

Ka Kot Lumthup Ba Batai Shaphang Ki Umpohliw



Community Led Landscape Management Project



Meghalaya Basin
Management Agency (MBMA)



THE WORLD BANK
IBRD • IDA

SPRING MAPPING MANUAL

1. Ban wad ia ki umpohliew kiba don ha ki shnong da ka jingiarap ki nongshong shnong.

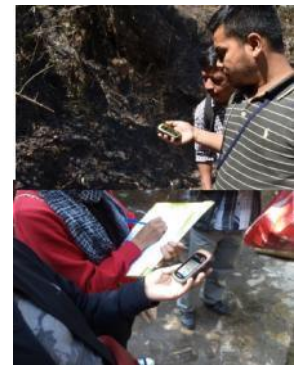


2. Ban leit sha ki jaka ba don ki umpohliew ryngkat ka jingiadon lang ki nongialam shnong.
3. Ban lum ia baroh ki jingtip shaphang ki umpohliew da kaba pyndap ha ka kot lum thup bala tip kum ka **Spring Inventory Sheet**(enclosed):
 - a) Ban buh jingthoh bad buh dak ia ki umpohliew (Codification Spring ID) : ban ai buh



jingtip shaphang jong ki, kawei na ka jingbuh dak kadei ban thoh ia ki distrik kum has EKH, WKH, EGH, bad kumta ter ter da kaba buh ruh ia ka kyrteng jong ki block kum MAI na ka bynta ka Mairang, Zik na ka bynta ka Zikzak, bad kumta ter ter bad bud pat da ka kyrteng jong ka shnong bad ka number jong ki umpohliew kum 01, 02, 03, bad kumta ter ter. Kum ka nuska EKH/MYL/UMT/001 kane ka pyni ba kane ka umpohliew kadei kaba na -East Khasi Hills distrik , Block-Mylliem, Shnong-Umtyngar, bad 001 kadei ka nombor jong ka umpohliew.

- b) Dei ban pyndokam da ka GPS (Global Positioning System) bad buh jingthoh ia ki jingshem ba wad lyngba u GPS : Ka jingpyndonkam ia u GPS ka iarap ban lap ia ka jaka b aka umpohliew ka don ia kaba la tip kum ki coordinates, kane ka iarap ban tip ia u longitude, latitude bad ka jingkyngjang ba ka umpohliew ka don elevation.
 - Pynkylla ia kine ki jingshem jong u GPS na u Degree Minutes Second (dms) sha u Degree Decimal (dd)
 - Jied ia ka jingshem kaba mih ha ka screen jong ka GPS
 - Shim ia ka jingkhain jong u GPS da ka jingthew kaba long 3m – 5m
 - Buh jingthoh bha ia ki jinshem lyngba u GPS kum ia ka longitude, latitude bad ia ka kynjang (elevation). Ia kine ki jingshem dei ban pynrung ha ka spring inventory sheet.



Ban shna ia ki map kiban pyni ia ka jingdon ki umpohliew (Spring Atlas) – Da kaba pyndonkam ia kine ki jingshem jong u GPS jong ki umpohliew ba la shem, kumta ha GIS Lab la pynrung da kine hi ki jingkhain la pynrung ynda kumta yn sa lah ban shna ia ka map jong ki umpohliew.

4. Lum jingtip ruh ia kiwei kiwei ki jingshem kiba iadei shaphang ki umpohliew kumjuh ruh ia ki sawdong sawkun katkum ba la pyni ha ka thup lum jingtip jong ka spring inventory field sheet kata kum ka; kyrteng jong ka umpohliew, ka ID jong ka umpohliew, ka Tarik/ka por, ka jaka ba don (shnong, distrik & Block), ka jingkhuid jingsuba, ka jingioh slap, ka jingtip, ka jinglongtra, ka jingheh ka umpohliew, ka

jingpyndonkam ia ka um bad kumta ter ter.

5. Ka jingthew ia ka jingmih ka um:

Jingwad bniah 1: Ka umpohliw kaba don ka jaka mih kaba paka:

- i. Shim ia kano kano ka jingpdiang ba la tip lypa ia ka jingthew katno ka um kan ngiam.
- ii. Peit ia ka por katno ka shim ba kane ka jingpdiang kan dap
- iii. Ka jingkhein ia ka jingmih ka um (Discharge) = katno ka pynmih (Volume) / ka por (Time). Ka jinthew kadei ban dei da ka (Litre/min)



Jingwad bniah 2: Ka umpohliw kaba mih na khyndew bad ba wanlang ha ka pung:

i. Da kaba pyndonkam ia u dieng, thew ia ka jingkylliew ka um bad sa buh dak.



