CLEAN-UP NOTICE WORKS PLAN

Unnamed tributary to Hopping Dicks Ck, TYALGUM

Lot 127/DP755724,

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BACKGROUND

The NSW Soil Conservation Service (SCS) was requested by Hewittville Pty Ltd (the client) to generate a works plan for remediation of an unnamed tributary as per a Direction to take clean-up action, issued by Tweed Shire Council.

SETTING

The subject site is located along an unnamed second order tributary to Hopping Dicks Ck (Fig 1). The drainage line is ephemeral and transitions from areas of incised channel to broad grassed areas, determined mostly by channel grade and presence or absence of riparian vegetation. The drainage line effectively terminates at a piped culvert under a neighbouring property access, after which it travels overland through grassed paddock to Hopping Dicks Ck.

Road construction activities along the Northern catchment of the drainage line experienced significant erosion following a severe rainfall event. The drainage line and in particular the lower 200m section, received sediment laden runoff during the event. The low grade of the drainage line in its lower reaches resulted in mass deposition of sediment within existing incised channels and in other low energy areas.

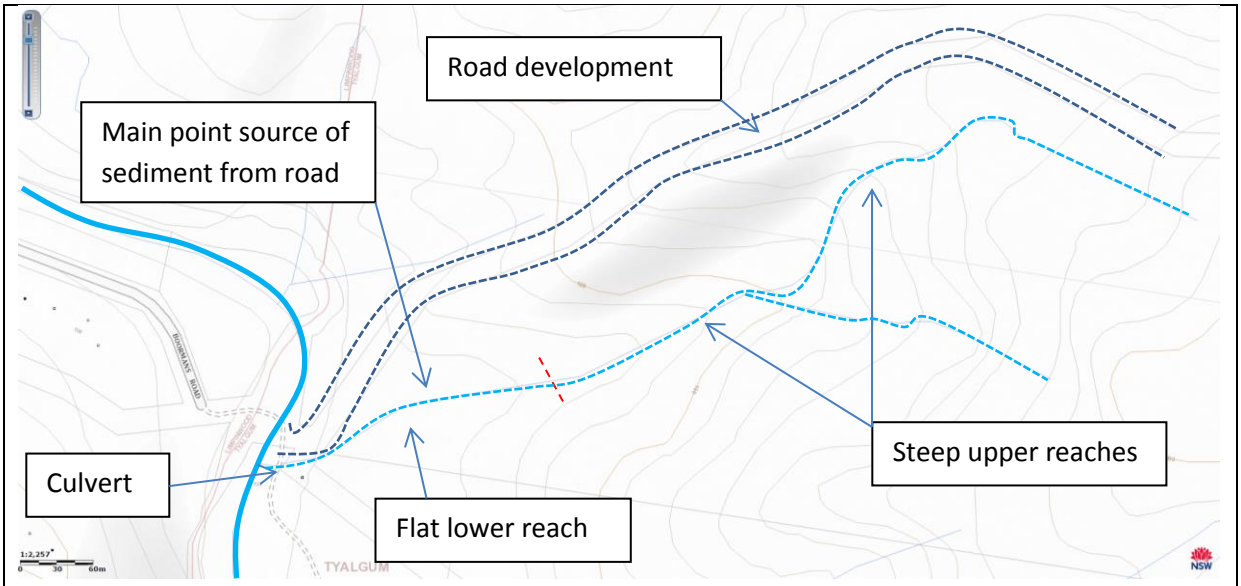


Figure 1 – Tributary general arrangement

SCOPE

The scope of the works plan includes;

- Initial site inspection
- Generation of works plan for remediation in consultation with the client
- Inspection of completed works including final report.

At the request of the client in consultation with Tweed Shire Council, the target reach for remediation was focussed on the lower 150-200m of the tributary. This was where the major flow path from upslope lands entered the drainage line and due to the low gradient, was where the majority of sedimentation occurred.

In accordance with the Tweed Shire Council Notice, the Works Plan needed to specifically address,

- The works schedule
- Removal methods and equipment
- Required Erosion and Sedimentation controls for stockpiles
- Final disposal location of sediments

CHANNEL ASSESSMENT AND VOLUME APPROXIMATION

Upon inspection, it was found that deposited sediment consisted mostly of medium sized sand particles, which was consistent with the parent material uncovered during the road development. The target reach comprised of a meandering partly incised channel, with secondary channels as flood runners, or historic outflanked meanders. The majority of sediment was deposited within the active channels, in addition to several large depositions on inside bends, behind debris racks or other energy dissipating features.

