EVALUASI TITIK KONTROL TINGGI UNIVERSITAS NEGERI SEMARANG DENGAN METODE PENGUKURAN KERANGKA DASAR VERTIKAL *BENCH MARK* (BM)

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***Abstract**: In 2009, State University of Semarang (UNNES) had engaged in the measurement of the Framework for the Horizontal and Vertical Basic Framework using Global Positioning Systems (GPS) geodetic type and installation of two bench mark (BM), however the height of its development (Z) in a region on the surface of the earth always changing and growing discourse according to some, especially for the city of Semarang itself reportedly decreased ± 5 cm from the average sea level (MSL) each year. What about the height of Campus UNNES have now?, In this study need to be investigated how much elevation change from a position (Unnes campus) in 2010. Measurement of vertical control framework BM Unnes tied to the High Point Geodesy (TTG) with a height of 221 004 449 number MSL in the area "Ada Supermarket" Banyumanik. Evaluation results of GPS measurements with the High Point of the ellipsoid existing high molecular weight 223 147 ± 02 UNNES the MSL and after going through the process of measurement data processing terrestrial high point for BM 02 219 237 ± Unnes is MSL, so that we find the comparison between BM 02 Unnes ellipsoid point with results measurement*

***Keywords**: control points, the basic framework of vertical, bench mark*

PENDAHULUAN

Latar Belakang

enDr T 922.T v SNksaSMhaT gkmksST pk(nsn mTEvgg) pGTUk,nDT(k,nirin TikmSnUn T Ik mrirsn T5ksn minTHnansTozsSVz Un,T4n T 5ksn minTHnansTPksU$n,T4k mn T(k mmr nin T *Global Positioning System*aTEd cpGUSkTd kz4kU$T 4n TIk(nan mn T9T:k BDT(nsiTEMy GTaksUnT.T InUziT Ik z,z mFT 4SUk(InUn T Uksak:nsT 4ST in(IraTvgg) pTpkinsn TZn mT4$SnUn TIn4nT unsSmT5z Usz,Tg naSz n,TTRI H) T6TMhizarsUn n,FT akDSmmnTMy TZn mTUksak:nsT4STv kaTn4n,nDTMy T Rs4kT66T4k mn TikUk,SSh TLTXT((T4n T4$kUnDrST (k,n,rST:kansn Tizzs4SnUTvey TEYFT/ GT4n T ikU$mmSh T k,,$azS4T EwGST pk4n min T r UiT Ik mrirsn T4kUn,STUzIzmsnGST(k mmr nin TezUn,T pUnUSz FTannUSSST n4nTUnDnI Tk mz,nDn 8TTT

gn(r T In4nT Iksik(:n mn ZnT ikU$mmSh TEwGT4STarnUT- ShZnDT4$ks(rinn T :r(ST ak,n,rT :ksr:nD±r:nDT 4n T (k rsrUT :k:ksnInT-nBn nTZn mT:ksik(:n mFTiDraraT r UiT-ShZnDTizUnTak(nsn mTak 4SST4$n:nsin T (k mn,n(STIk rsr n TLT0TB(T4nsSTsnUn±snUnT (rinT nST ,nrUT Eyp?GT akUSnIT UnDr Zn8T Mnmm$n nT4k mn TikU$mmSh T5n(IraTvgg) pT pkinsn T "FT nUnaT 4nansT Uksak:rUT (ninT ck mrirsn T5z Usz,T 5kU$mmSh T My T v kaT DnsraT4Shirin Tr UiT4nInUT(k mkUnDrSTIzaSaST U$mmSTMy Tv kaTannUSS$

Mks4nansin TS4k USSSnaSTIks(nan,nDn T Zn mTn4nTaksUnTr UiT(k(Iksz,kDTmn(:nsn T 4n Tar:aUn aSTZn mTFk,naTUk Un mTsrn mT,SmirIT aU4ST 4n T ik4n,n(n T Ik(:nDnan FT (ninT Ik k,SSh T SST 4SS2Brain T In4nT :nmm$n nT (k 4nInUn TanUrTikU$mmSh Tn:az,rUTarnUrTUSSST My T 4n,n(T Dn,T SST My T Zn mT Uksak:nsT 4ST ,Smir mn T v SNksaSMhaT gkmksST pk(nsn mT Evgg) pGFT (k,n,rST Ik mrirsn T UkskaUSaT ,n mar mT4ShIn mn 8T

