

TIONESTA, PA



P qvgu<

O CUY "cpf "TgO k'ugluo le"f'cwc"ltqo "I gqo gvtleu"46/ej cppgn" I gqf g'y kj "607"J | "i gqrj qpgu'cv'c"32/hqgv'ur celpi 0

O CUY "y gli j vgf "cxgtci g'lj gct/y cxg"xgmekkgu*Xu+"ltqo " I gqo gvtleu"Ugluk6 ci gt0TgO k'cxgtci g'Xu'xcnngu"ltqo "Uglu" Qr vTgO Kd{ "Qr vko 0J XUT"cxgtci g'Xu"ltqo "I tlnr"d{ "O QJ Q0

Eqmgtgf "f'cuj gf "hpgu'eqttgur qpf "vq'lphttgf "tqenlf gr vj u" ltqo "gcej "v'rg'qh'lwtxg{0

Figure 7B: Seismic Results Site 7

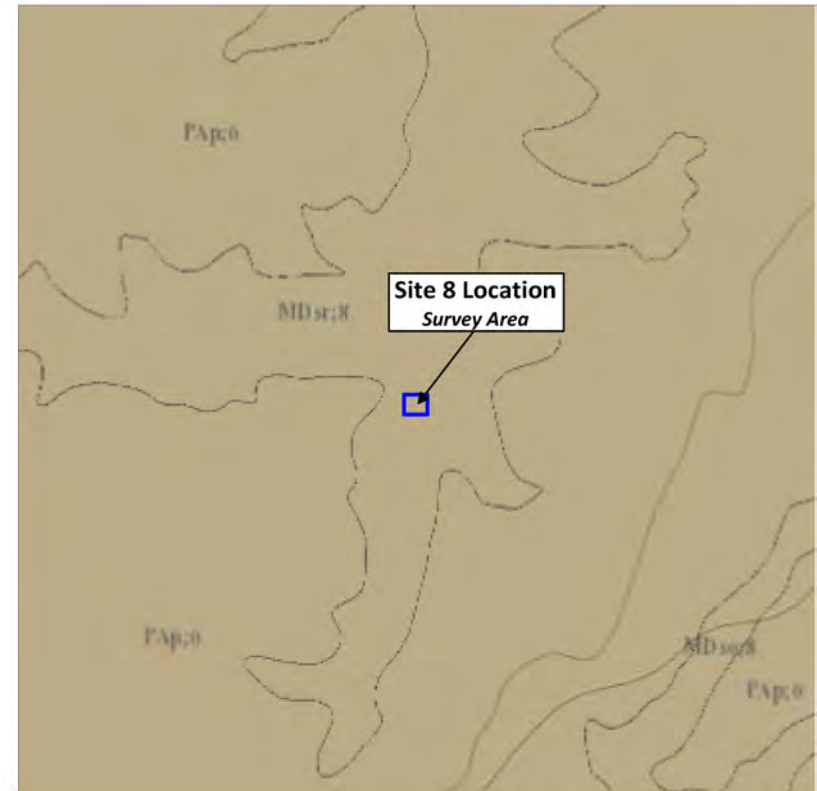
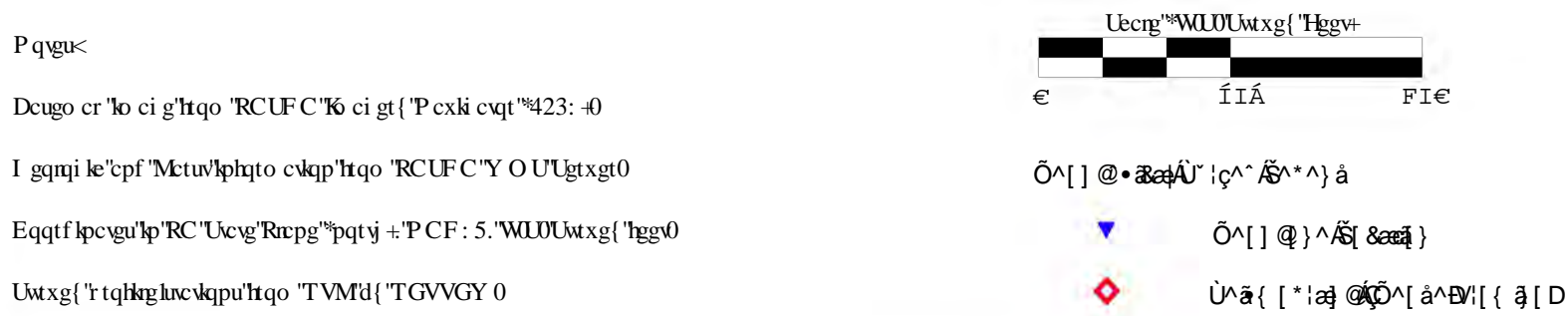
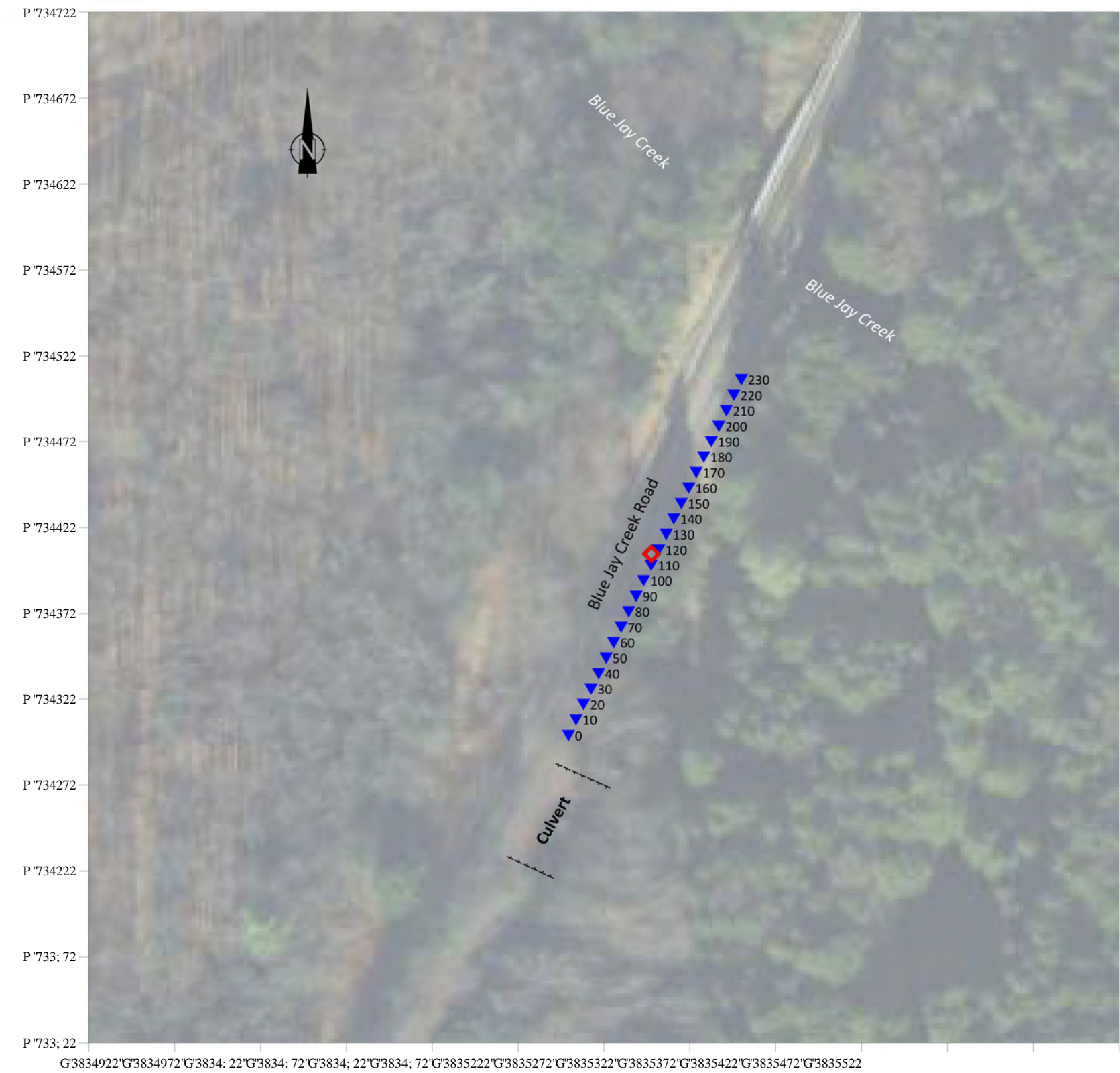
An Evaluation of Unconsolidated Overburden Thickness
PENNDOT Site 7

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FOREST COUNTY

TRONESTA, PA

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REVISION DATE: 11/12/2021
SCALE: Graphical
FIGURE NO. 7B



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REVISION DATE:	11/12/2021
SCALE:	Graphical
FIGURE NO.	8A