Investigation holes found varying depths of sediment, but mostly in the range of 15-30cm with localised deep deposits up to 40cm. Differentiation between deposited sediment and natural insitu material was fairly obvious, as the soft yellow sand would abruptly change at natural depth either through striking soft grey clays, gravels, tree roots or organic debris – sticks and leaf litter.

Accurate estimation of the actual volume of sediment to be removed is difficult to determine, however volumes in the order of 60-80m3 should be expected.

Figures 2 and 3 below, represent schematic diagrams (not to scale) of the target reach, indicating general chainages, major sediment deposition areas and approximate depths.

Figure 2 : General shape of dominant channel and approximate chainages (not to scale)

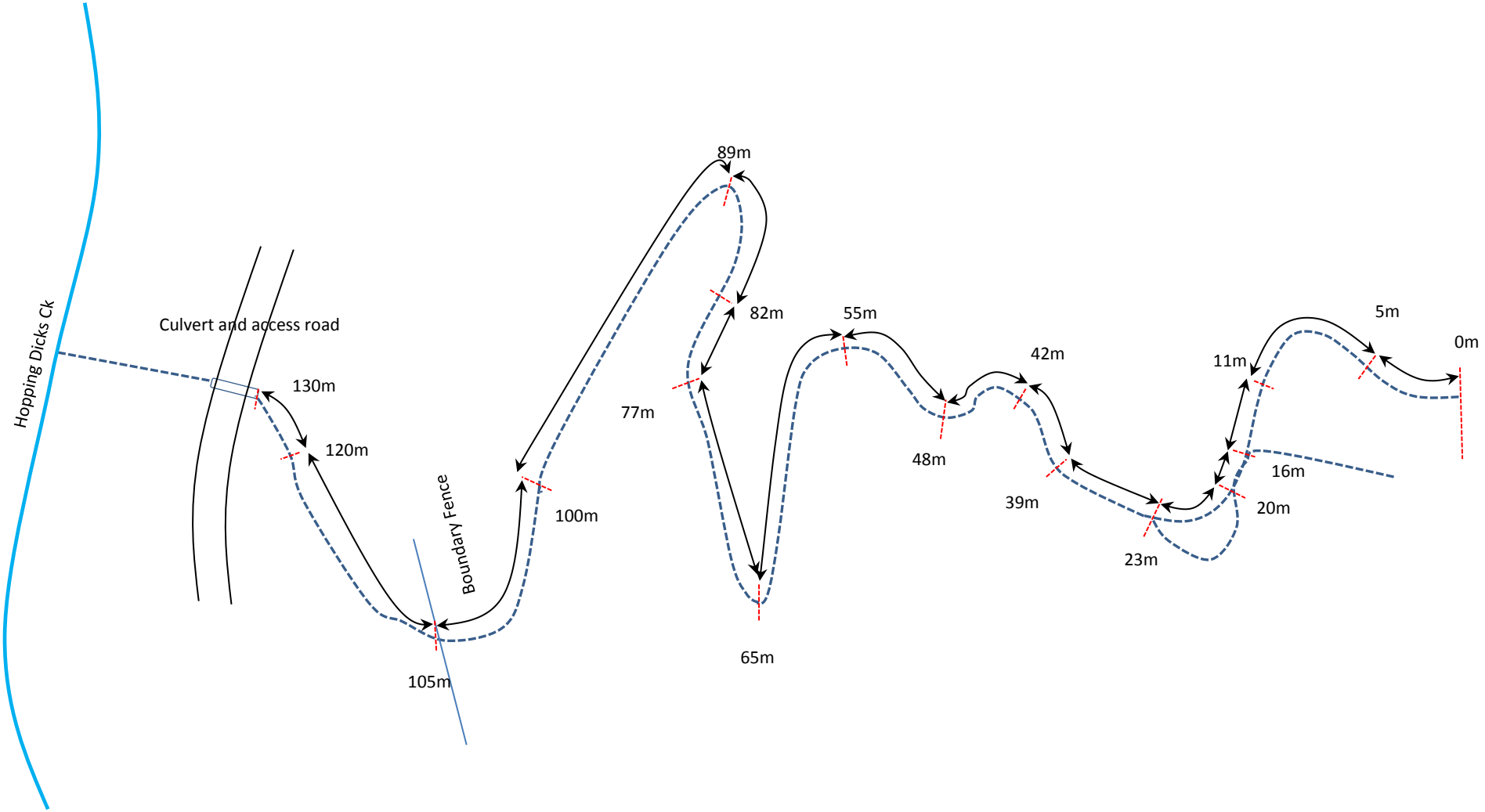
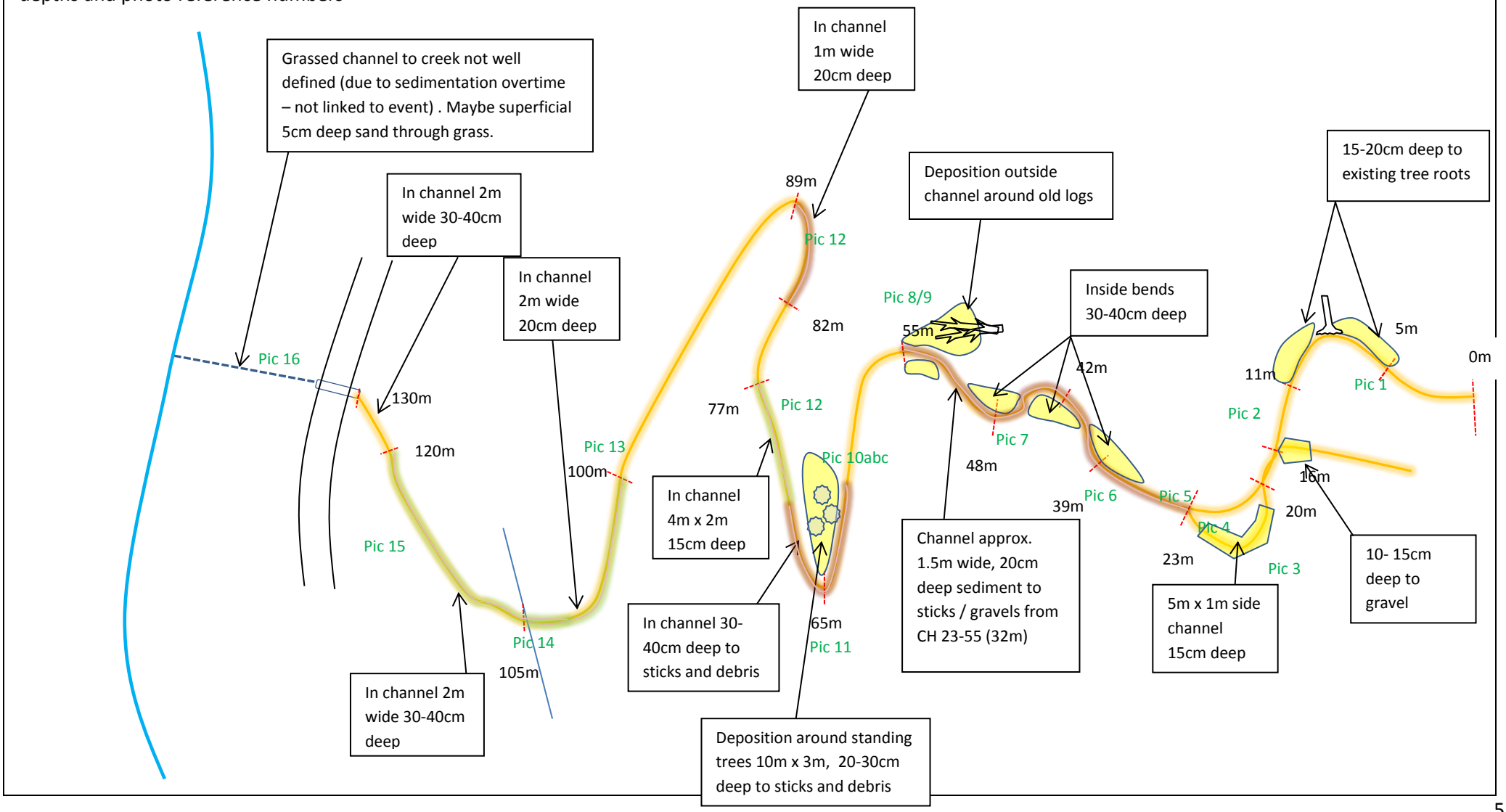