Ir(ran T(nan,nDT4n,n(TIk k,SSh TSST n4n,nDTak:ksnInT:kansTIksr:nDn TikU$mmSh T 4nsSTarnUrTIzaSaSTEn(IraTv kaGTIn4nTUnDr T 92A28T erfrn T 4nsST aU4ST SST n4n,nDT r UiT (k mkUnDrSTIzaSaSTNksU$n,T4nsSTMk BDTy nsiTZn mT Uksak:nsT 4ST ,Smir mn T 5n(IraT vgg) pT pkinsn TannUT SSFT(ninTck mrirsn T5z Usz,T ikU$mmSh TiksnminT4nansTNksU$n,T4Shirin T 4k mn T (k mnBrT ikIn4nT :S4n mT srfrin T ikU$mmSh TUksUk UrTEeSSSTeSmmSEd kz4kaSSST

ck k,SSh T SST 4$Dnsnlin T 4nInUT (k(:ks$n TanUrT ShSTkU$mmSh TarnUrTUSSSTEMy GT Zn mTUksak:nsT4ST,Smir mn Tv SNksaSMhaTgkmksST pk(nsn mTEvgg) pGTakDSmmnT4nUnT Uksak:rUT 4nInUT 4$n GnUn T 4n T(k fn4ST an,nDanUrT GnizsTIk mn(:Sh TikIrUran T4n,n(Tsn minT Iksk Bn nn Tk(:n mr n Tak,n frUZn8T

Pengukuran Kerangka Dasar Vertikal

5ksn minT 4nansT NksU$n,T (ksrInin T Uki ST4n TBnsnTIk mrirsn Tir(Ir,n TUSSS±USSST Zn mTUk,nDT4$kUnDrSTnUnrT4SUk Urin TIzaSaST NksU$n, ZnT :ksrInT ikU$mmSh ZnT UksDn4nIT :S4n mT srfrin T ikU$mmSh T UksUk Ur8T MS4n mT ikU$mmSh T srfrin T SST :Shan ZnT :ksrInT ikU$mmSh T(rinTnST,nrUTsnUn±snUnTE(kn TaknT ,kNk,TEyp?GTnUnrT4SUk Urin T,zin,8TT

ck mn4nn T fnsSmT iksn minT 4nansT NksU$n,T 4$r,nST z,kDT Mk,n 4nT 4k mn T (k kUnlin Typ?T4ST:k:ksnInTUk(InUT4n T 4SUksrain T4k mn TIk mrirsn Ta$nUT4nUnsTUk,SSST Mnizarsun n,FT (r,nST niDST UnDr T A.j2±n T (k(r,nST rInZnT Ik ZnUrn T aSaUk(T U$mmST naSz n,T4k mn T(k,nirin TIk mrirsn Ta$nUT 4nUnsTUk,SST Zn mT (k,k-nUSTUSSS±USSSTiksn minT 4nansTZn mTUk,nDTn4nT(nrIr TIk(:rnUn TUSSS± USSST:nsrTIn4nTiksnInUn TUksUk Ur8TukfnsSmTUSSST iksn minT4nansTNksU$n,TSST4Sak:rUTak:nmmSTeSSST eSmmSEd kz4kaSEeed GST

oSmmnTannUSSFTIk mrirsn T:k4nTU$mmST a$nUT4nUnsT(naSDT(ksrInin TBnsnTck mrirsn T

: k4nTU$ mmSZn mT n,S mTUk,$$$Tp kDS mmn T kUk,$$$n T iksn mi nT4nansTNksU$n,TE5 G4S ZnUhi n Tak: nmnST : nUhaT DnsmnT Uks: kansT I ks: k4nn TU$ mmST DnaST I k mrirsn Ta$ nU4nUhsT ksmS4n T r,n m8Tc n4nT Uh: k,T9T4$W friin TBz UzDT kUk Un T kUk,$$$n T a$ nUTUk,$$$T r Uh i T I k mn4nn T iksn mi nT4nansT NksU$n,8Tv Uh i T kI ks,rn T k mS nUh T kU$ mmSn FT : $hT I n4nTar nUh T- $hZnDTU4ni T4$Uk(r in TeedFT (ninT : $nT (k mmr nin T ikU$ mmSn T U$$T UkSn mr,naSak: nmnSS nUh TZn mT(k 4kinUS$DnsmnT ikU$ mmSn TUk,$$$UksDn4nI Ty p?8T

Tabel 1. TeS minU5 kUk,$$$n T

eS minU ikUk,$$$n T	5T
6T	7T ((T
66T	XT ((T
666T	1T ((T

ck,nian nn T I k mrirsn T iksn minT 4nansTNksU$n,T4nI nUT4$hirin T4k mn T7TE$mGT BnsnFT Zn$W T (kUz4kT a$ nUT 4nUhsFT I k mrirsn T es$nz z(kUS$aT4n T k mrirsn TMnsz(kUS$a8T