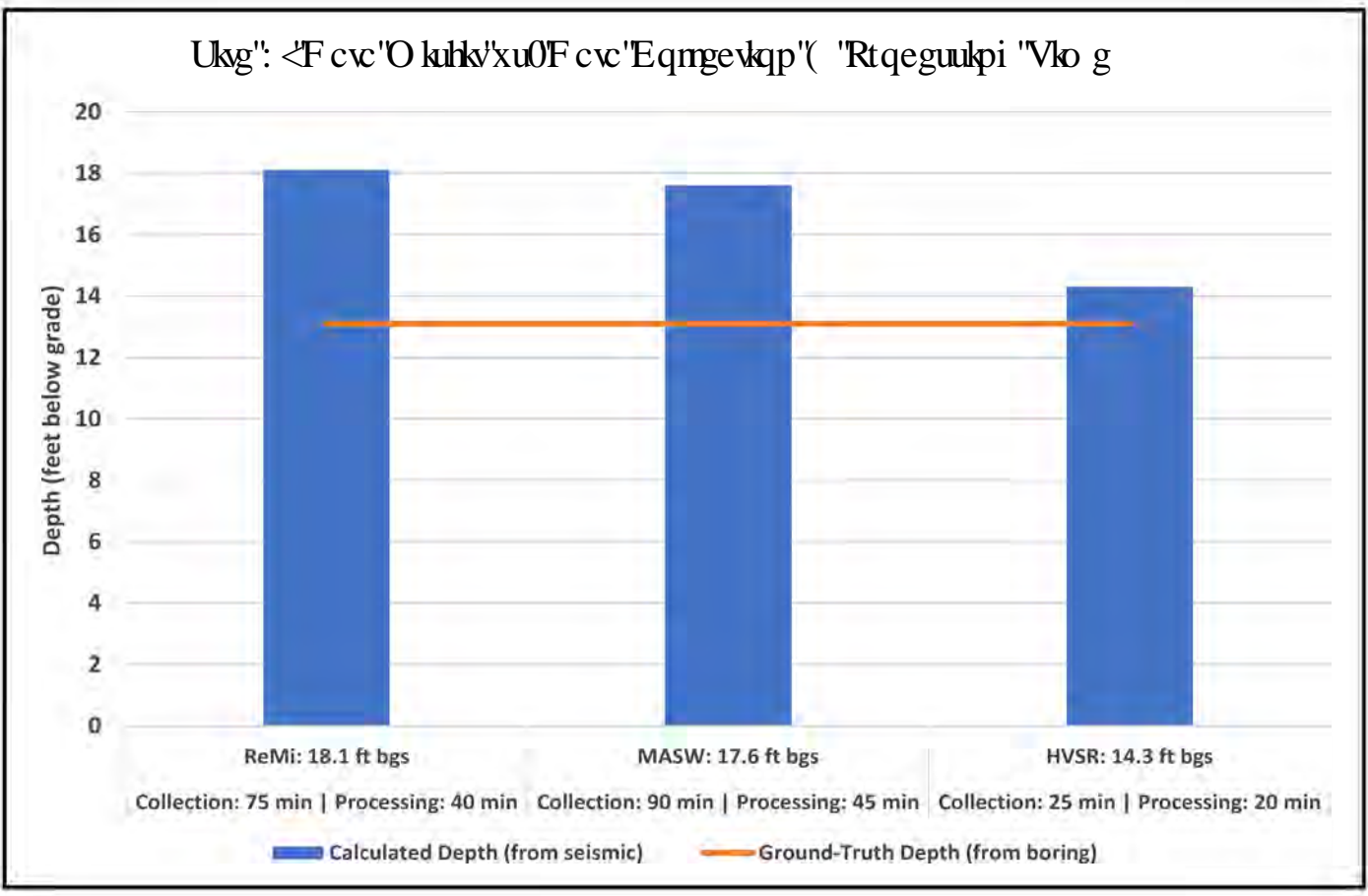
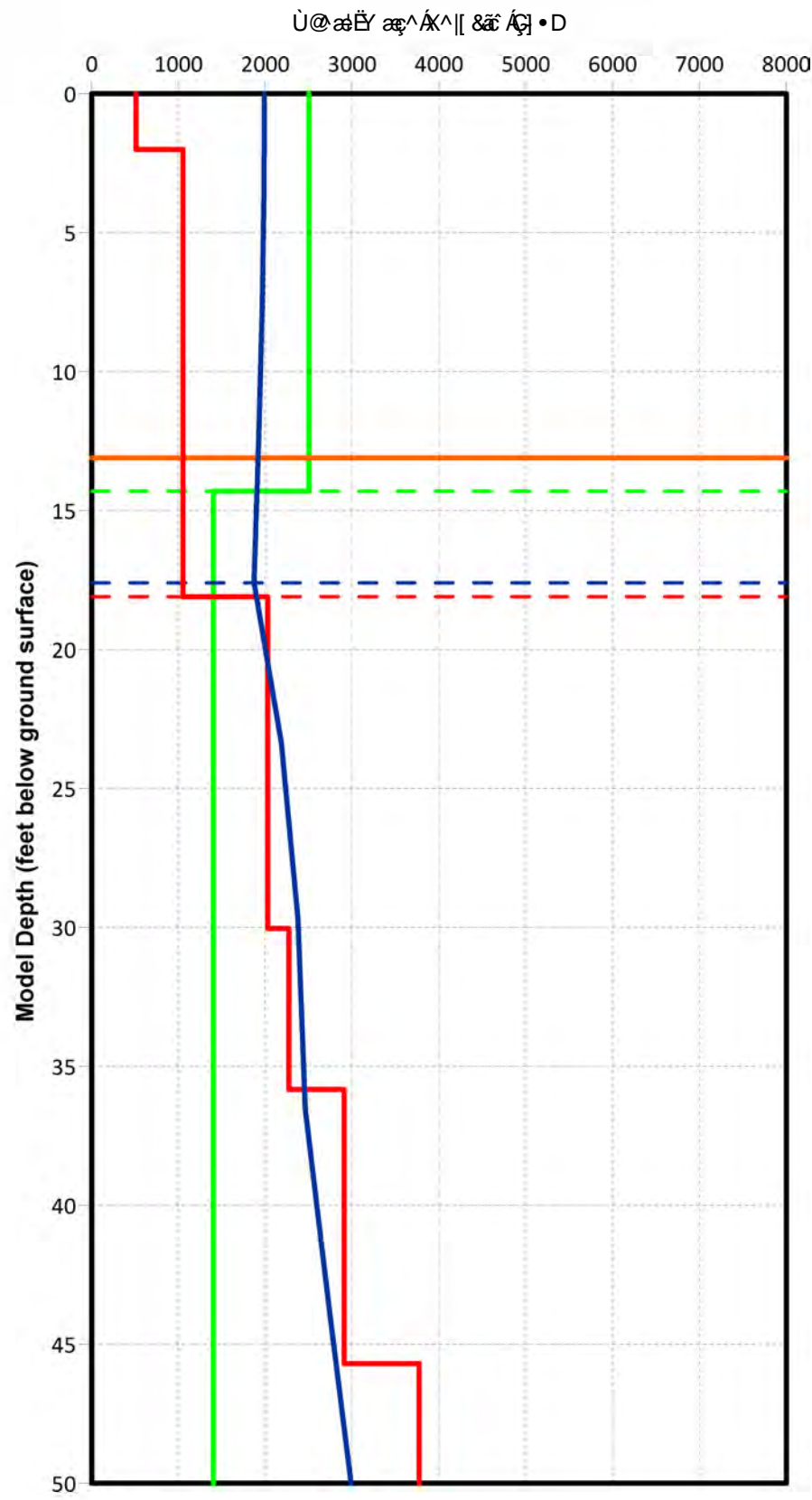
Figure 8A: Data Coverage and Geologic Setting Site 8

An Evaluation of Unconsolidated Overburden Thickness

PENNDOT Site 8

FOREST COUNTY

TIONESTA, PA



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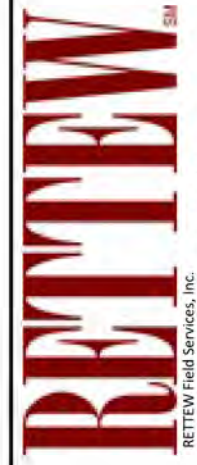
O CUY "c'p'f "T'g'O k'ug'k'uo l'e'f'c'v'f'it'q'o "I g'q'o g't'le'u'46/ej c'p'p'g'n' I g'q'f'g'y'k'j "607"J | "i g'q'r'j q'p'g'u'c'v'c'32/h'q'q'v'ur c'el'p'i 0

O CUY "y g'li'j v'g'f "c'x'g't'c'i g'f'ij g'et/y'c'x'g'x'g'm'ek'k'g'u"X'u+f'it'q'o " I g'q'o g't'le'u'U'g'k'u'k'o c'i g't'0T'g'O k'c'x'g't'c'i g'X'u'x'c'm'g'u'it'q'o "U'g'k'u" Q'r'v'T'g'O k'd{ "Q'r'v'o 0J X'U'T" c'x'g't'c'i g'X'u'f'it'q'o "I t'k'm'd{ "O'Q'J Q'0

Eq'm't'g'f "f'c'uj g'f "h'p'g'u'e'q't't'g'ur q'p'f "q'p'h'e't't'g'f "t'q'en'l'f g'r'v'j u" f'it'q'o "g'c'ej "v'r'g'q'h'f'u'w'x'g{0

Site 8B: Seismic Results Site 8

An Evaluation of Unconsolidated Overburden Thickness
PENNDOT Site 8



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TRONESTA, PA

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DRAWN BY:	CTM
REVISION DATE:	11/12/2021
SCALE:	Graphical
FIGURE NO.	8B



P qvgu<

Deugo cr 'lo ci g'ltqo "RCUFC"K ci gt{ "P cxli cvqt" *423: +0

I gqmji le"cpf "Mctuv'lpqto cvkqp'ltqo "RCUFC"Y O U'Ugtxgt0

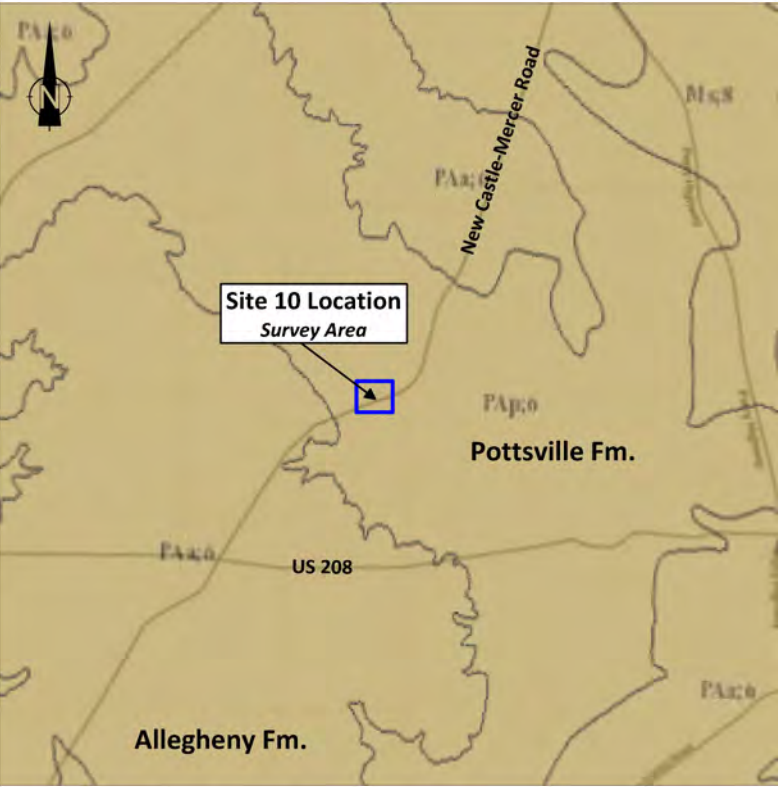
Eqqtf lpcvgu'lp "RC"Ucvg'Rncpg" *pqtvj + 'P CF: 5. "WLUUwtxg{ 'hggv0

Uwtxg{ 'r tqhrgulucvqpu'ltqo "hgrf"lwtxg{ "cpf" TVM'd{ "TGVVGY 0

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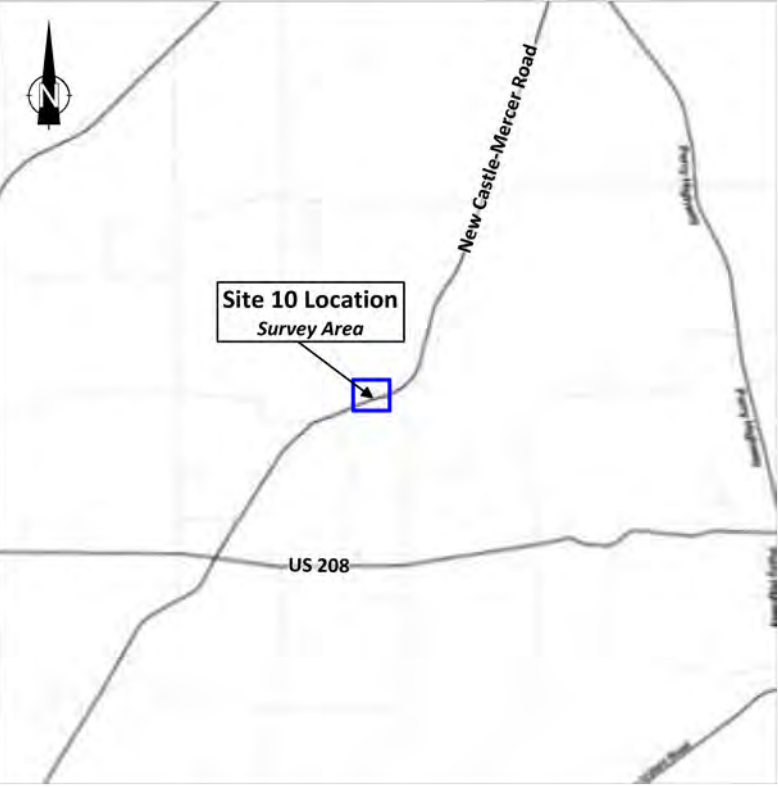