- ii. Shim ia ka jingpdiang ba la tip lypa ia ka jingngiam ka um, tong ia ka um n aka pung bad peit ia ka por.
- iii. Peit ia ka por katno ka shim ba ka um kan dap biang ha kato ka jingbuh dak.
- iv. Ka jingkhein ia ka jingmih ka um (Discharge) = katno ka pynmih (Volume) / ka por (Time). Ka jinthew kadei ban dei da ka (Litre/min)



6. Ban peit ia ka jingbha jong ka um da kaba pyndonkam water tracers: Ki katto katne ki jingpeit bniah ha kaba iadei bad ka jingkhuid jong ka um ki long ka jingpjah jingsyiad, ka pH, ka TDS, ka EC, ka jingdon mluh, bad kumta ter ter.

- Pynngam kumba 2 inshi ia u jingthew ha ka



nannga sa pynmeh ia une u jingthew.

- Ka jinglong ka pH bad ka jingkhuit jingpjah jong ka um kan sa paw ha ka screen.
- Nyngkong eh peit shwa ia ka jingkhuit jingpjah bad sa ap kumba katto katne por haduh ba ka pH jong ka um nannga sat hew pat ia ka Shim ia ka jingkhein jong ka.
- Ñion ia u budam ha ka tiar ba tip shaphang ka um (water tracer) bad pynkylla sha kawei pat ka jingthew kata sha ka Electrical conductivity (EC) ne ban tip katno ka bording electric ka lah ban par ha kane ka um, ap haduh ba ka jingthew kan neh katjuh bad sa shim ia ka jingkhein kaba mih.
- Ñion biang ia u budam ban pynkylla pat sa sha kawei ka bynta kata ban tip ia ka jingum jong ki mineral ia kaba la tip kum ka Total Dissolve Solids (TDS), ap

haduh ba ka jingthew kan neh katjuh bad sa shim ia ka jingkheĩn kaba mih hangne.

- Ñion biang sa shisien ia u budam ban pynkylla sa sha kawei pat ka bynta, kata ban tip ia ka jingdon jong ka mluh Salinity, ap haduh ba ka jingthew kan neh katjuh bad sa shim ia ka jingkheĩn kaba mih hangne.

Ka jinglong jong ka um bad ki bynta ba kongsan jong ka -

➤ **pH**

- Ka pH jong ka um ka long naduh 0-14, ka um kaba don ia ka $pH > 7$ la khein ba ka long basic bad ka um kaba don ia ka $pH < 7$ la ong ba kadei ka um kaba long asid. Ka jingdon jong ka pH ha ki um kiba mih shalor (surface water) ka long naduh 6.5-8.5, katba ka um kaba don shapoh khyndew (Ground water) khyndew ka pH jong ka, ka long 6-8.5

Ka um kaba don ia ka pH kaba duna than ne ka bun than ka long kaba ma.

- Lada ka pH ka bun palat ka pyndait ia ki khmat bad ia ka pynsniew ia ka sniehdoh.
 - Lada ka pH ka duna than ka pynsaw bad pyndait ia ki khmat, ka pynjew ia ka um, ka pynlong bih ruh ia ka um namar bun ki kynja nar ki ju um noh ha kum kane ka jait um.
 - Ka BIS kaba biang ne standard ka dei ban long 6.5-8.5
- **Ka TDS (Total dissolved Solids) ne ka jingum jong ki mineral**
- Ia ka Total dissolved solids (TDS) la thew halor ka jingum noh jong ki mineral bapher bapher ha ka um.
 - La wad bniah ia ka TDS ha ki um ki wah, ki pung, ki wah duid khnang ban tip la ka um ka long kaba bha ne basniew.
 - Hynrei ym khein pat ba ki um ki wah kiba don ia ka TDS kin long noh kiba jaboh.
 - Ka Total dissolved solids ka ju long namar ka daw jong ka jingum ki maw bad ki khyndew kiba don ia ki mineral bapher bapher.
 - Kham bun sien ka daw kaba wanrah bha ia ka TDS ha ki um ki wah ka long namar ka jingwan tuid ka um na ki jaka rep bad ki jaka sah jong ki briew, ka jingshah rong noh ka khyndew bad ka jingwan tuid jong ka um jaboh na ki karkhana bad ki jaka saiñ ia ki jaboh bapher bapher.
 - Ka BIS kaba biang kadei ban long naduh 500–2000 mg/l
- **Ka jinglah jong ka bording elektrik ban par ha um (Electrical Conductivity-EC)**
- Ka Conductivity kadei ka jinglah jong ka um ban kit ia ka bor ding elektrik lyngba ki ion kiba don ha ka.
 - Ynda ki mluh ki um noh ha ka um ki phiah sha ki ar jait kata sha ki positive bad negative charged ions.
 - Kumta ka TDS ka don ka jingiadei bad ka EC bad ka jingthew ia kane ka long 0.65.
- **Ka jingdon ka mluh ha ka um (Salinity)**
- Ka Salinity ka thew ia ka jingdon jong ka mluh ba la um noh ha ka um.
 - Namar ba ka jingdon jong ki ion ka kyntiew ia ka salinity bad ruh ia ka conductivity, kumta ka salinity bad ka conductivity ki don ia ka jingiadei. Ka mluh kaba don ha ki um duriaw kadei ka mluh bam ia kaba la tip kum ka sodium chloride (NaCl).
 - Lah ban ong ba ka Salinity ka mih na ka jingbun jong ka mluh ba la um.