y kUz4kTa$ nUT4nUhsT I sS a$ ZnTn4n,nDT (k mrirsTU$ mmST: 4 Tn,nUTa$ nUT4nUhsTzI U$aT4ST ,nI n mn T(k mmr nin Tsn(: rTrirs8To SmmnT annUT S$FT I k mrirsn T : k4nT U$ mmST 4k mn T (k mmr nin T(kUz4kTa$ nUT4nUhsTzI U$aT(na$DT (ksrI nin TBnsnT I k mrirsn T: k4nTU$ mmSTZn mT I n,S mTUk,$$$Tp kDS mmnT kUk,$$$n T iksn minT4nansT NksU$n,TE5 HPGT4S ZnUhi n Tak: nmnST: nUhaTDnsmnT Uks: kansT I ks: k4nn TU$ mmST DnaST I k mrirsn T a$ nU4nUhsT ksmS4n T r,n m8T

ck mrirsn T es$nz z(kUS$aT I sS a$ ZnT n4n,nDTn4n,nDT I ksz,kDn T: k4nTU$ mmST (k,n,r ST fnsniT,n mar mTUksz I z mTUksDn4nI T: k4nTU$ mmST 4k mn T (k(I ksD$W min T U$ mmST n,nUFT ar4rUT NksU$n,TEVk $DTnUhr TS i ,S na$Taks UhTU$ mmSTmnsSaT : 4 TZn mT4S ni $TzkDT: k n mTUk mnDTsn(: rT rirs8T

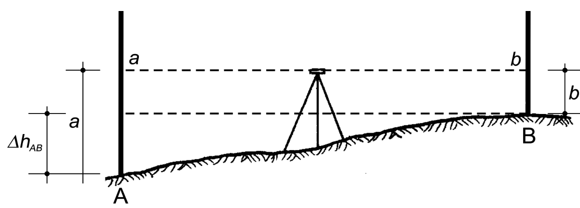
ck mrirsn TMnsz(kUS$aT n4nT sS a$ ZnT n4n,nDT (k mrirsT : k4nT Ukin n T nU zaUks8T ck mrirsn T U$ mmST 4k mn T (k mmr nin T (kUz4kT :nsz(kUS$aT 4$hirin T 4k mn T (k mmr nin Tak: rnDT: nsz(kUksTak: nmnSTn,nUT r Uh(n8T

y kUz4kTa$ nUT4nUhsT(ksrI nin T(kUz4kT Zn mT I n,S mTUk,$$$T4S n 4S min T4k mn T(kUz4kT U$$nz z(kUS$aT 4n T: nsz(kUS$a8T on,T S ST 4nI nUT 4$k,nain T 4k mn T (k mmr nin T UkzsST I ksn(: nUh T ikan,nDn TZn mT4nI nUT4$Wsr in T (k,n,r ST I ksan(nn T (nUk(nU$aT 4$$sk a$n,T I nsa$n,8T

Metode Pengukuran Sifat Datar Optis

Ty kUz4kTa$ nUT4nUhsTzI U$aTn4n,nDT szakaT I k k Uh n T kU$ mmSn T4nsSTakfr(,nDTU$$TnUhr T I k mrirsn T I ks: k4nn T k,kNha$T cks: k4nn T Zn mT4$ niar4Tn4n,nDT ks: k4nn TU$ mmS4SnUhaT nST,nr UT ikTar nUh TU$$TUksUk UhTakI n fn mTmnsSaT NksU$n,8Tcks: k4nn TU$ mmSTn UhsnTU$$±U$$Tnin T 4nI nUT4$Uk Uh in T4k mn TmnsSaTar(: rTI n4nT I kan- nUT Zn mT4$W frin TI n4nTsn(: rTZn mT NksU$n,8T

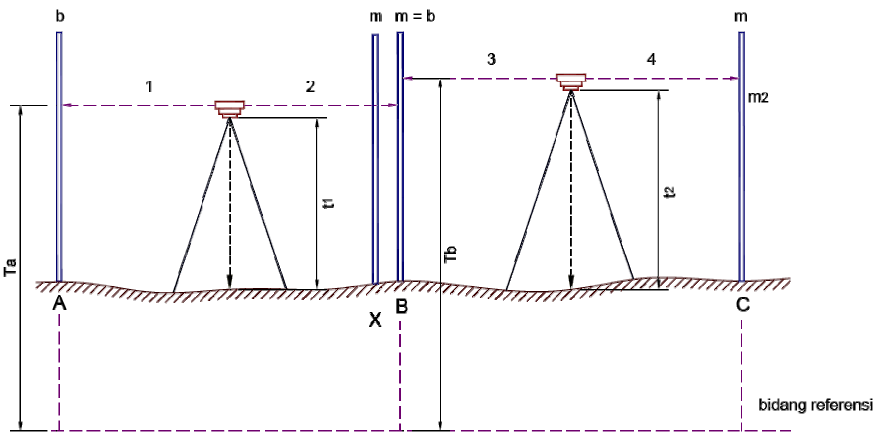
erfrn T4nsST I k mrirsn TI k Z$ nUT4nUhsT n4n,nDT(k BnsST: k4nTU$ mmSTn UhsnT4rnTU$$TZn mT 4$ irs8T y $n, ZnT : r($T : r(ST (k(I r ZnST I ks(rinn T kU$ mmSn TZn mTU$4ni Tan(nTnUhr T (k(I r ZnSTak,$$DTU$ mmS$Tb I n: $hTak,$$DTU$ mmST 4nsST4rnT: rnDTU$$T4nI nUT4$ kUhDr ST(ninTU$ mmST U$$T ik4rnT 4n T akUksra ZnT 4nI nUT 4DW mT akUk,nDTU$$T ksUh(nT4$ kUhDr STU$ mmSZn8T