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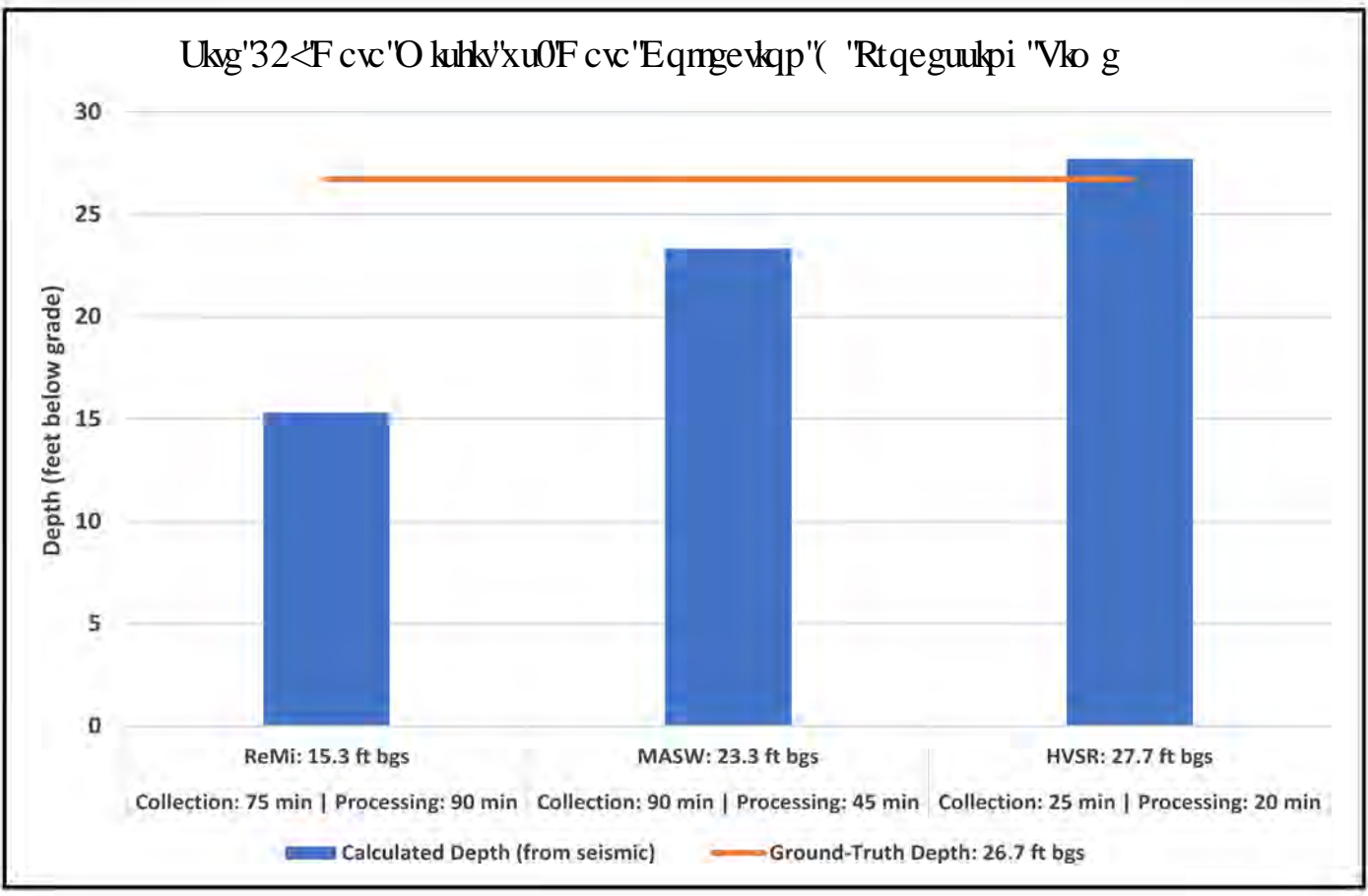
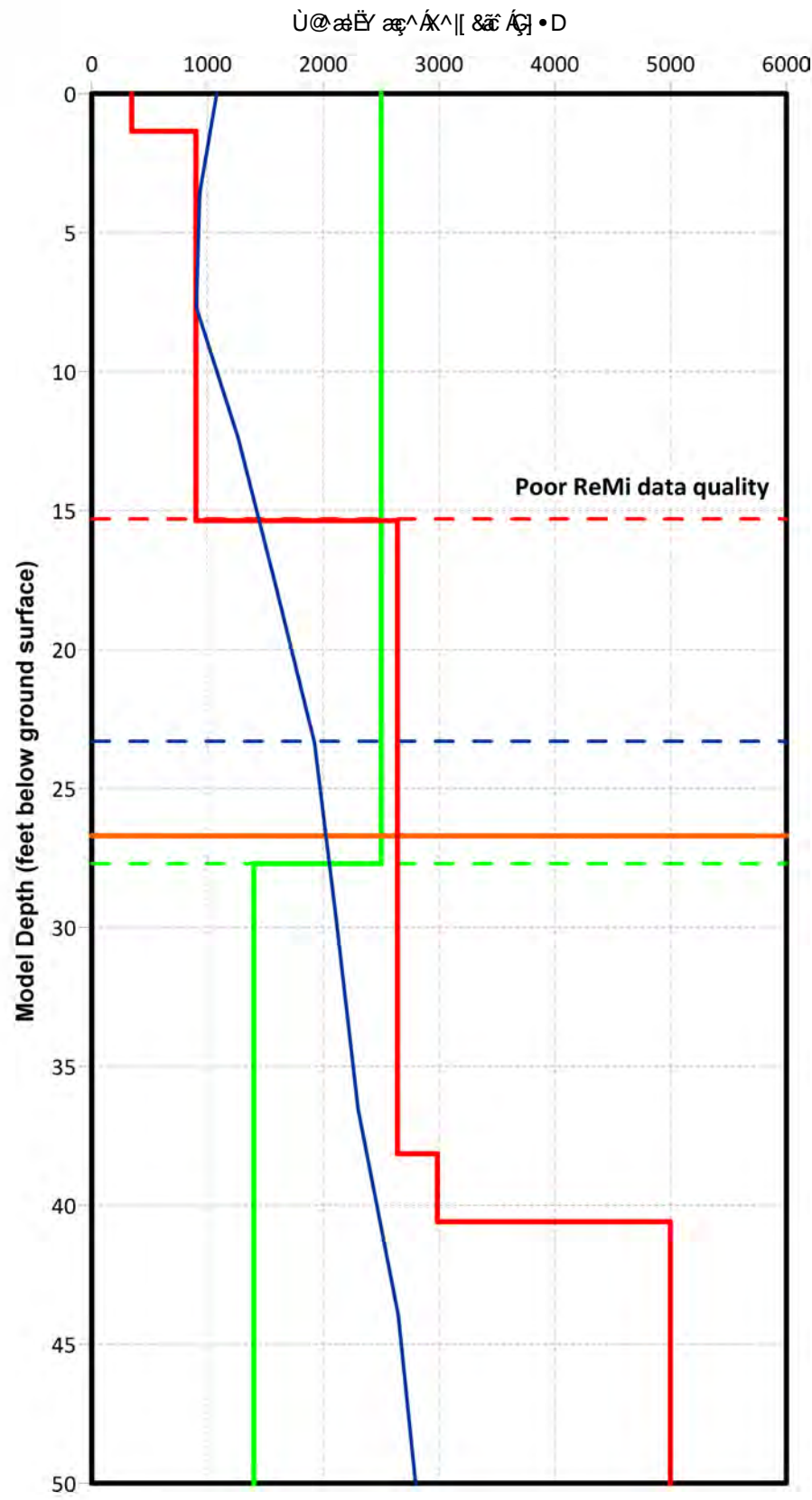
SURVEY DATE:	10/12/2021
REVIEW No.:	105082002
REVIEWED BY:	CHR/FKB
DRAWN BY:	CTM
REVISION DATE:	11/12/2021
SCALE:	Graphical
FIGURE NO.	10A

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Phone 1-800-738-8395

Figure 10A: Data Coverage and Geologic Setting Site 10

An Evaluation of Unconsolidated Overburden Thickness
PENNDOT Site 10



P qvq<

O CUY "cpf "TgO K'uguo le"f cæ"ltqo "I gqo gtleu"46/ej cppgrl
I gqf g'y kj "60"J | "i gqr j qpgu"cv'c"32/hqqv'ur celpi 0

O CUY "y gli j vgf "cxgtci g'uj gct/y cxg'xgmekkgu"*Xu+ltqo "
I gqo gtleu"Ugukú ci gt0TgO K'cxgtci g'Xu'xcmgv'ltqo "Ugku"
Qr vTgO K'd{ "Qr vO 0J XUT"cxgtci g'Xu+ltqo "I tlm'd{ "O QJ Q0

Eqmgtgf "f cuj gf "hpgu'eqttgur qpf "q"phgttgf "tqenlf gr vj u"
ltqo "gcej "v'r g'qh'wtxg{0

Figure 10B: Seismic Results Site 10

An Evaluation of Unconsolidated Overburden Thickness

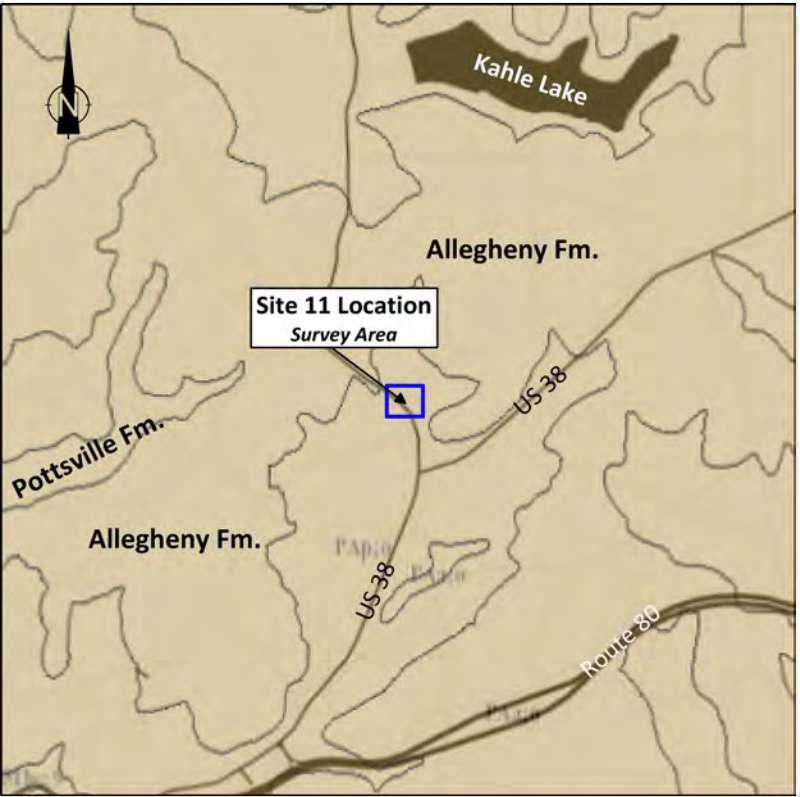
PENNDOT Site 10



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DRAWN BY:	CTM
REVISION DATE:	11/12/2021
SCALE:	Graphical
FIGURE NO.	10B



P qv<
Deugo cr 'lo ci g'ltqo 'RCUFC'K ci gt{ 'P exli cvqt''423: +0
I gmqi le'cpf 'Mctuv'lpqto cvkp'ltqo 'RCUFC'Y O U'Ugtxgt0
Eqqtflpcvgu'lp'RC'Ucvg'Rncpg''pqtvj + 'PCF: 5.'WLUUwtxg{ 'hgv0
Uwtxg{ 'r tqhrgulncvqpu'ltqo 'hgrf'lwtxg{ 'cpf'TVM'd{ 'TGVVGY 0



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DRAWN BY:	CTM
REVISION DATE:	11/12/2021
SCALE:	Graphical
FIGURE NO.	11A