FIGURE 3: General location of sediment deposits, approximate depths and photo reference numbers



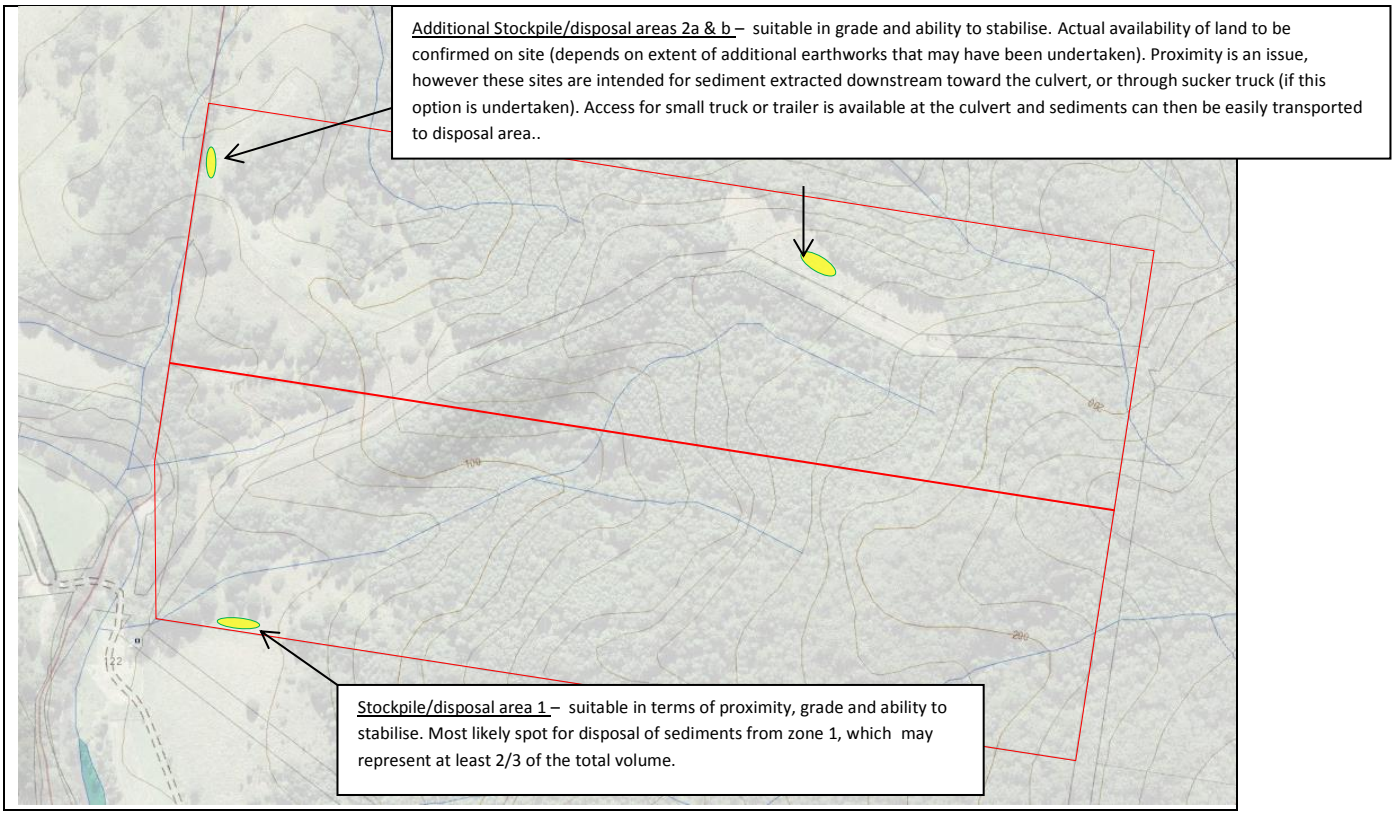
RECOMMENDATIONS

- As noted in the Clean-up direction, mechanical removal of sediments is not permitted due to the likely impact to surrounding lands.
- This leaves manual removal consisting of shovels for bulk out and brushes and / or leaf blowers for removal of sediments around the base of trees and vegetation.
- In order to differentiate between sediment deposits to be removed and natural debris racks, bed and bank materials, it is recommended, using a leaf blower (or rake), to first blow recently dropped leaf litter away from the channel and general areas identified in the schematic map. This will aid identification of transition areas between deposited sediments and natural banks or natural coarse debris racks.
- Excavated sediment will need to be conveyed by wheel barrow (manual or powered) to a transition point where light plant is permitted and can reasonably access to transport sediments to the stockpile and disposal area. These locations are identified on Figure 4.
- Sediment retrieval may be split into two or more zones, depending on access and available haul routes. One obvious split is the boundary fence. Zone 1 may extend from the upstream start of works to the boundary fence, with sediments hauled out upstream to the disposal area (this may be difficult for the most downstream parts, where some major deposits are located). Zone 2, from the boundary fence to the culvert will see sediments hauled out downstream to the access at the culvert. Sediments from this zone will need to be transported to the most accessible stockpile / disposal area (Fig 4). It may be easier to temporarily remove the boundary fence and haul a greater volume of sediment downstream for a shorter distance to the access at the culvert.
- Generally, excavation and removal should occur on a retreating front – i.e. go down to the most downstream extent and work back. This allows trafficking to be undertaken on deposited sediments, reducing any impacts on natural bed and banks.
- Transport paths or 'haul roads' should be identified to allow safe and practical transport of the sediments out of the creek channel, while minimising additional disturbance to existing vegetation and creek banks. If possible it may be best to choose one route and focus all movements in this area to minimise disturbed areas.
- In areas with active flows, or heavily water logged areas, a dewatering strategy consisting of sump and pump may be required to facilitate sediment removal and handling. Pumped water may be discharged to stable grassed areas and allowed to return to the drainage line downstream of the works