Gambar 1. csS a$ T k k Uh n T k4nTU$ mmS4k mn T a$ nU4nUhs8T

5 kUksn mn Tmn(: nshT

$$\left(\Delta h_{AB}\right) = a - b$$



Gambar 2.T5kUksn mn Tck mr i r sn Tp$SnUTHnUhsT

5kUksn mn Tdn(:nsT9hT

A8Tb FMFF4n T= TqTaUhaS: hTYTqTaUhaS: Tn UhsnT

98Tb 4n$n T aUhaS: T bT 4$kUhDr ST U$mmS ZnFT (ni nhT

n8THSak: r UT I k mr i r sn TikT: k,ni n mFT: TqT sn(: r T k,ni n mCT

: 8THSak: r UT I k mr i r sn TikT(r i nF(TqTsn(: r T (r i n8THnsST I k mr i r sn TAT4n T9FTU$mmST aUhaS: TMT4$kUhDr $F(ni nhT

B8THSak: r UT I k mr i r sn TkT: k,ni n mCT

48THSak: r UT I k mr i r sn Ti kT(r i nFTaUhaS: TMT 4Sak: r UU$$T r UhsT

78Tunsni Tb MFTM= T4aUT(naS m±(naS mT4Sak: r UT aki aSnUhr Ta,nm8T

K8Te S qTU$ mmSn,nUCT

08Te m qTU$ mmSmsSaT: S4$ 8T

ck mksU$ T,nS T4nsST: k4nTU$ mmSn UhsnT 4r nTU$$ Tn4n,nDTak,SaSDT I k mr i r sn T i kT: k,ni n mT 4n T I k mr i r sn Ti kT(r i n8THk mn T4k($Sn T ni n T 4$ ksz,kDT : k4nT U$ mmST akar nST 4k mn T i kU$ mmS TU$$ TZn mT4$ i r s8T

ck mr i r sn Ta$ nUT4nUhsT i ksn mi nT4nansT NksU$n,TDnsr aT4S- n,ST4k mn T(k mS4k U$$naST i kan,nDn TaSaUk(nU$T4n,n(TDn,TS S T i kan,nDn T mnsSaT: S4$ Tn,nUTa$ nUT4nUhsT z I U$T(k,n,r STar nUr T I k mr i r sn Ta$ nUT4nUhsT4n,n(T I zaSaS 9TaUh 4TE9T i n,ST: ks4SSTn,nU8T5 kan,nDn TmnsSaT: S4$ Tn4n,nDT i k(r mi S n TUksr mi $U Zn TmnsSaT: S4$ TUkszl z mT i kT nsnDT nUhaT nUhr T : n- nDT 4Si S nUn T z,kDT i kUks: nUhan T n: s$ T(k(: r nUn,nUTS S: kUr,± kUr,T I skaSaS$T

ck mksU$ T,nS T4nsST: k4nTU$ mmSn UhsnT 4r nTU$$ Tn4n,nDTak,SaSDT I k mr i r sn T i kT: k,ni n mT 4n T I k mr i r sn Ti kT(r i n8THk mn T4k($Sn T ni n T 4$ ksz,kDT : k4nT U$ mmST akar nST 4k mn T i kU$ mmS TU$$ TZn mT4$ i r s8T

ck mr i r sn Ta$ nUT4nUhsT i ksn mi nT4nansT NksU$n,TDnsr aT4S- n,ST4k mn T(k mS4k U$$naST i kan,nDn TaSaUk(nU$T4n,n(TDn,TS S T i kan,nDn T mnsSaT: S4$ Tn,nUTa$ nUT4nUhsT z I U$T(k,n,r STar nUr T I k mr i r sn Ta$ nUT4nUhsT4n,n(T I zaSaS 9TaUh 4TE9T i n,ST: ks4SSTn,nU8T5 kan,nDn TmnsSaT: S4$ Tn4n,nDT i k(r mi S n TUksr mi $U Zn TmnsSaT: S4$ TUkszl z mT i kT nsnDT nUhaT nUhr T : n- nDT 4Si S nUn T z,kDT i kUks: nUhan T n: s$ T(k(: r nUn,nUTS S: kUr,± kUr,T I skaSaS$T