RETTEWSM

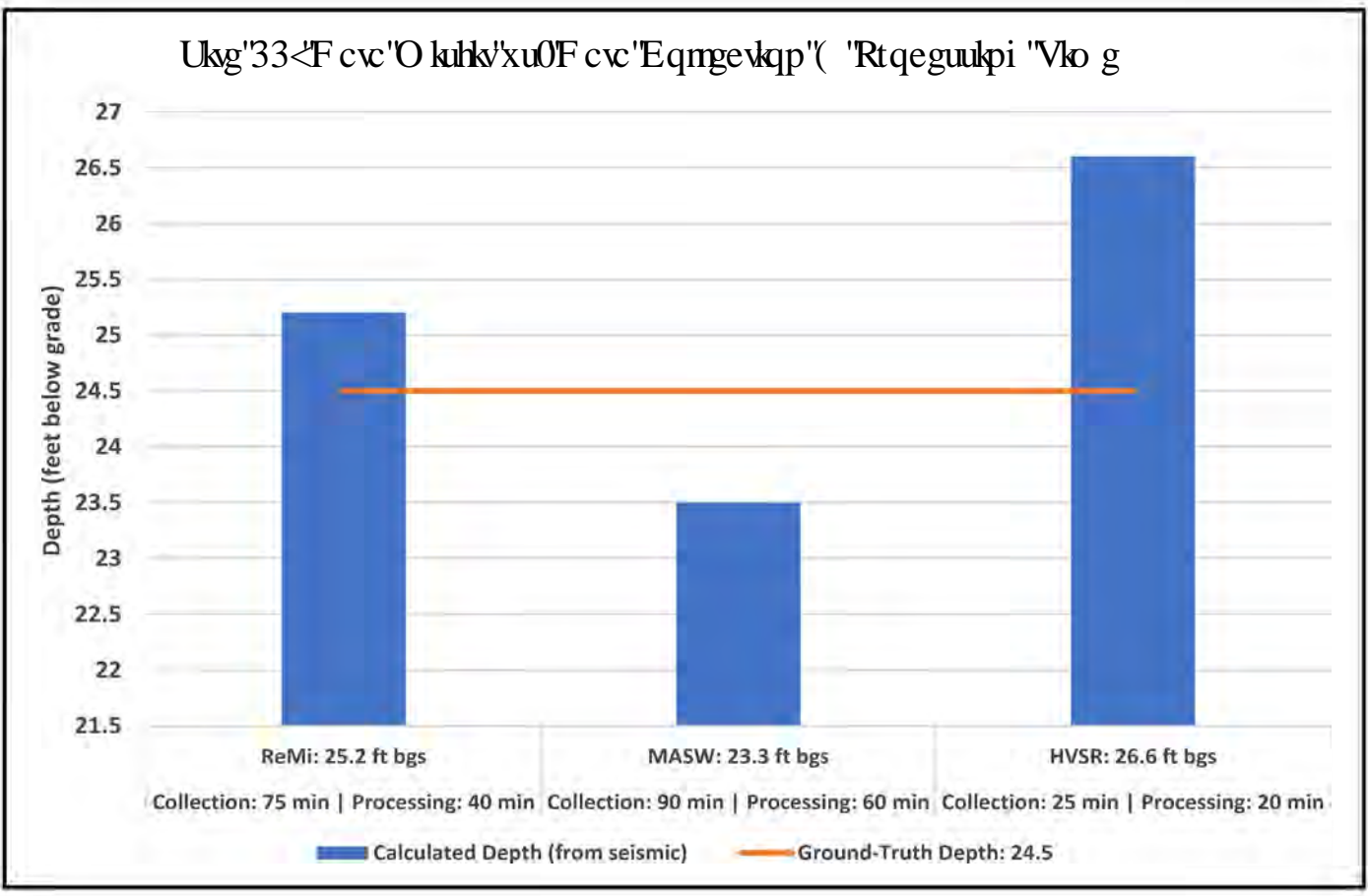
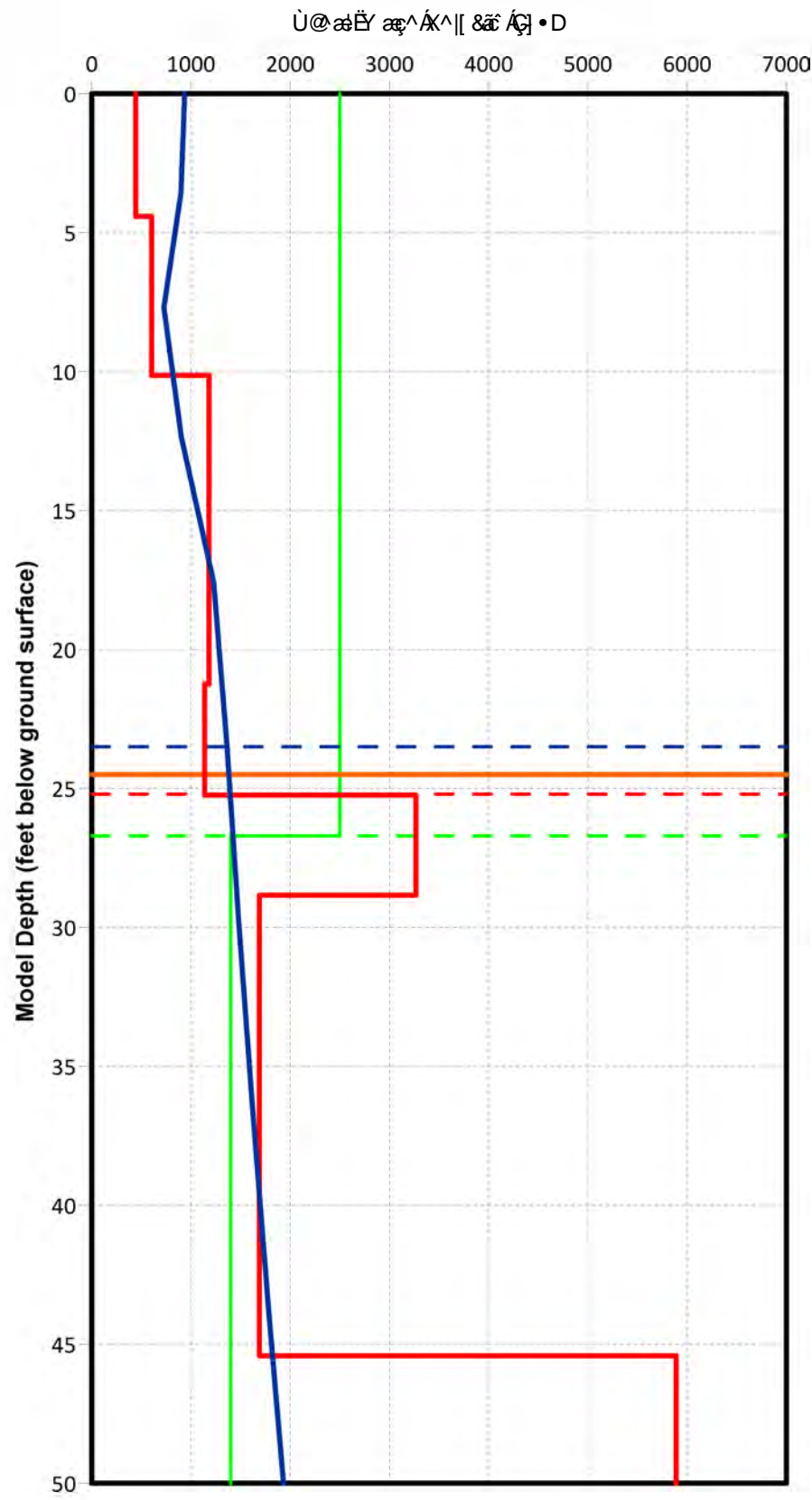
RETTEW Field Services, Inc.
3020 Columbia Avenue, Lancaster, PA 17603
Phone 1-800-788-8395

Figure 11A: Data Coverage and Geologic Setting Site 11

An Evaluation of Unconsolidated Overburden Thickness
PENNDOT Site 11

VENANGO COUNTY

OIL CITY, PA



Pqvuk<

O CUY "cpf "TgO k'ugkuo le"f cwc'htqo "I ggo gtleu"46/ej cppgn' I gqf g'y kj "607"J | "i gqr j qpgu'cv'c"32/hqqv'ur celpi 0

O CUY "y gli j vgf "cxgtci g'lj gct/y cxg'xgmekklgu"*Xu+htqo " I ggo gtleu"Ugku0 ci gt0TgO k'cxgtci g'Xu'xcnvgu'htqo "Ugku" Qr vTgO k'd{ "Qr v0 0J XUT"cxgtci g'Xu'htqo "I tkm'd{ "O QJ Q0

Eqmtgf "f cuj gf "hpgu'eqttgur ppf "vq"lphettgf "tqemlf gr vj u" htqo "gcej "Vr g'qh'wtxg{0

Figure 11B: Seismic Results Site 11

An Evaluation of Unconsolidated Overburden Thickness

PENNDOT Site 11

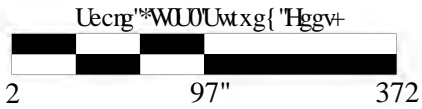


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SCALE:	Graphical
FIGURE NO.	11B

P"5; 4472
P"5; 4422
P"5; 4372
P"5; 4322
P"5; 4272
P"5; 4222
P"5; 3: 72
P"5; 3: 22
P"5; 3: 72
P"5; 3: 22



G'35; : 472"G'35; : 522 G'35; : 572"G'35; : 622"G'35; : 672"G'35; : 722"G'35; : 772"G'35; : 822"G'35; : 872"G'35; : 922"G'35; : 972



P qv<

Dcugo cr "lo ci g"tqo "RCUF C"K ci gt { "P exki cvqt"%423: +0

I gqrqi le"cpf "Mctuvlphqto cvkqp"tqo "RCUF C"Y O U"Ugtxgt0

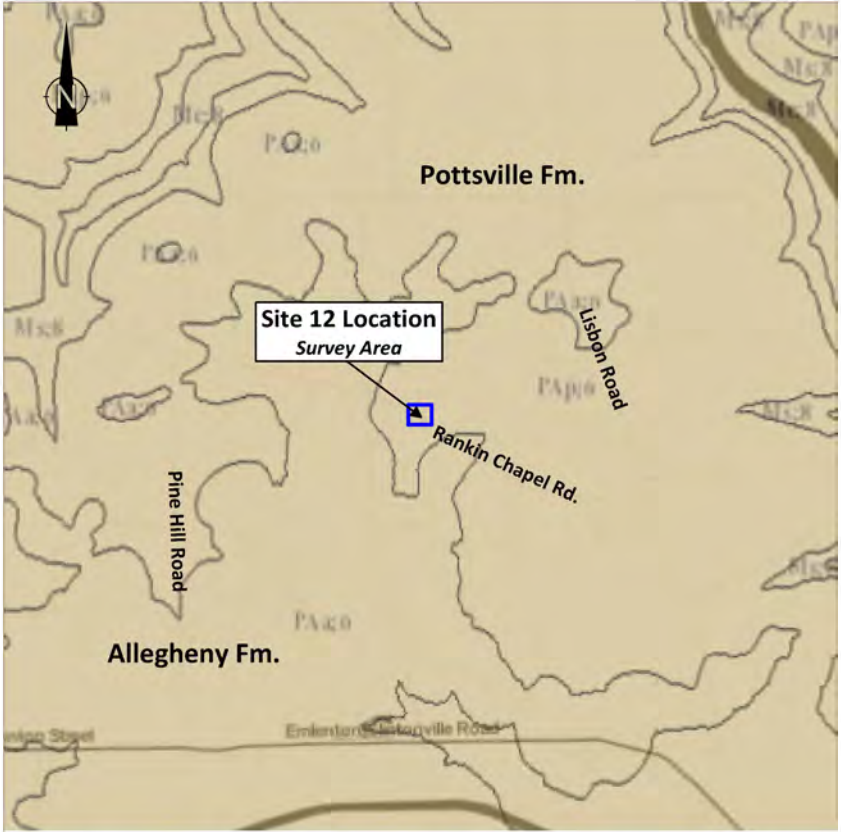
Eqqtf lpcvgu"lp"RC"Ucvg"Rrpg"*pqtj + "P CF : 5. "WUWUwtxg{ "hgv+