- Alternatively, the client may explore the use of a sucker truck to remove wet sediments. This method is low impact as the truck can be parked on stable ground, outside the riparian area with a long length of suction hose. As the sand in channel is wet, it may lend itself well as a slurry to be pumped. The method would be relatively low impact and may also be employed with the manual methods for a complete solution.
- Sediment stockpile and disposal area is to be appropriately setup, including
    - Location on relatively flat ground, outside of active channel and riparian areas

- Location in relatively cleared area, allowing for maximum groundcover establishment for stabilisation.
- Run on water diversion – earth bund, sandbags or small cut channel
- Downslope sediment control – sediment fence

- Upon completion of sediment removal, the stockpile should be levelled to blend into surrounding landform as best as possible. Upslope and downslope controls will need to be maintained until groundcover establishment of a minimum 70% cover is achieved. Upon site setup, controls must be placed to allow enough room for final land forming, otherwise another set of controls will need to be installed.
- Following land forming, the sediment disposal area is to be covered to encourage rapid establishment of stabilising groundcovers. Initial cover of sands may be via two methods;
  - Thin jute matt, straw or other organic material / mulches
  - Pre stripped natural material from disposal area footprint – this would need to be undertaken as part of the disposal area set up. The stripped grasses and thin layer of topsoil would be windrowed on the upslope side of the disposal area, then respread over the disposed and landformed sediments. Depending on the amount of exposed soils in the final respreading, open weave jute matt may be required to boost immediate groundcover.
  - Both cover options will require application of rapid cover crop seed, such as Japanese Millet
- Of the two cover methods, respreading of pre-stripped natural grasses will most likely provide the best long-term rehabilitation result, but will appear more invasive initially.

Figure 4 – Stockpile / Disposal areas



WHAT TO REMOVE

Without over complicating the process, generally the deposited sand is visibly different to other insitu materials. Major differentiation between natural and deposited material is colour and texture. Deposited materials to be removed are yellow sands. Fine grained clays, grey / black decaying organic matter, gravels, sticks and course organic debris are to remain.