7. Ka jingpule bad wad bniah ia ki maw (Geology)–

Lano lano haba phi shem ia ki maw kiba paw shalor kiba don hajan ki umpohliw, phi dei ban peit thud ia ka rukom long jong u maw, ka jinglong ka dur ka dar, ka jingtylli bad kumta ter ter.

- Ki jait maw kiba ju kham lap bha ki kynthup ia u – Maw ba la tip kum u Igneous, Sedimentary, metamorphic.
- Kumno ngin ithuh ia ki maw?
 - **Maw Igneous** – u long uba eh, uba don ka jinglang tylli ba long syrtap; ka rong bunsiem ka long rong iong, lieh, bthuh, pink.
 - **Maw Sedimentary** – Ki maw ba long syrtap syrtap, kiba long shyiap bad khoh lyngknep, ka rong jong ki ka long rong ktieh ne bthuh.
 - **Maw Metamorphic** – Kine ki maw ki long ia bit lang uwei bad uwei mar katjuh, ki iapher ka rong, bun sien ki long phyrnai (ki don ruh ia ki mica)



8. Ki jait umpohliw - Observe the type of spring whether depression, contact, fracture, fault or karst spring.

- **Ki umpohliw ba la tip kum ki Depression spring:** Ki umpohliw (Depression spring) kidei kita ki jait umpohliw kiba mih ha ki jaka ba long hapoh. La pynlong ia kine ki jait umpohliw ha kaba ka um kaba don shapoh khyndew ka mih noh shalor na ka daw ka jingat jingthem ka jaka. Kumta ka um ka tuid bad ka ki jaka ba kham them ka um ba napoh ka mih noh shalor.
- **Ka umpohliw ia ka kaba la tip kum ka Contact spring:** Ki umpohliw (Contact spring) kidei kita ki jait umpohliwkiba mih na ki jaka kiba don ki maw kiba jem bad kiba ka um ka lah ban ngam nalor jong kiwei pat ki maw kiba kham eh bad kaba ka um kam lah ban sam. Kumta ha kine ki bynta ba kine ki ar jait ki maw ki ia tyngkhuh la don da ki umpohliw. Kine ki umpohliw ki mih na ha ki bynta kiba kham shalor ha ki lum.
- **Ki umpohliw ba la tip kum ki Fracture spring:** Ki umpohliw Fracture spring kidei ki jait umpohliw kiba mih namar ka jingorpait jong ki maw kiba kham eh bad kiba ka um ka kham jynjar ban sam lyngba. Ka jingioh khiih ka um ba shapoh khyndew ha kum kane ka jait kadei namar ka jingdon ki jingorpait. Kine ki umpohliw ki ju mih ha ki jaka ba kane ka jingorpait ka kyndew bad ka ryngkew.

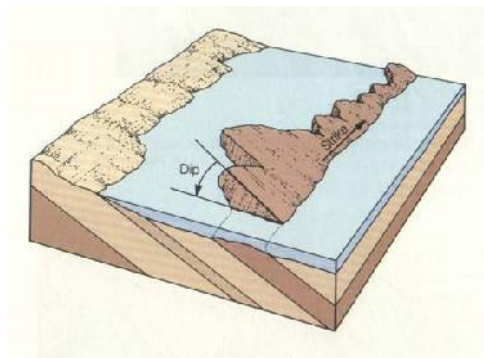
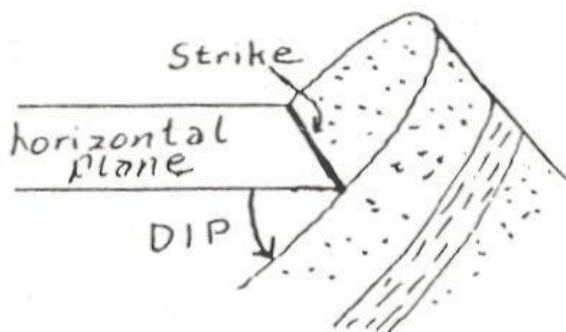