Uwtxg{ "rtqhlglucvqp"tqo "TVMd{ "TGVVGY 0

I gqrj {ulecnUwtxg{ "Ngi gpf

I gqrj qpg"Nqecvkp

Ugkuo qi tcrj "I gqf gIvtqo kpq+



I gqrqi le"Ugw<pi €Á I€€€€Á F€€€€
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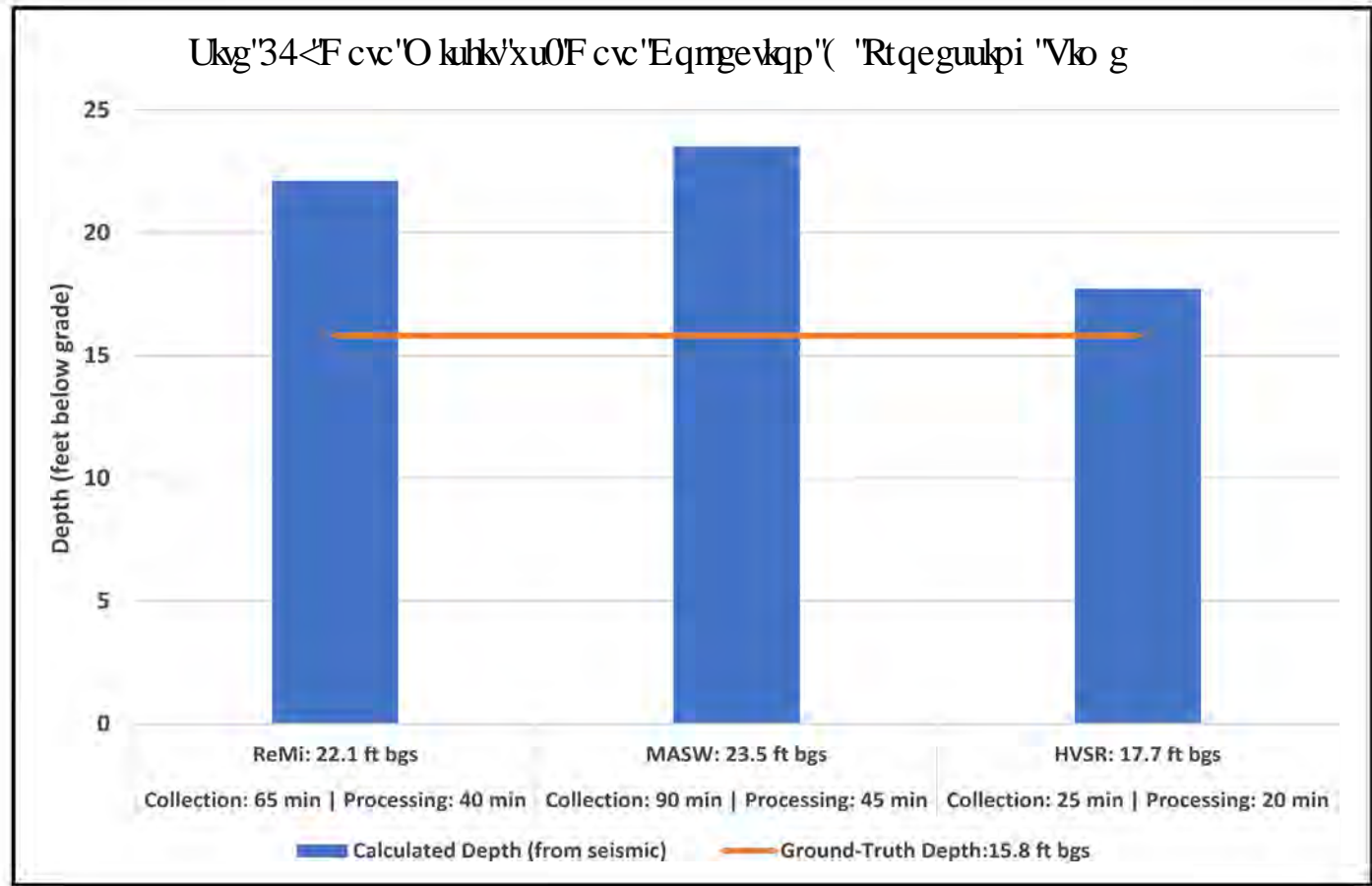
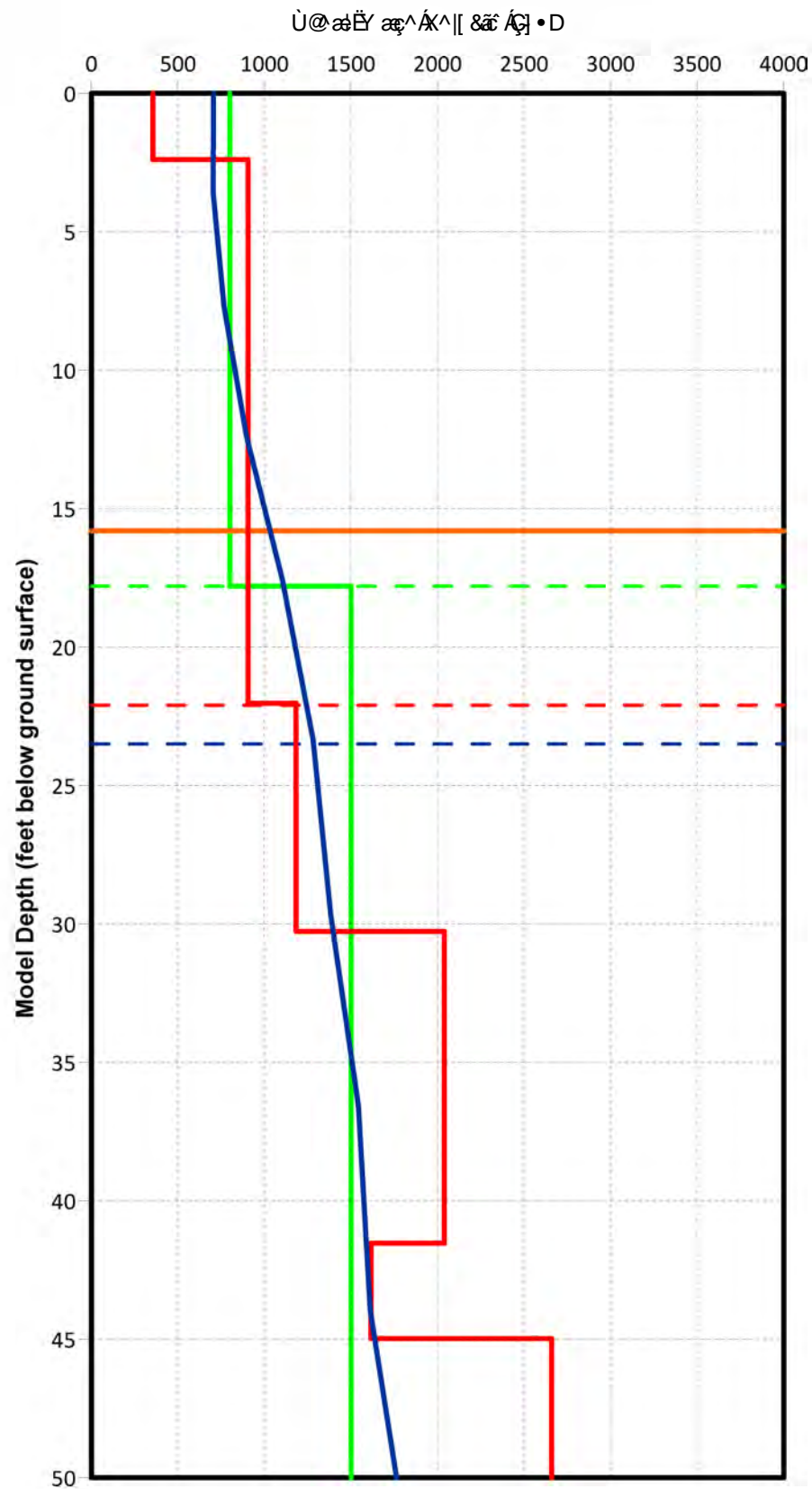
Ukg"Nqecvkp €Á I€€€€Á F€€€€
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SCALE:	Graphical
FIGURE NO.	12A

Figure 12A: Data Coverage and Geologic Setting Site 12

An Evaluation of Unconsolidated Overburden Thickness
PENNDOT Site12



P qvq<

O CUY "cpf "TgO kluguo le"f cwc"ltqo "I gqo gtkeu"46/ej cppgn"
I gqf g'y kj "60"J | "i gqrj qpqu'cv'c"32/hqq'ur celpi 0

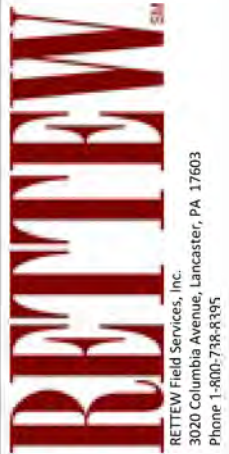
O CUY "y gli j vgf "cxgtci g'lj gct/y cxg'xgmekkgu"*Xu+ltqo "
I gqo gtkeu"Ugukó ci gt0TgO k'cxgtci g"Xu'xcn'gu'ltqo "Ugku"
Qr vTgO k'd{ "Qr vto 0J XUT"cxgtci g"Xu'ltqo "I tkm"d{ "O QJ QO

Eqmgtgf "f cuj gf "hpgu"eqttgur qpf "q'kphgtgf "tqenlf gr y u"
ltqo "gcej "v r g'qh'wtxg{0

Figure 12B: Seismic Results Site 12

An Evaluation of Unconsolidated Overburden Thickness

PENNDOT Site 12



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FIGURE NO.	12B



P qv u <

Deugo cr "lo ci g"ltqo "RCUFC"K ci gt{ "P cxli cvqt"%423: +0

I gqm i le"cpf "Mctuv'lp hqto c v k p'ltqo "RCUFC"Y O U Ugtxgt0

Eqqtf l p c v g u'lp "RC"Ucvg'Rncpg"%pqt v j + "P CF: 5."WLUUwtxg{ 'hggv0

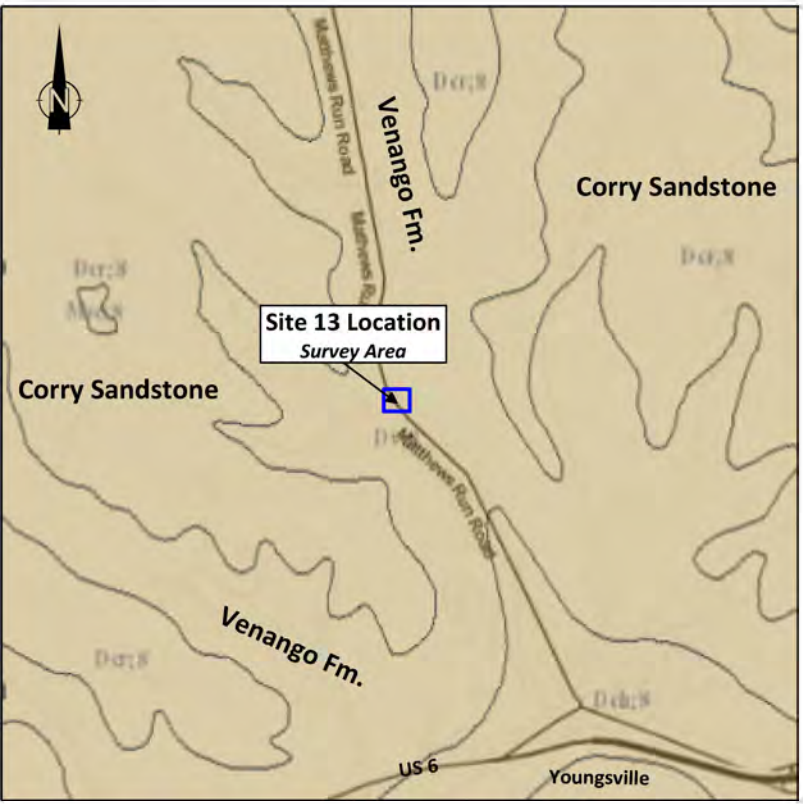
Uwtxg{ 'r tq hkgulncv k p u'ltqo "hgrf"bwtxg{ 'cpf "TVM'd{ "TGVVGY 0