?n mi nD±n mi nDT 4n,n(T I k mr i r sn T a$ nUT 4nUhsT i ksn mi nT 4nansT NksU$n,T n4n,nDT ak: nmnST ksS r UhT

A8Tpr sNkZzsTni n T(k ks$ nT I kUhT4n T: nUhaT+ : nUhaT4nksnDT I k mr i r sn 8T

98T5 kUr nTU$ T(k n 4nSak(r nT I ksn,nUh TZn mT 4S r Ur D i n TaksUhT(k mn(: ST I kUhT4n T: nUha±

METODE PENELITIAN

Perencanaan

A8Ty kUz4kT Ik mrirsn T a$nUT 4nUhsT Zn mT 4$nr nin Tn4n,nDT Ik mrirsn Ta$nUT4nUhsT IksmSIr,n mFT4$ n nT4k mn T(k,$DnUT(k4n T ,nIn mn FTnar(aSTIk,nian nn TIk mrirsn T 4n,n(TanUrTDnsSn4n,nDTATi (TIksmS4n TATi (T Ir,n m8T

98Tcksaz $FFcksn,nUh T4n TMhDn T

n8Tur(,nDTUkn(Tn4n,nDTKTUkn(T

:8Tb,nUT Zn mT 4$nr nin T ccHT Eckan-nUT Ik Z$nUT4nUhsGU$kTzUz(nU$aT9Tr S$8T

B8THn,n(T AT Ukn(T Uks4ST 4nsST AT zsn mT arsNkZzsFT9Tzsn mTk(kmn mTsn(:rT4n TAT zsn mT(k BnUhUT:nBnn Tsn(:r8T

48TMhDn TIk 4rir mTn4n,nDTInirTInZr mT r UriT:n UrFT BnUT aksUhTirnaTak:nmnST Ik n 4nTUST:n UrT4n TIkUhTsk Bn nT Ik mrirsn Tak:nmnST:nDn TzsS UhaS8T

k8Ttzs(r,SSTrirsT4n Tn,nUTUr,SaTaksUhTiksUhaT aikUTk mrirsn 8

Peninjauan Lapangan

A8Tck BnsSn TeSTeSmmSTdkz4kaSTEeedGTZn mT 4$n mmITaUh:$T4n,n(TnsU$n TU$4niT:ksr:nD± r:nDT 4n,n(T fn minT -niUrT UksUk UrT Ik mn(nUh FT4n T4nInUT4$h4$n Tak:nmnST srfrin TIn4nTannUTIk,niann TIk mrirsn T 4n,n(TDn,TSST eedT z(zsT KK.T4k mn T ikUmmn T99AF22KT4ST4nksnDTfn,n TakU$n:r4ST 4ST4kIn TbHbTa-n,nZn Tak(nsn m8T

98Tun,rsTZn mT4SDTr UriTIk mrirsn Tn4n,nDT fn,rsT Zn mT (k,n,rST fn,n T pkU$n:r4ST +T unU$mn,kDT+Tv $nT+Tv UhmT±T6$TPkUksn T+T uk(:nUh T:kaSTnsnDTikTv kaTpkinsn T+T esn miST+TMn nsn T+TcSUrT(nariTrUh(nT v kaT pkinsn T 4n T irsn mT,k:$DT fnsniT n UhsnTeedT4k mn T5n(IraTv kaTpkinsn T n4n,nDTLTA9FXTi (8

Pengolahan Data

onaST4nsSTIk mn(:Sn T4nUhT4SnIn mn T 4n TIk mz,nDn Tn4n,nDTU$mmSTU$S$±U$S$TEInUziGT Zn mT 4$irsT Zn mT 4$irsTr UriTikIks,rn T Ik mmn(:nsn T4n,n(Tk(kUhn 8T

b4nIr T,n minD±n minDT Ik mz,nDn T 4nUhTDnaSTk mrirsn Tn4n,nDTak:nmnSTks$rUhT n8T(k r,Sain T SnST:k n mTnUhaTEMbGT:k n mT Uk mnDTEMeGT4n T:k n mT:n-nDTEMMGT

:8Ty k BnsST SnSTkan,nDn TnnsSaT:S4$T

B8Ty k mD$U mTMeTzskiaSTEMe5GaSakU$nITa,nm8T

48Ty k mD$U mT:k4nTU$mmST4STakU$nITa,nmT4nsST :nBnn T:k n mTUk mnDTzskiaST:k,nin mT4n T (rin8TMk4nTU$mmSTn-n,TarnUrTa,nmT4$ksz,kDT (k,n,rST Ik mrsn mn T :k n mT Uk mnDT :k,nin mTizskiaST4k mn T:k n mTUk mnDT (rinTizskiaS8TMk4nTU$mmSTakU$nITa,nmTDnsraT (k(k rDSTaZnsnUT:k4nTU$mmSTan(nT4k mn T z,T f$nT fn,rsT Ik mrirsn T:ksn-n,T4n T :ksniDSTIn4nTUSTZn mTan(n8Tck fr(,nDn T :k4nT U$mmST n-n,T akU$nI T a,nmT(ksrInin T ikan,nDn TnBniT:k4nTU$mmST Zn mTDnsraT 4$zskiaSTikIn4nTakU$nITa,nmT:ks4nansin T :z:zUTUksUk Ur8T

k8Ty k mD$U mTfnsniTEx4GTakU$nITa,nmT4k mn T (k fr(,nDin TfnsniT:k,nin mT4n TfnsniT (rin8T