- **Ki umpohliw ba la tip kum ki Fault spring:** Ki upohliw (Fault spring) kidei ki jait umpohliw kiba mih naka daw ba don ka jingbym iaryntih ha ki maw, kane ka pynlong ia ka um ba napoh ban ioh ksam shalor namar ka bor jong ka jingtan ne hydrostatic pressure).
- **Ki umpohliw ba la tip kum ki Karst spring:** Ki umpohliw ba ju mih ha ki jaka ba don mawshun la ju tip ia ki kum ki umpohliw karst spring. Ki umpohkiew kiba mih ha ki jaka ba don mawshun ki mih ha ki jaka ba long thliw ne them namar ka jingthliw ki maw naka daw ba la um noh ka shun. Kumta ka um ka ioh ban mih na kine ki thliw, ki nala, ki lynghong bad kiwei kiwei ki jaka kiba long thliw ha kine ki maw shun.



9. Ki Strike bad Dip :

- Ka DIP ka dei ka jingthew ia ka angle kaba duna ia ka 90° ba la pynlong da ka jingiakynduh ki maw bad ka jaka kaba beit. Katba ka STRIKE pat kadei kata ka bynta kaba iatyngkhuh

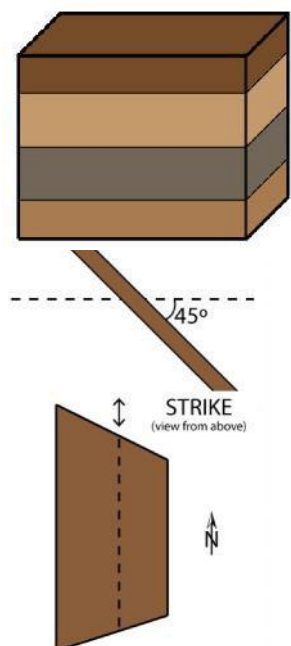


lang ka khyndew bad ka jaka ba don u maw.

Watla ki kynien ba pyndonkam ki lah ban long kiba kham sngew jynjar ban sngewthuh ha ka sien ba nyngkong, hynrei kim dei kiba eh ban sngewthuh lada ngi la shemphang bha. Ngii ia sdang shwa ban sngewthuh da kaba peit iaki maw sedimentary kiba thiah beit. Shu mutdur ba ka bynta ba ha khlieh duh jong une u maw kadei ka sla khyndew.

Shu mutdue bad shi bynta jong une u maw la pynnoh shapoh sha ka phang kamon. Te kumta ia kane ka bynta kaba pynthiah shapoh la ju tip ia ka kum ka "dip". Ngii batai ba kane ka bynta ka noh sha ka liang ka mon, namar kadei sha kata ka bynta ba la pynthiah ia u maw. Kumta ngii thew ia ka tip ba kadei ka angle hpdeng kane ka bynta kaba thiah beit bad kane kane la pynnoh shapoh.

Mynta pat ngin mutdur ba ngii peit ia kane kajuh ka jonglong jong u maw hynrei da kaba peit na jrong. Hangne ruh, ngii iohi b aka don ka jingthiah jong shi bynta jong u maw sha ka liang kamon. Hangne ngin draw ia uwei u line uba thiah beit napdeng— ia une pat ngii khot u "strike". Ha kane ka nuksa, u strike udei u line uba wan na shatei shaduh shathied. Kane ka pyni ba une u maw u thiah sha ka liang mihngi.



Ki nongwad bniah bad kiba pule shaphang ki maw ne ki Geologists ki thew ia ka strike bad dip da kaba pyndonkam ia ka tiar ba la tip kum ka Brunton compass.

Ki bynta kiba treikam ha u brunton compass ki long kumne harum

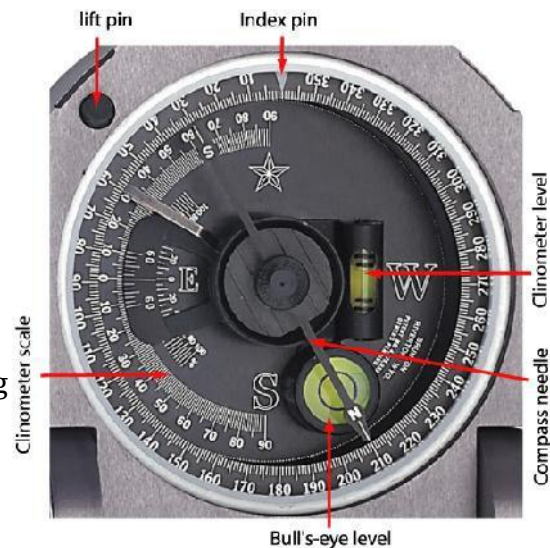
- Ka Innermost dial kaba long kum ka baje ba napoh duh – kane ka thew ia ka dih (thew ia ka jingsharing slope)
- Ka Middle dial ne ka bynta ba ha pdei
- Ka Outermost dial ne ka bynta ba sha (geological mapping)