I gqr j { ulecn'Uwtxg{ 'Ngi gpf

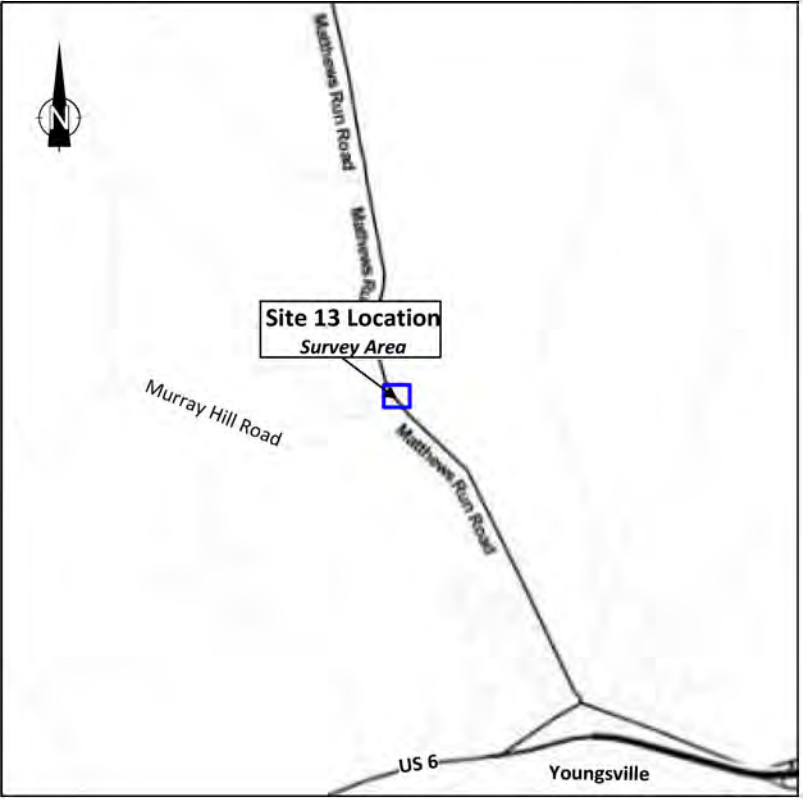


I gqr j qpg"Nqecv k p

Ugk uo qi tcr j "%I gqf g l Vtqo k p q +



I gqm i le"Ugwkpi "e_A I e e e_A F e e e e_A
Ô æ æ \



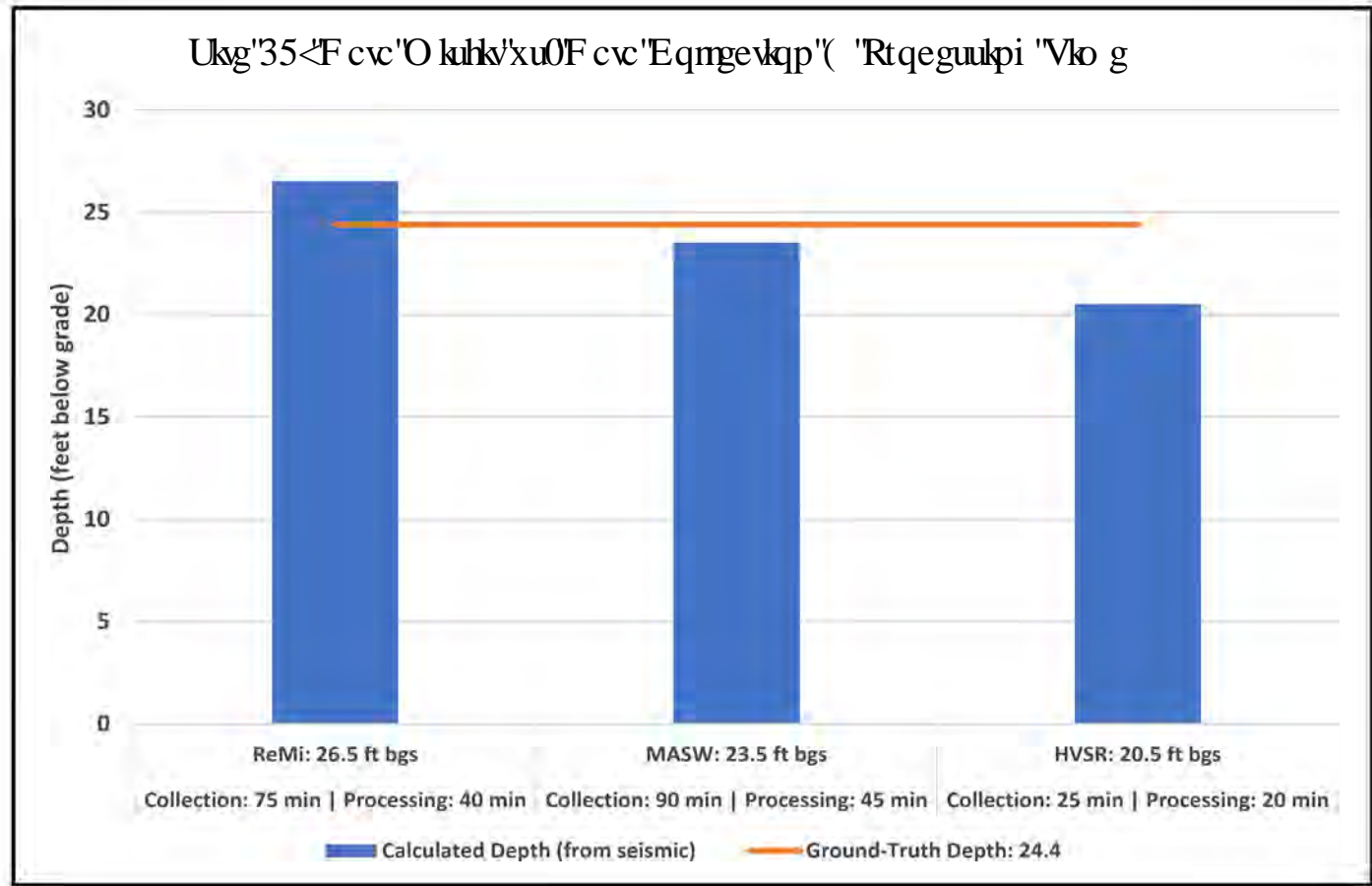
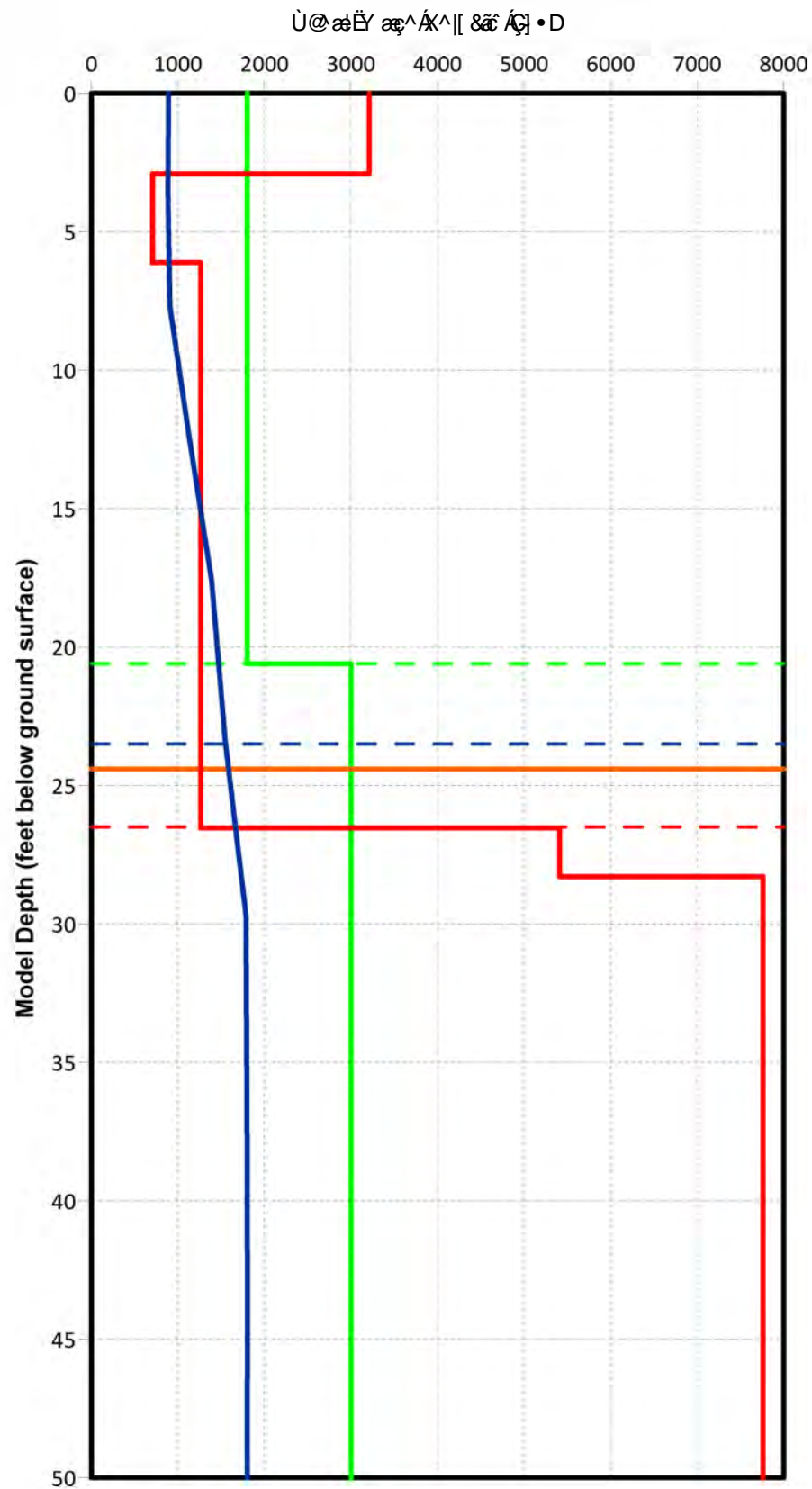
Ukg'Nqecv k p "e_A I e e e_A F e e e e_A
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SCALE:	Graphical
FIGURE NO.	13A

Figure 13A: Data Coverage and Geologic Setting Site 13

An Evaluation of Unconsolidated Overburden Thickness
PENNDOT Site 13



P qgu<

O CUY "cpf 'TgO k'ugkuo le'f'cvc'htqo 'I ggo gvt'ku'46/ej cppgn'
I gqf g'y kj "607"J | "i gqr j qpgu'cv'c'32/hqqv'ur cekpi 0

O CUY 'y gli j vgf "cxgtci g'lj gct/y cxg'xgmekkgu"Xu+htqo "
I ggo gvt'ku'UgkuK ci gt0TgO k'cxgtci g'Xu'xcnvgu'htqo 'Ugku"
Qr v'TgO k'd{ "Qr vo 0J XUT"cxgtci g'Xu'htqo 'I tkm'd{ "O QJ Q0

Eqmgtgf 'f'cuj gf 'hpgu'eqttgur ppf 'v'q'phgttgf 'tqenlf gr vj u"
htqo "gcej "v'g'qh'wtxg{0

Figure 13B: Seismic Results Site 13

An Evaluation of Unconsolidated Overburden Thickness
PENNDOT Site 13

RETTEW
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FIGURE NO. 13B

WARREN COUNTY

WARREN, PA



P qv<

Deugo cr 'lo ci g'ltqo 'RCUFC'K ci gt{ 'P cxli cvqt'423: +0

I gmqi le'cpf 'Mctuv'lpqto cvkp'ltqo 'RCUFC'Y O U'Ugtxgt0

Eqqtflpcvgu'lp'RC'Ucvg'Rrcpg'pqtvj + 'P CF: 5.'WLUUwtxg{ 'hgv0

Uwtxg{ 'r tqhrgulucvqpu'ltqo 'hgrf'lwtxg{ 'cpf' TVM'd{ 'TGVVGY 0

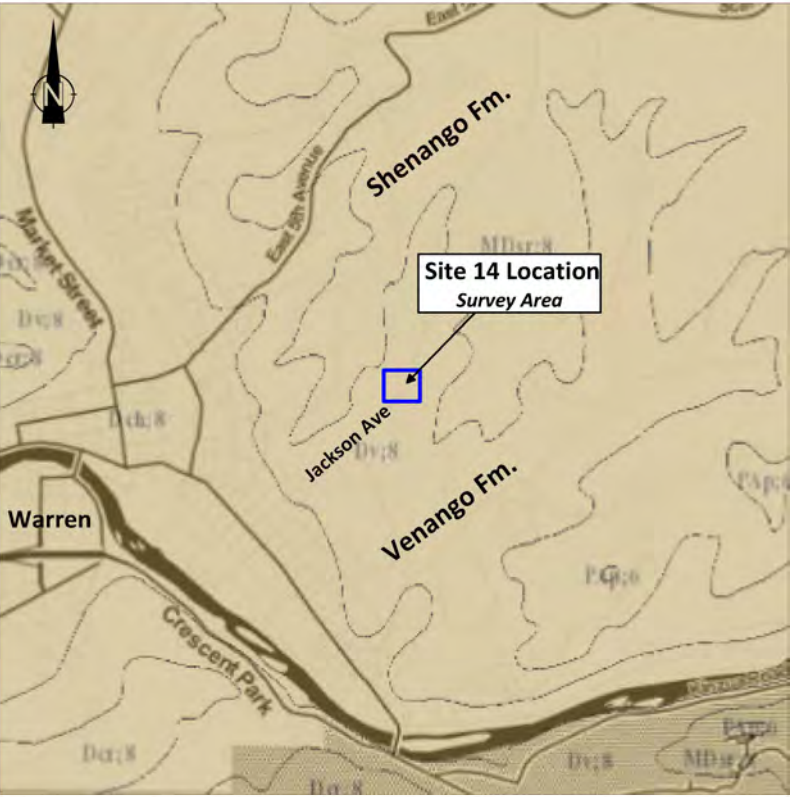
Ucrg'WLUUwtxg{ 'hgv+

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▼ Ô^[] @} ^S{ &æq }

◆ Û^ã{ [*!æ @Q^[â^D][{ â [D



I gmqi le'Ugwki "e_A

1000' 0' 0'