G8Ty k mD$U mT UzUh,T fnsniT ExEx4GT fn,rsT Ik mrirsn T4k mn T(k fr(,nDin Tak(rnT fnsniTa,nm8T

m8Ty k mD$U mT :z:zUT izskiaST akU$nI T a,nmT 4k mn T(k(:nmSTfnsniTa,nmT4k mn TUzUh,T fnsniTks(rinn 8Tpk:nmnST:z:zUTizskiaSFT$hT (k mmr nin T fnsniT akU$nI T a,nmT Zn mT (ksrInin TIk fr(,nDn TfnsniT(rinT4n T :k,nin m8TezUh,T:z:zUTn4n,nDTfr(,nDTfnsniT ak(rnT a,nm8T 5zskiaST U$mmST akU$nI T a,nmT 4k mn T4k($$n T4$ksz,kDT(k,n,rST kmnU$DT ikakn,nDn TnBniT:k4nTU$mmST4$n,$n TfnsniT

4k mn Ta,nmTUksak: rUT4n T4S nmS4k mn TUzUn,T fnsni Tak,r sr DTa,nm8T

D8Ty k mDSU mTU$ mmSTU$$$±U$$$ T l k mri r sn TEe$ST 4k mn T BnsnT (k fr(,nDi n T U$ mST U$$$T ak: k,r (ZnT4k mn TU$ mSTU$$$ T i zski aST Zn mT DnaS ZnThi n Tan(nT4k mn T z,8T

8ST u$ nT U$4ni T an(nT 4k mn T z,T (ni nT l k mz,nDn T 4nUnT DnsraT 4$,n mST 4n T 4S$4k U$$$ naST i k(: n,ST ,kUni T i kan,nDn Zn8T u$ nTU$ mmSTU$$$ Tn- n,T4$ kUnDr $ST(ni nTU$ mmST U$$$±U$$$ T i zski aST 4$ ksz,kDT 4k mn T BnsnT (k fr(,nDi n TU$ mmSTU$$$ Tn- n,TUksDn4nl T: k4nT U$ mmST zski aSTa,nmTakBnsnT: ksr sr Un 8T

HASIL PENELITIAN DAN PEMBAHASAN

Pengambilan Data Lapangan Double Stand

ck mn(: $n T 4nUnT ,nl n mn T 4S nmST i k4n,n(TKTU$ T4$ n nTakU$nl TU$ T l k mn(: $n T fnsni ZnT: ks: k4n± k4nTakl ksU$T ks$ r UnT

A8Te$ TAT(k(r ,nSTl k mn(: $n T4nUnT4nsSTeed T KK. T 4kl n T bHbT a- n,nZn T Mn Zr(n $T an(l nS4k mn Tk(: nUn TUz,TunU$ mn,kDTE4nUnT eks,n(l $GST

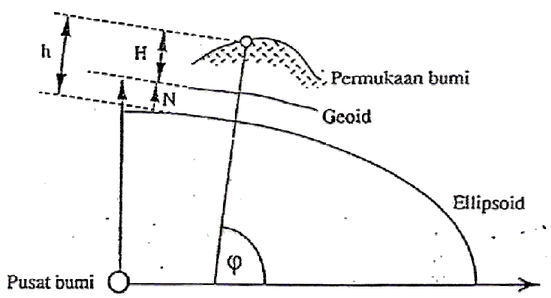
98Te$ T9T(k(r ,nSTl k mn(: $n T4nUnTk(: nUn T Uz,T fnU$ mn,kDT an(l nST 4k mn T i n(l raT v gebd TE4nUnTeks,n(l $GST

78Te$ T7T(k(r ,nSTl k mn(: $n T4nUnT5n(l raT v gebd Tan(l nS4k mn Tuk(: nUn T: kaSTnsnDT v gg) p TE4nUnTeks,n(l $GST

K8Te$ TKT(k(r ,nST k mn(: $n T4nUnTuk(: nUn T MkaSTbsnDTv kaT(k rfr TMy T9T5n(l raT v kaTpki nsn TE4nUnTeks,n(l $GST