a jaka ba don ka umpohliw

Ban thew ia ka Strike bad:

- Buh ia u compass ha ka jaka ba madan. Ka kham suk lada ngi buh ia u compass ha ka khnang ba kan long madan bad jlih bad ka jaka buh ruh kan kham heh.
- Pynbeit bha ia u compass bad peit ba ka trai jong u compass kan beit, peit ba ito u lyer um iba don ha une u jingthew "Bull's eye level" in long hapdeng.
- Ynda I lyer um I la long hapdeng, u compass u la shong



beit bad ieng beit bad iaid mar katjuh bad u line ba thew ia u strike. Sa peit ia ka jingthew kaba pyni ha u compass ban lap ia ka strike.

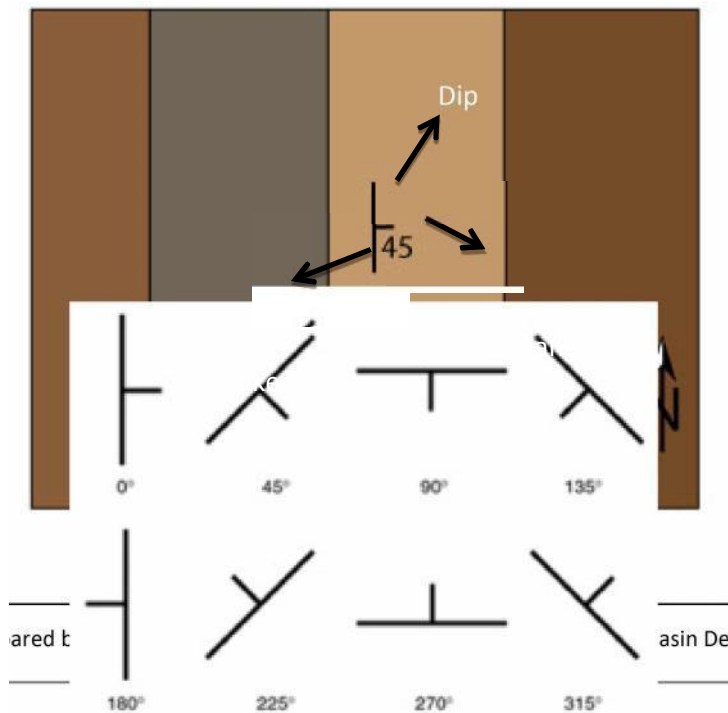
Ka jingiapher jong u Strike ka long naduh 0° haduh to 360°, kaba pyni hangne kadei ka jingthew kaba long 45°

Ban thew ia ka Dip:

- a) Haden ba la lap ia ka strike, pynphai ia u compass sha ka 90 (Namar u line jong u dip u ieng beit ha ka angle kaba long 90° na u strike ne shim ia u compass bad buh ia trai jong da pyngkiang khnang ba un phai shajuh shaba don u dip.
- b) Buh ia u compass da kynriang ha ka jaka ba madan.
- c) Pynpai bha ia ka bynta ba shadien jong u compass haduh ba I lyer um iba don ha u "Clinometer level" in wan ha pdeng.
- d) Peit ia ka jingthew jong u dip katkum ba mih ha u compass. Peit ia ka rukom phai bad ia ka degree. Ka angle jong ka Dip ka lah ban long naduh 0-90 degrees, ka dip kadei ban long kaba bynta kaba ieng beit na u strike (nuksa., u strike ba 40°n ym phai satei lam mihngi ne shathie lam sepngi)

Shisien ba la ioh ia ka jingthew, phi lah ban pyni ha ka jingkhein kumba la kdew harum.

Ban ioh ia u Strike ka long kaba suk bha, namar ngi shu buh beit ia u compass. Lada ngi thew ia u strike jong u maw na ba bynta ba shatei shaduh shathie, ngi lah ban draw ia u line uba beit bad kheiñ ba ka bynta ba shaneng kadei ka phang shatei. Lada u maw u phai 45 degree sha mih ngi, ngi dei ban buh dak ha ka bynta ba hapdeng jong u strike, uba kdew shaphang mih ngi. Kham harum jong une ngi lah ban thoh ia ka jingthew ia ka u dip ba u long: "45". Kane ka jingbatai kan long kum kane ka jingdro ba la pyni harum.