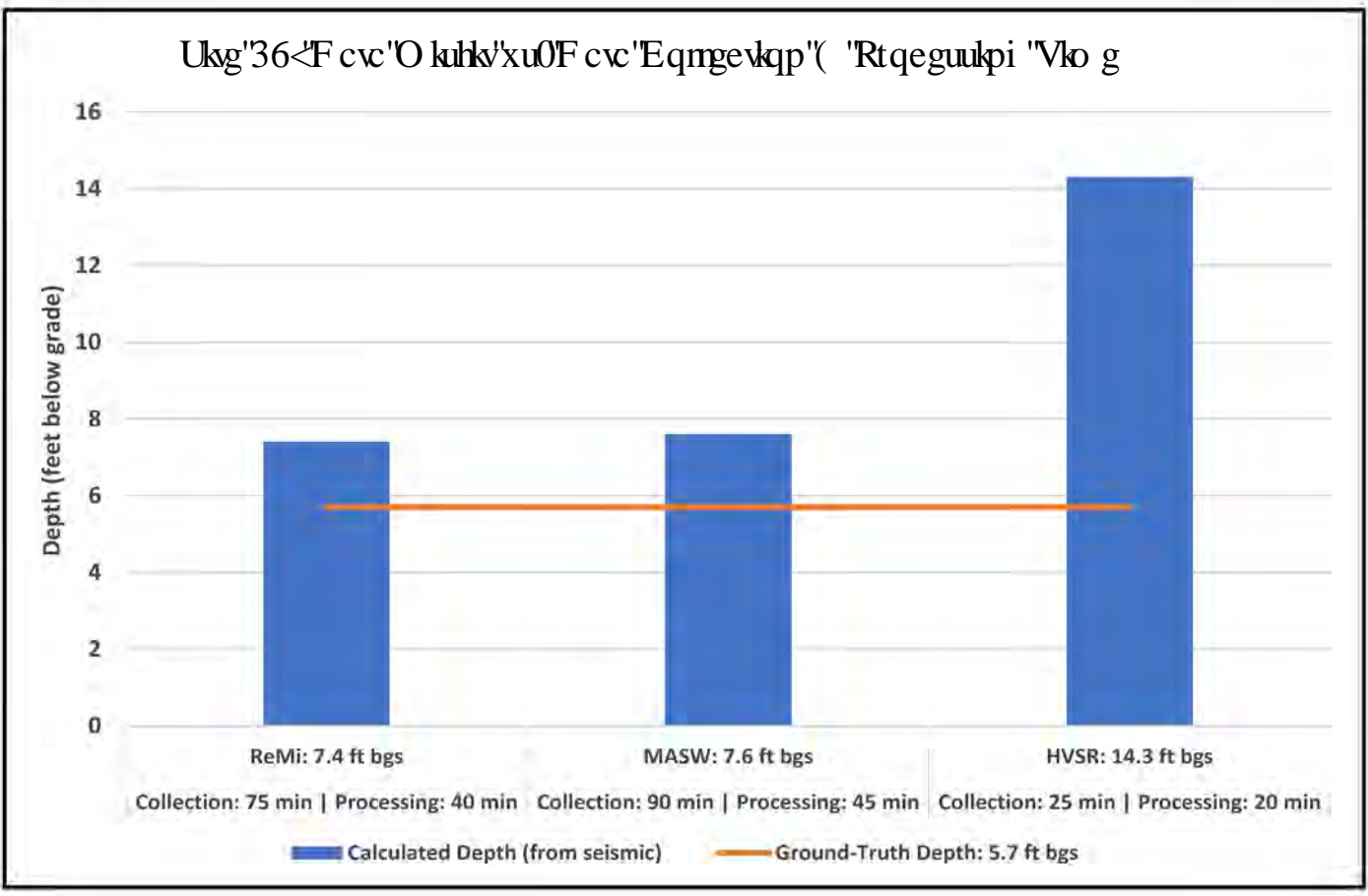
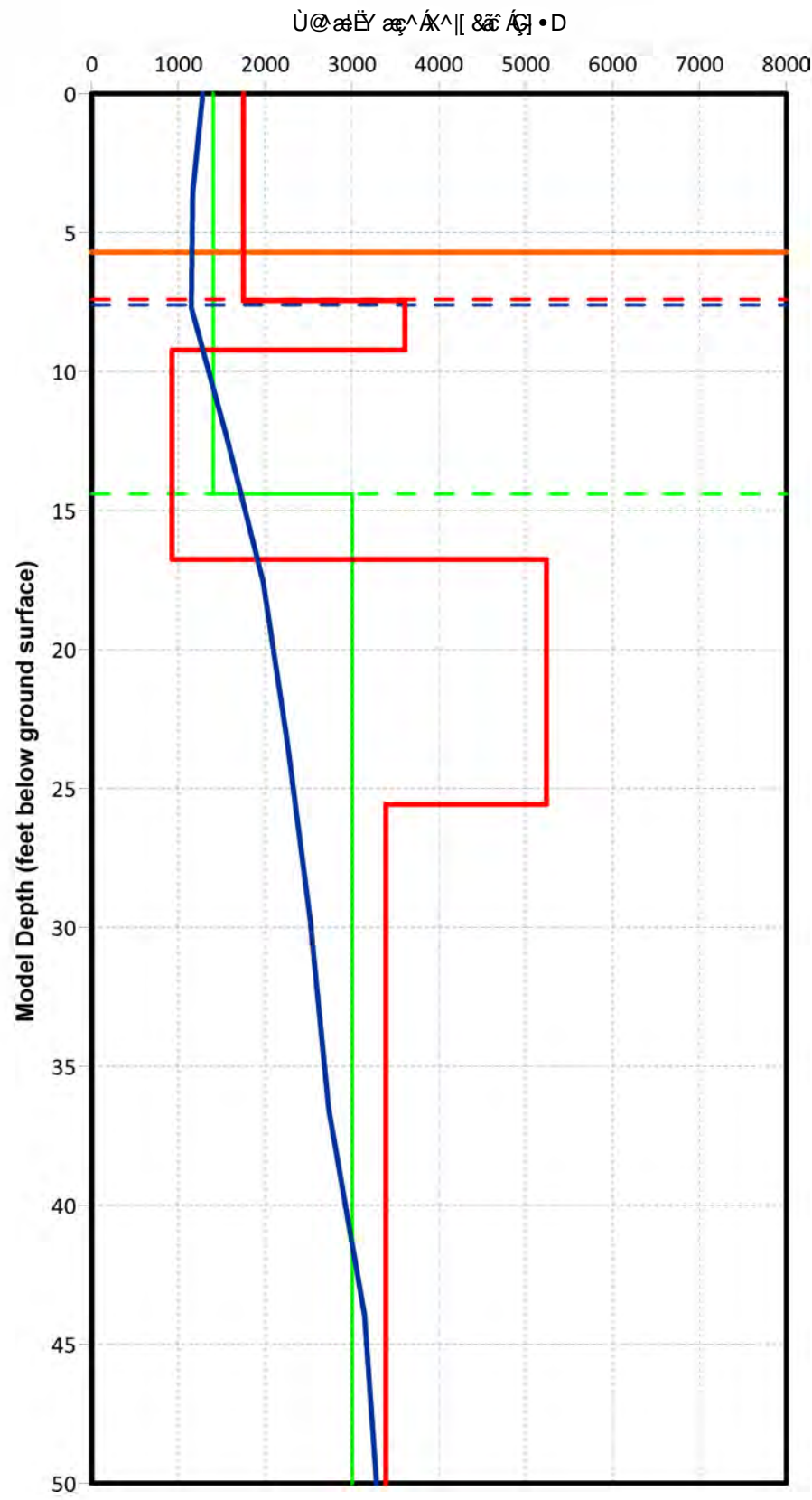
0' 0' 0'



Ukg'Nqecvqp"e_A

1000' 0' 0'

0' 0' 0'



P qvku<

O CUY "cpf "TgO K'ugkuo le"fcv"ltqo "I ggo gvtkeu"46/ej cppgn" I gqf g'y kj "60"J | "i gqr j qpgu"cv"32/hqqv'ur celpi 0

O CUY "y gli j vgf "cxgtci g'uj gct/y cxg"xgmekkgu"*Xu+"ltqo " I ggo gvtkeu"Ugku6 ci gt0TgO K'cxgtci g"Xu'xcmgv"ltqo "Ugku" Qr vTgO Kd{ "Qr vO 0J XUT"cxgtci g"Xu"ltqo "I tlm"d{ "O QJ Q0

Eqmrtgf "fcuj gf "hpgu"eqttgur qpf "vq"lphgttgf "tqemlf gr vj u" ltqo "gcej "v'r g'qh'wtxg{0