The aim should be to remove the bulk of the yellow deposited sand, while minimising disturbance to existing vegetation, surface roots, natural bed and bank surfaces. It is not feasible, nor is it recommended to remove all the sand, as it is likely over excavation and damage to plant root systems and bed and bank materials may occur.

Areas of deposited sediment around base of trees and shrubs should be carefully removed using brushes or blowers. It should be noted that native vegetation growing between the valley margins, on the floor of an active creek bed, in a low gradient depositional zone should have a natural resistance to, or a survival mechanism for inundation by sediment. With this in mind, it would be undesirable to see the entire floor stripped of sediment and organic matter. Efforts should be focussed on major depositions only.

The following photos are to be used as a guide to identify major deposition areas for the target reach. Photo numbers are referenced on the schematic plan figure 3.

Pic 1 – Sand deposits out of channel around trees. Dig approx. 15-20cm until existing surface roots.

	Pic 2 – Light leaf blow will reveal transition between yellow sands and natural bank / debris areas
	Pic 3 – Sediments deposited mostly in channel. Limit disturbance to bed and banks outside incised channels.
	Pic 3a – Dig test holes to find natural base – usually defined by tree roots, sticks, gravels or grey/black clays and organic matter.

	Pic 3b – Dig test holes to find natural base – usually defined by tree roots, sticks, gravels or grey/black clays and organic matter.
	Pic 4 – Sediments in channel
	Pic 5 – Wet sediments – suitable slurry for sucker truck, otherwise may need to dig sump and dewater during excavation .

	Pic 6 – Sediments are likely to be deeper on inside bends.
	Pic 7 – Deep sediments in channel, inside bend
	Pic 8 – Sediments in channel, in addition to out of channel deposit around trees (next pic).

	Pic 9 – Sediments to be removed around old logs
	Pic 10a – Sediments in channel and across inside bar amongst native vegetation. Care to be taken around base of existing trees and shrubs.
	Pic 10b – Sediments in channel and across inside bar amongst native vegetation. Care to be taken around base of existing trees and shrubs.

	Pic 10c – Deep sediment to natural surface of sticks, roots and organic debris.
	Pic 11 – Deep sediment in channel and at end of inside bar
	Pic 11 – Deep sediments mostly in channel

	Pic 12 – Sediments in channel approaching corner
	Pic 13 – Sediments in channel on approach to boundary fence
	Pic 14 – Deep Sediments around boundary fence

	Pic 15 – Sediments in channel only from boundary fence to culvert
	Pic 16 – Sediment downstream of culvert. It was apparent that the function of culvert prior to the event would have been extremely limited, most likely due to natural accretion on the flood plain overtime. Whilst some sediment removal through the grass may be undertaken, it would be unreasonable to expect the level of excavation required to reform a suitable channel as part of this exercise
	Pic 17 – Sediment stockpile / disposal area 1. The bulk of excavated material could be spoiled and stabilised in this area, with appropriate upslope and downslope controls.

TIMING, DURATION and SEQUENCING

Due to works required in an active drainage line, it will be important to schedule works around a period of dry weather, before and during the clean-up activity. Works should be postponed should there be visible flows in the drainage line prior to commencement. If rainfall is encountered during works, it is recommended works cease until surface flows disappear.

Duration of works is ultimately dependant on the clients choice of removal methods (i.e. fully manual or with aid of sucker truck) and the size of the manual workforce. It is likely that even with a team of 5 -10 labourers, it may take at least one week to remove sediments and stabilise disposal areas.

Work sequencing should consist of;

1. Labourer's induction and familiarisation with the site, including the aim of the clean-up exercise, material identification and general extent of works.
2. Sediment stockpile/ disposal area set up
3. Identification of haulage routes and methods
4. Identification of excavation limits / transition areas
5. Dewatering if required
6. Sediment removal
7. Landforming and stabilisation of disposal areas(min 70% cover is the benchmark)
8. Rehabilitation of any access tracks or disturbance (min 70% cover is the benchmark)
9. Monitoring and removal of remaining erosion and sediment controls once site reaches 70% groundcover target.

APPROVALS

The client may be required to obtain a Controlled Activity Permit from the NSW Office of Water prior to works within the drainage line.

Part 7 approvals from NSW Fisheries are not required for streams less than 3rd order.

Approvals from Tweed Shire Council are assumed in complying with the issued Clean up notice.