Pengukuran Tinggi dengan Geographic Potitioning System (GPS)

eS mmSTZn mT4S4nl nUn T4k mn Td cp TEDGT n4n,nDT U$ mmST k,,$ azS4T 4n T : ri n T U$ mmST zsUDz(kU$$ T Eb GTakl ksU$T Zn mT4S4nl nUn T4nsST ,kNk,S m8T ur mnT Uksmn Ur mT l n4nT k,,$ azS4nT skQsk aST Zn mT4Smr ni n 8T Hnl nUT4Sr : nDT i kT U$ mmST zsUDz(kU$ T f$ nT r 4r ,naST mkzS4T Eg GT 4$ kUnDr $T v (r (ZnT kUk,$$n TU$ mmS4nsSTd cp T9± 7T n,S,k: $DTsk 4nDT4S n 4S mi n T kUk,$$n T zaSaST DzsSz Un, ZnFT anUk,$T Dn ZnT : SnnT (k mn(nUST DzsSz 8T *One sided geometry"* T S ST Dn ZnT (k(: ks$ n TakUk mnDT4nsSTi z GSmr snaSTzl U$ n,FT 4n TkQi ZnT,k: $DTUksnanT n4nT k k Un TU$ mm8ST e$4ni Tn4n ZnTanUk,$T4S n- nDTl k mn(nUTfr mnT (k Zk: n: i n TU$4ni Tn4n ZnT k mk,$ S Sn TkQi ± kQi Ti kan,nDn T4n T: SnaTZn mT(k(l k mnsr DST U$ mm8STHn,n(Ti nar aTl zaSaSTDzsSz Un,FTn4n ZnT anUk,$T 4ST U$ r s± nsnUT nUnr l r T r Unsn±ak,nUn FT ak4$ $T : n Zni T l r ZnT i k(n(l rn T r UriT (k mk,$ S STUksak: r UFTUksmn(: nsT4n,n(TS r aUsnaST mn(: nsTakl ksU$4S n- nDTS $T



T

Gambar 1. Tck k Un TczaSaSTeS mmSTHk mn Td cp T

ck k Un Tl zaSaST4k mn Td cp TEYF FwGT (k,n,r ST 7T nal ki T l ksDSU mn T Zn mT DnsraT 4$ hi r i n TakBnsnT(nUn mTZnSUTnT

A8T) ,$ S naST kan,nDn T4n T: SnaCT

98Td kz(kU$TanUk,$T k mn(nUCT

78Teki $ Tskaz,r aSTn(: Smr $Z8T

pkUk,nDT (k,n,r ST l k mz,nDn T 4k mn T (k mmr ni n T azQUnskT l k mz,nDT 4nUnT l k mri r sn Td cp T4S4nl nUTU$ mmSTU$$$ Tk,,$ azS4TMy T 29Tv kaTn4n,nDTLT9978AKj Ty p ?8T

Pengolahan dan Klasifikasi Data Hasil Pengukuran Tinggi Sifat Datar

pk: k,r (T (k mz,nDT 4nUnT DnaST l k mri r sn T4$ hi r i n Ti ,naST$naST4n TSl r U$ mT

4nUhT 4$ n nT I k mz,nDn ZnT 4Şhirin T (k mmr nin TI ksn minUT,r ni TI k mz,nDT4nUhT ZnSIT y $szazOOT) WBk,8T b4nIr T Bz UzDT IksDSU mn TZn mT4Şhirin T4SanfSn Tn4nTUh:k,TT 4Sn-nDTSSHT

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Tabel 2. T=z UzDTen:k,Tck mn(:Şn T4n Tk mz,nDn TT ck mrirsn T5kU$mmSh T),kNhaSe$$T5ksn minTPksU$n,TMcg TRs4kT9Tvgg)p

e$$T	ensmkUT	e8Tb,nUT	MbT	MeT	MMT	−oT ckST e$$T	−oT InUh9T	unsniT e$UT E(kUksG	5kUksn mn T
cAT	c2T	A871T	28j AT	28AXAT	2820AT	A89A. T	T	99T	T
	c9T	T	98X. 0T	98j 2T	98KK0T	±A8A. 2T	±A8A. 0T	90T	T
c9T	cAT	A87XT	28j 0T	28AX2T	282K0T	A8922T		90T	T
	c7T	T	98A2T	98K70T	987X2T	±A82j 0T	±A82j 1T	A0T	T
T	T	T	T	T	T	T		T	T

T

onaŞT4nsSTI k k,$$h TSSn4n,nDT:ksrInT :kansn TU$$TU$mmSTMy T29Tv kaT4n,n(T:k UiT Uh:k,TakIksUSE ksSrUSSST