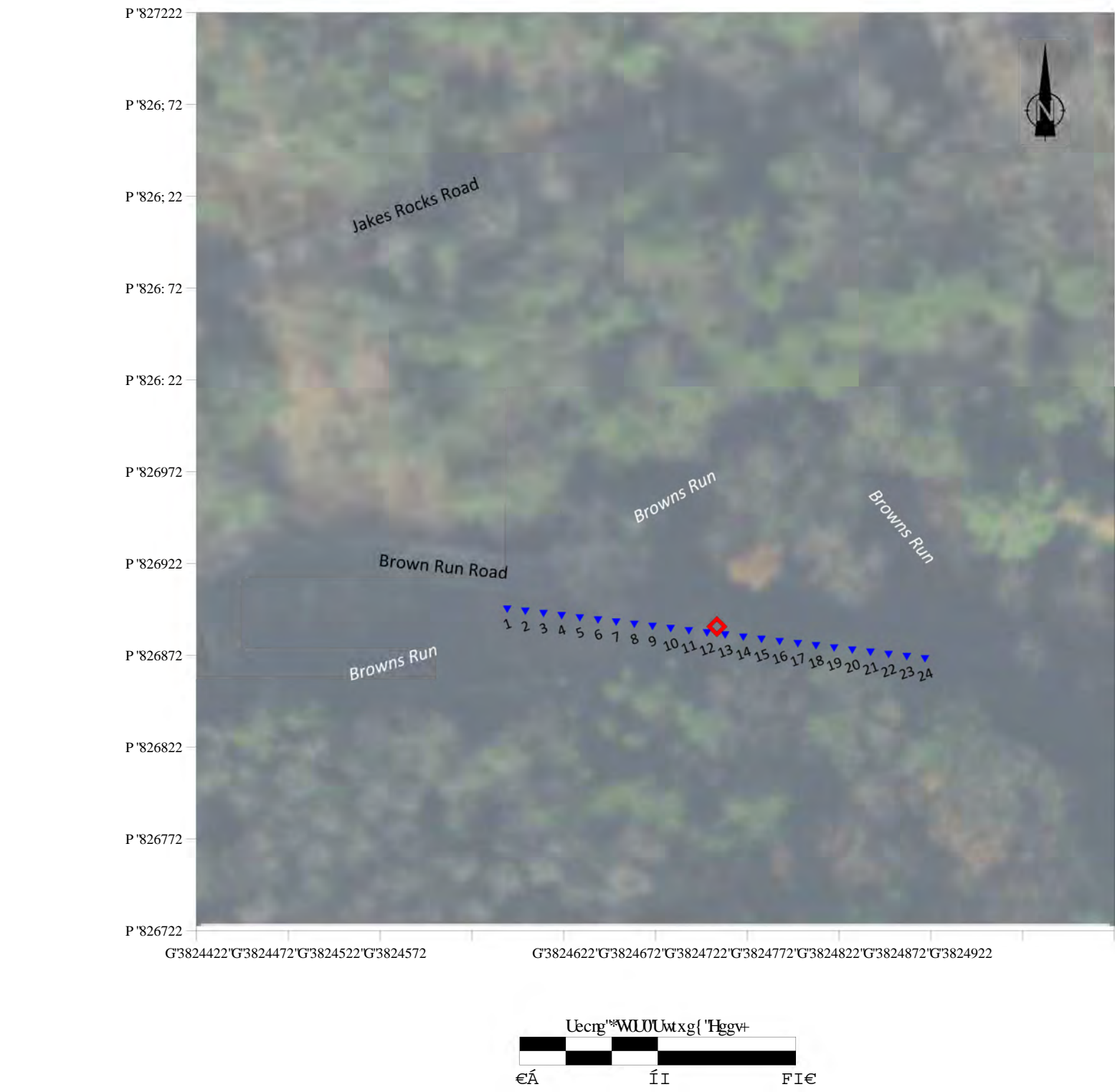
Figure 14B: Seismic Results Site 14

An Evaluation of Unconsolidated Overburden Thickness

PENNDOT Site 14



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FIGURE NO.	14B



P qv<

Deugo cr 'lo ci g'ltqo 'RCUFC'K ci gt{ 'P cxli cvqt''423: +0

I gmqi le'cpf 'Mctuv'lpqto cvkp'ltqo 'RCUFC'Y O U'Ugtxgt0

Eqqtflpcvgu'lp'RC'Ucvg'Rncpg''pqtj + 'P CF: 5.'WLOUwtxg{ 'hgv0

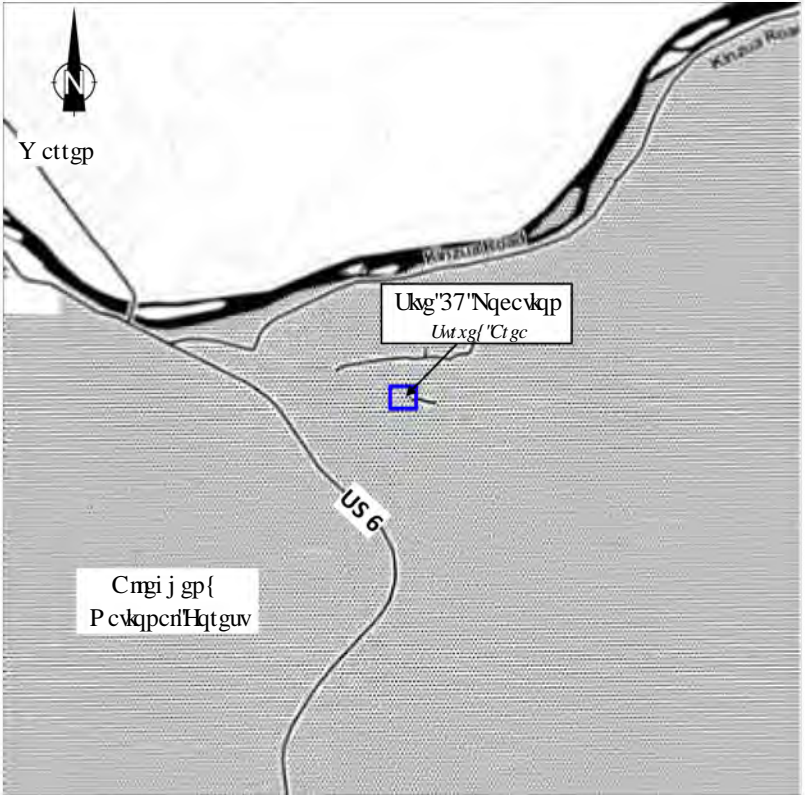
Uwtxg{ 'rtqlhglncvqpu'ltqo 'TVM'd{ 'TGVVGY 0

Legend:

- ▼
- ◆



I gmqi le'Ugwkipi



Ukg'Nqecvkqp

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SCALE:	Graphical
FIGURE NO.	15A

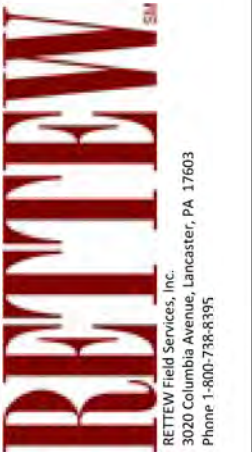


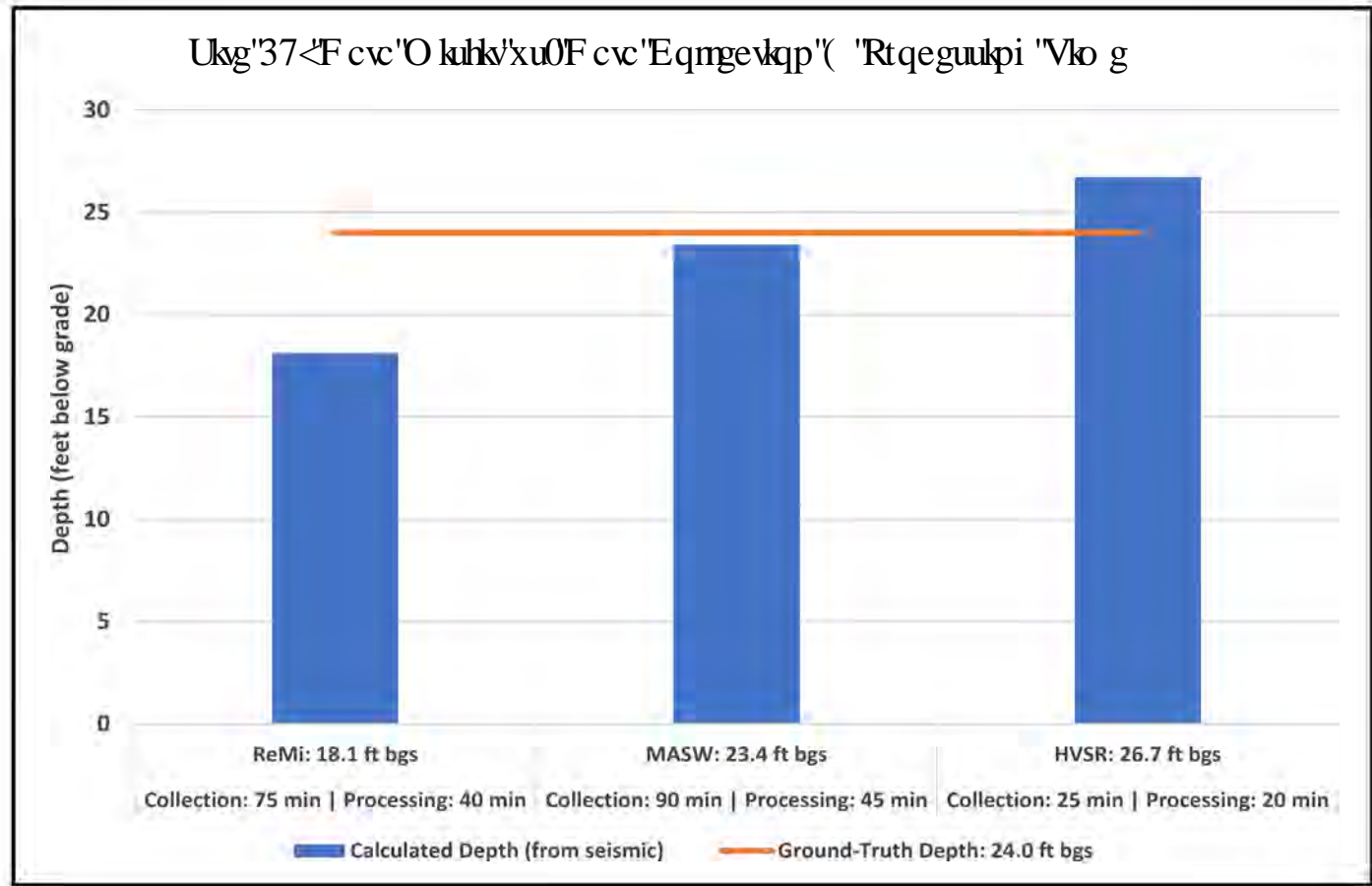
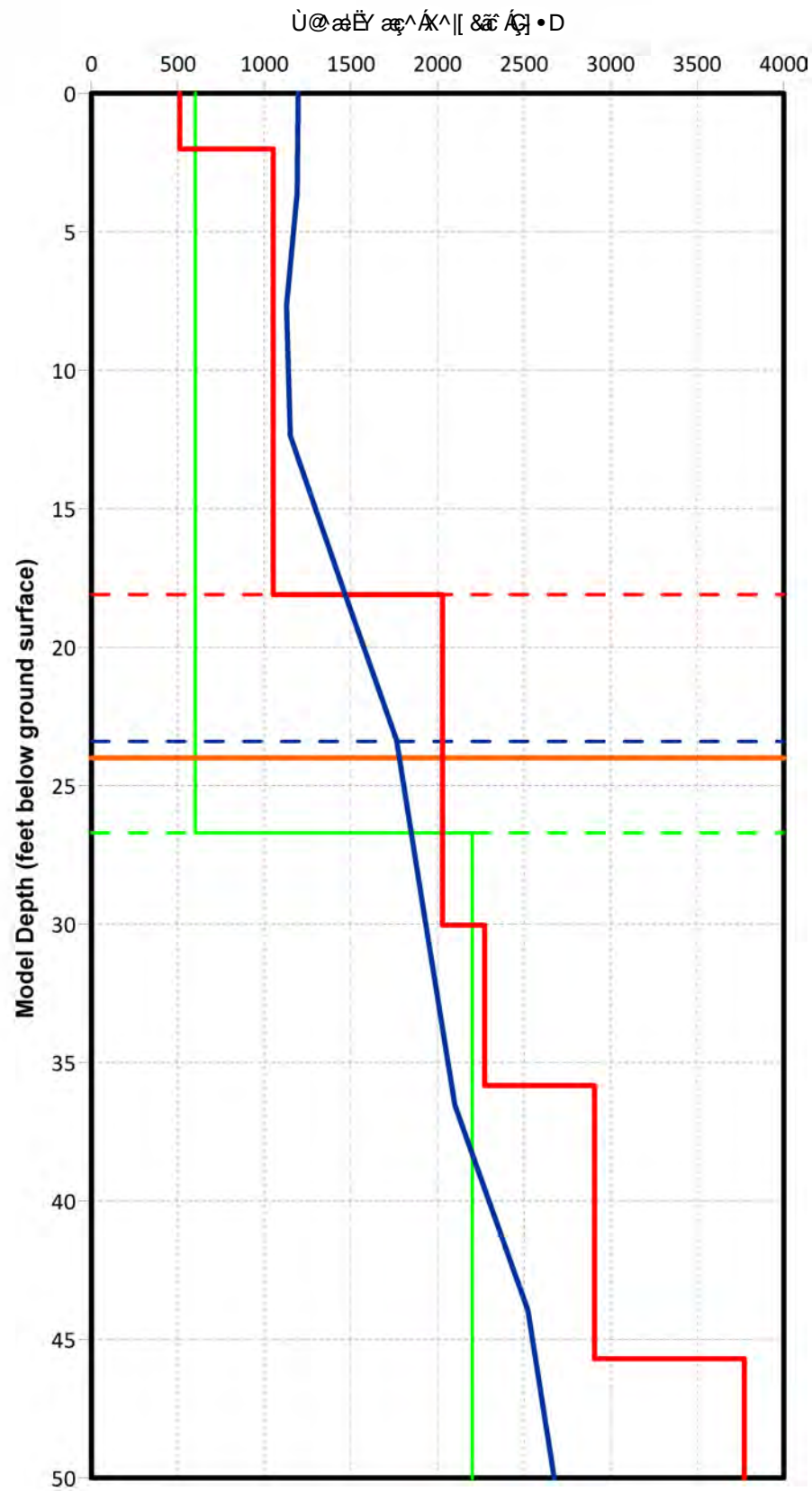
Figure 15A: Data Coverage and Geologic Setting Site 15

An Evaluation of Unconsolidated Overburden Thickness

PENNDOT Site15

WARREN COUNTY

WARREN, PA



Pqgu<

OCUY "cpf" TgO K'uguo le"fcw"ltqo "I gqo gtleu"46/ej cppgn" I gqf g'y kj "60"J | "i gqr j qpgu"cv"32/hqqv'ur celpi 0

OCUY "y gli j vgf "cxgtci g'lj gct/y cxg"xgmekkgu"Xu+ltqo " I gqo gtleu"Ugku" ci gt0TgO K'cxgtci g"Xu"xcmgv"ltqo "Ugku" QrvTgO K'd{ "Qr wo 0J XUT"cxgtci g"Xu"ltqo "I tkm"d{ "O QJ Q0

Eqmtgf "fcuj gf "hpgu"eqttgur qpf "q"lphgttgf "tqemif gr yj u" ltqo "gcej "v'r g'qh'wtxg{0

Figure 15B: Seismic Results Site 15

An Evaluation of Unconsolidated Overburden Thickness

PENNDOT Site 15



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FIGURE NO.	15B