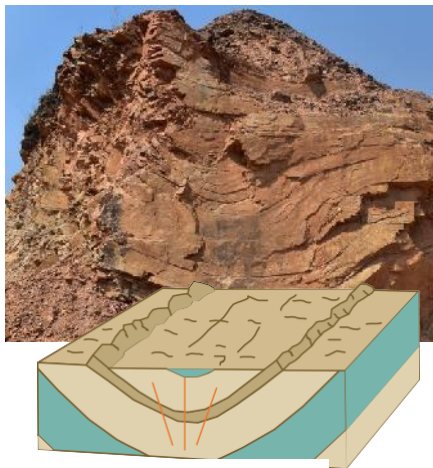


Kine ki rong ba iapher ha ka map ki pyni ia ki maw bapher bapher kumba ki paw shalor ka sla khyndew, ka jan long kum ba la pyni ha ka jingdro haneng. Lada ngi khlem da buh dak ia u strike bad dip symbo, ngin ym don jingsngewthuh la kito ki syrtap maw ki dip has sepngi, sha mihngi ne shalor. Hynrei da kaba ai dak, ngi lah ban pynwandur ia ka rukom shong jong ki maw ha ka rukom jong ka dur 3-D.

10. Kiwei pat ki rukom long jong ki maw kiba ngi hap ban tip:

Ka jingsniew dur jong ki maw (Rock Deformations) – Ki maw ki sniew bad kylla dur na ki daw bapher bapher. Kine ki dur ba pyni ki pynpaw ba ka jingkylla dur ha ki maw kadei na ka daw jong ki bor bapher bapher.

- Ki Folds

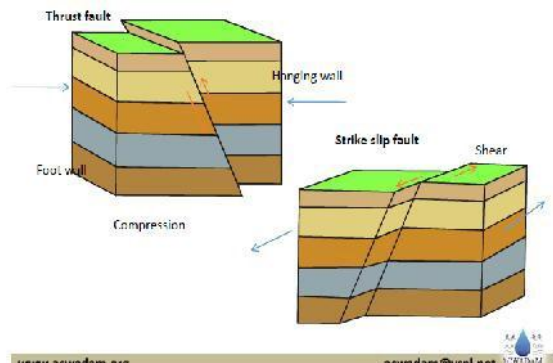


Syncline fold



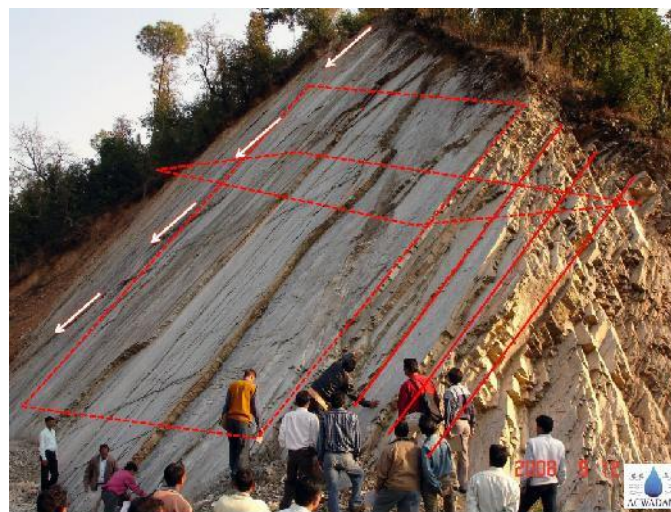
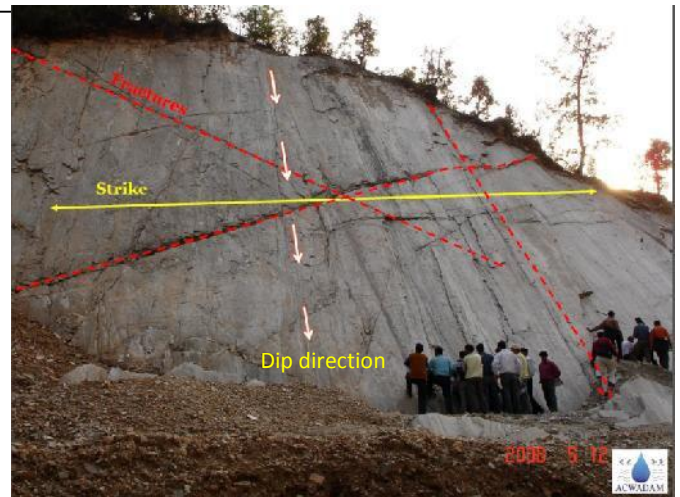
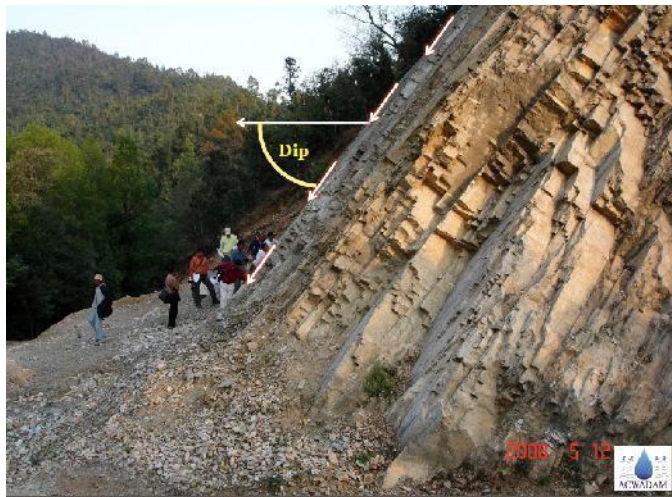
Anticline fold