Tabel 3. TonaŞTck mz,nDn THnUhT) Nh,rnaSe$$TeSmmST vgg)pT

ck mrirsn T5kU$mmSh T),kNhaSe$$T5ksn minT PksU$n,TMcg TRs4kT9Tvgg)p

pkm(k T	ŞnST
ezUh,TnDTc2TEc0T	±78077T
ezUh,TbDTc2TEcAA0T	±728920T
ezUh,TboTcgTEcA2ATEcgGT	±Kj 8 XXT
ezUh,TboTMy 9TEI 2T	0X892. T
ezUh,TnDTcTniDSTEc01T	j A8 Xj T
ezUh,TnDTcgTEcAT	K98179T
ezUh,TnDTeedTEcAT	± A82j AT
eReb?TboT	±A8 Xj T

u5dT→Te5dT2K. TMn Zr(n $TEgz8KK. G),kNhaSHT 99A822KT
My T9Tvgg)pT),kNhaSHT9A. 897j

SIMPULAN DAN SARAN

Simpulan

Mks4nansin TDnaŞT4nsSTIk mn(:Şn T 4nUhT4n TIk mz,nDn TZn mTUk,nDT4Şhirin T 4nInUT4Sa$ Ir,in Tak:nmmS:ksSrUST

A8Tck mrirsn Tiksn minTiz Uz,TNksU$n,TMy T v kaT4$nUn TIn4nTe$$TeSmmSTdkz4kaST Eeed GTz(zsTKK. T4k mn TkU$mmSh T99A822KT y p?T4S4nksnDTb4nTp-n,nZn 3TMn Zr(n $8T

98T) Nh,rnaSDnaŞTIk mrirsn T4k mn TdcpTe$$T eSmmST4nsSTU$mmSTk,,$ azS4TkiaSU$mTMy T29T vgg)pTZnSUTLT9978AKj Ty p?T4n TakUk,nDT (k,n,rST IszakaT Ik mz,nDn T 4nUhT 4nsST Ik mrirsn TU$$TU$mmSTUksakaU$aTr UiTMy T29T v kaTn4n,nDTLT9A. 897j Ty p?FTakDSmmnTiSUhT 4nInUSTks:n 4Smn Tn UhsnTU$$Tk,,$ azS4TMy T 29Tv kaT4k mn TDnaŞTIk mrirsn TUksakaU$aT ak:kansTLT78 A2Ty p?8T

T

Saran

A8TeSmmSTU$$TMy T29Tv kaT4nInUT(k fn4ST nBrn TE$$TSSnUGr UiTIk mrirsn TU$mmSTMy T ,nS ZnTZn mTUksak:nsT4ŞSmirmn Tin(IraT v kaTpkinsn 8T

98THSDnsnlin TIk mrirsn TU$$TU$mmSTEksn minT iz Uz,TNksU$n,GT4Şhirin TakU$ITUhDr TnmnsT mkfn,n±mkfn,nT Iksr:nDn T ,nDn T 4nInUT Uks4k U$$naSTakBnsnTUkInUTakDSmmnT4nInUT 4$h4$n T nBrn T 4n,n(T Ik,nian nn T Ikiksfnn T ika$Şn T UksrUh(nT Zn mT (k Zn mirUTIksiksnan Tfn,n TZn mT4nInUT 4S4$kiaST (k,n,rST Iksr:nDn TU$mmST (rinT Uh nDTakU$ITUhDr Zn8T

DAFTAR PUSTAKA

b:S4SFTo8w8FTHsFT9222FTck k Uh TczaSaS4k mn T dcpT4n T bI,$naSZnFT ceT csn4 ZnT cnsn(SUhFTunInsUh8T

T

Mr4Sz zFTy 8T4n Tn-n ±in-n 8TA. . . 8T6(rTvirsT en nD8Tb minan8TMn 4r m8T

T

y raUzOnTF5ma8Twr,iS,S8Tb azsSFTbsSaTy r n UzT4n T)izT I ka(z zFT 922.FT cksn T 4n T 5z UsSraST ckUnT ek(nUST v UiT yk 4rir mTck(:n mr n TMksik,n frUn T 4SIMS4n mTcksUn nDn FIMcgFTuninsUn8T

T

ursran Tck 4S4Sn Teki STMn mr n T92208T pUsriUrsT 5rsSr,r(T cszmsn(T pUr4ST ck 4S4Sn T eki ST pS S,ST tce5T vc6BT ursran THS Uki:n mTce5Tv c6BTMn 4r m8T

T

T

pS4fn:nUT8 z-,n 4Tc8FT6s8y p) FT9221FTy kUz4nT ck mrirsn TeSSSTHnansTeki STRs4kT9T 4n T7FT5nar:4SUTck mrirsn T5n-nan T 4n T □ S,hZnDFT HSkiUzsnUT ck mrirsn T HnansFTHkIrUZT6FIMcg±I 6BT

T

8888888888888888888TEA.17G8Tvirs Ten nDT98Turs ran T eki STpS S,STc) H=8TMn 4r mT