- Ki Faults

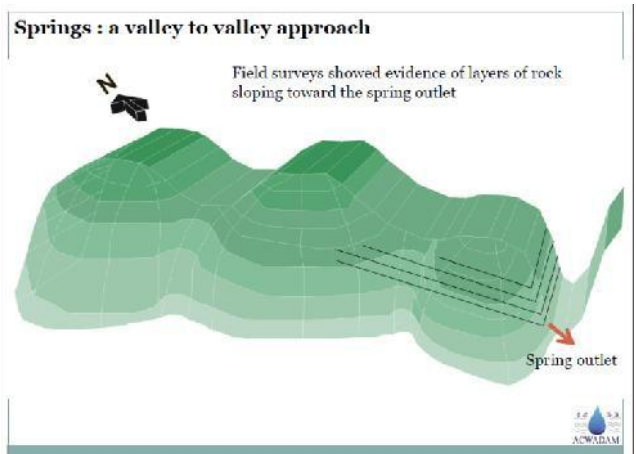
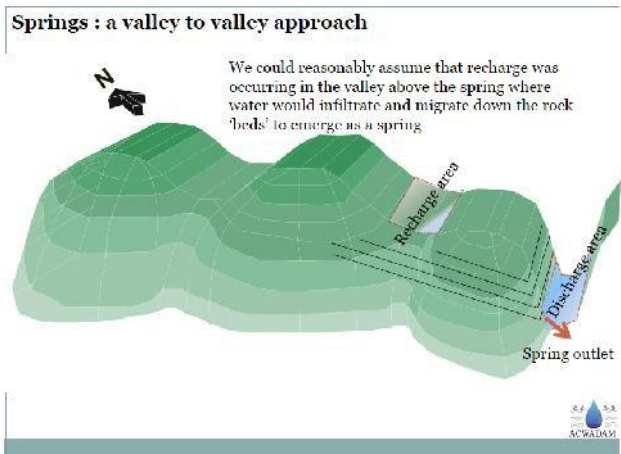


- Ki Joints

Ka dur bala shon ia ka jinglong ki maw:



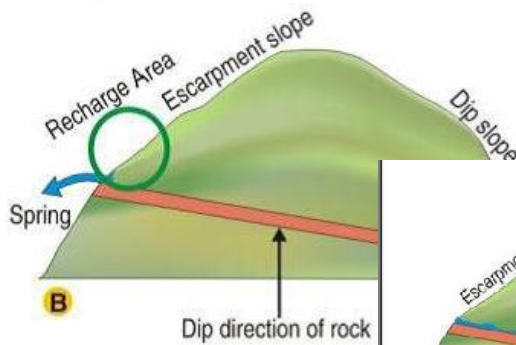
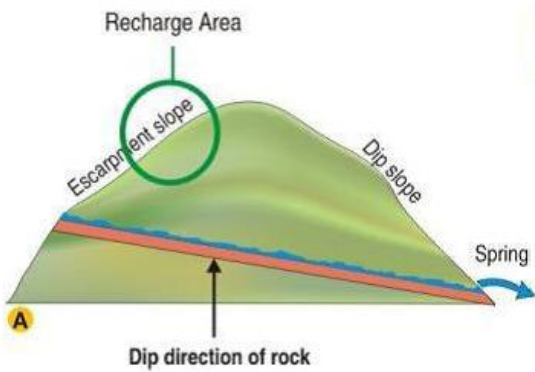
Ka jingpyni ia ka jinglap ia ka jaka kaba lah ban pynkyrsoi ia ka umpohliw:



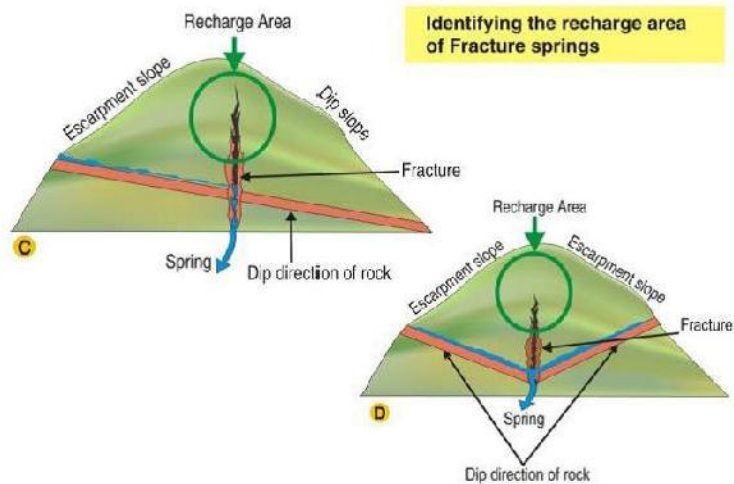
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Dip direction of rocks and recharge area of springs

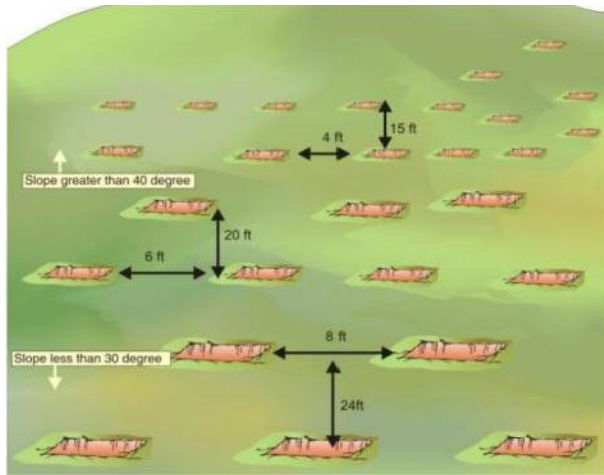
Identifying the recharge area of Depression and Contact springs



Identifying the recharge area of Fracture springs



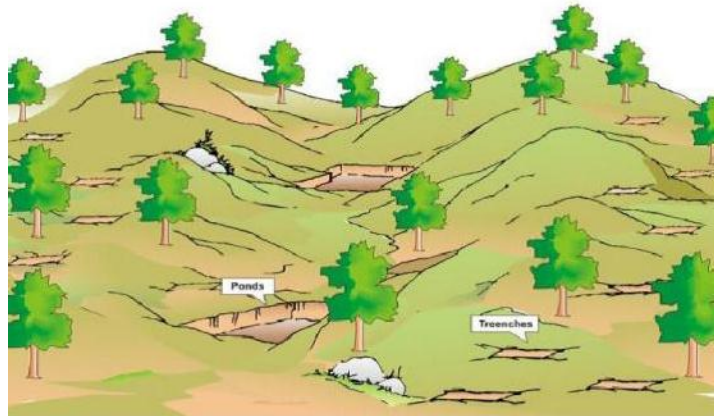
Ki jingshna ban pynkyrsoi ia ka um. Ban tih ia ki thliw sawdong, ban tih thliw nur kyrdan kyrdan (terrace trenches), ban tih ia ki thliw ha ki lum (Contour trenches), bad kiwei kiwei.



Making pond in the natural depression area

Location of pond

Digging ponds in natural depressions, will help to collect maximum runoff. Construction of trenches on sloping lands in this case is not needed.



KA JINGPYNTIP

Ka jingurlong jong ka jingbatai ha kane ka thup jingthoh ka donkam ia ka jingbtin lynti bad jong bun tylli ki shnat ba kynthup ia ka:

1. ACWADAM, ARGHYAM,PSI
2. Dhara Vikas (Sikkim)
3. Soil and Water Conservation Department Meghalaya
4. Meghalaya Schedule Of Rate 2013-14 (Building)
5. Meghalaya Schedule Of Rate 2012-13(Road and Bridges)



MEGHALAYA BASIN MANAGEMENT AGENCY (MBMA)

www.mbda.gov.in
www.cllmp.com

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