

**Contributed by Holger Maier
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Tasks

You have been asked to:

1. Select the final location and layout of the part of the mine site consisting of the following components:
 - (i) Administration building (approx. area = 7,500 m²)
 - (ii) Lawn (approx. area = 2,500 m²)
 - (iii) Car park (approx. area = 7,500 m²)
 - (iv) Paved area surrounding mine drift entrance (approx. area = 30,000 m²)
 - (v) Paved plant (machinery) area (approx. area = 15,500 m²)

When selecting the final location and layout, consideration should be given to the following:

- (i) The area surrounding the mine drift entrance must cater for access to the tunnel
- (ii) The car park and lawn area must be adjacent to the administration building
- (iii) The plant area must be adjacent to the mine drift
- (iv) Earthworks should be minimised
- (v) Stormwater should not cause significant damage, even in extreme events when the capacity of the stormwater system is exceeded (i.e. consideration of minor / major flow paths).

A number of alternatives should be considered and the final choice justified.

2. Choose an appropriate stormwater drainage scheme for the mine site, including appropriate sub-areas and appropriate locations for all pits and pipes. When selecting pipe locations, consideration should be given to the fact that the slopes of the pipes should match those of the ground surface as closely as possible to minimise construction costs. All of the stormwater from the site and from those parts of the surrounding bushland that could potentially flood the mine must be captured and conveyed to Inverbrackie Creek. Water quality considerations can be ignored. A number of alternatives should be considered and the final choice justified.
3. Design all of the pipes, including diameters, slopes and covers (the minimum pipe cover is 600mm). Please note that there is no need to design the pits. Design flows for each pipe should be calculated using the deterministic rational method, although other methods might be more appropriate for calculating any design runoff from the bushland. A return period of 100 years should be used. The following design chart can be used to determine an appropriate pipe size, given a design slope and flow. Detailed calculations need to be provided and the final design needs to be justified. All calculations need to be checked by another member in the group and this should be clearly evident in your report.
5. Produce a design report, including all calculations and a set of clear diagrams summarising your design. The diagrams should include plans and longitudinal sections of the system showing ground level, pipe invert (bottom) and pipe obvert (top). Longitudinal sections should be drawn to appropriate (and possibly different) vertical and horizontal scales. All calculations should be done on "Engineering Design Calculation" paper available from the School Office (N136). A 3 cm right-hand margin should be used to summarise important results. The report should contain:
 - (i) A front cover or title page with title, names, etc.
 - (ii) An executive summary (including introductory / background information and diagrams summarising the final design (layout and sizes))
 - (iii) A table of contents (including appendices, list of tables and list of figures, as well as their page numbers)
 - (iv) An introduction (starting on page 1 and including a site map)
 - (v) A body (e.g. design methodology and approach, results etc.)
 - (vi) A summary of the final design (including diagrams of final layout and sizes)
 - (vii) Appendices, including all detailed calculations (all appendices should have titles which should be included in the table of contents)

It should be noted that:

- (viii) All sections should be numbered (including the appendices)
- (ix) All pages should be numbered sequentially (including pages in the appendices)
- (x) All calculation pages should be dated (always include year eg. 21/9/01), initialled by the person who performed the calculations and initialled by the checker
- (xi) Any assumptions you have made should be stated clearly
- (xii) Any source material must be referenced
- (xiii) Tables should have a number and title placed at the top of the table
- (xiv) Figures should have a number and title placed beneath the figure

- (xv) The report should be bound
- (xvi) All Tables and Figures should be numbered, have a title and be referred to in the text
- (xvii) Any landscape pages should be oriented so that the bottom of the page is on the outside

Assessment Criteria

The assessment criteria for the submission are as follows:

Goals/Grade	F < 50	P 50-64	C 65-74	D 75-84	HD >85
Choice of site layout and drainage scheme	Inappropriate choice of layout and drainage scheme, major violation of criteria / constraints	Appropriate choice of layout and drainage scheme, minor violation of some criteria / constraints	Appropriate choice of layout and drainage scheme, satisfaction of all criteria / constraints, consideration of a number of different alternatives	Appropriate choice of layout and drainage scheme, satisfaction of all criteria / constraints, consideration of a number of different alternatives, development and utilisation of a number explicit assessment criteria to choose between alternatives	Innovative choice of layout and drainage scheme, satisfaction of all criteria / constraints, consideration of a number of different alternatives, development and utilisation of a number explicit assessment criteria to choose between alternatives, critical discussion of different alternatives in relation to assessment criteria and detailed justification of final choices
Design of Drainage Scheme	Major errors in calculations, calculations not checked, referenced or explained clearly	Minor errors in calculations, calculations checked, referenced and explained clearly	Calculations correct with no errors or omissions, calculations checked, referenced and explained clearly	Calculations correct with no errors or omissions, calculations checked, referenced and explained clearly, in-depth discussion of assumptions and limitations of calculations	Calculations correct with no errors or omissions, calculations checked, referenced and explained clearly, in-depth discussion of assumptions and limitations of calculations, detailed assessment criteria and justification of final design / innovative process for choice of final design
Diagrams <ul style="list-style-type: none"> ▪ Appropriate number of drawings ▪ Appropriate views ▪ Neatness ▪ Completeness of information 	Inadequate	O.K.	Good		
Report <ul style="list-style-type: none"> ▪ Spelling and grammar ▪ Structure and organisation ▪ Completeness ▪ Clarity and readability 	Inadequate	O.K.	Good		

Submission

Please submit one hardcopy of the final report per group in the submission box for Water Eng. IIS2 outside of the School Office (N136).

1. TASK 2-4: DESIGN PROJECT – PHASE 4

Group Size: 2 (self-selected)

Objective

The objective of this phase of the design project is to obtain the 1:10 and 1:100 year design flows at the gauging station of Inverbrackie Creek using the runoff-routing model RORB. This will involve the development and calibration of the RORB model for the Inverbrackie Creek catchment, as well as its application in order to obtain the required design flows. In addition, the calibrated RORB model is to be used to assess the impact of the stormwater runoff from the proposed mine site on the 1:100 year design hydrograph at the point where the stormwater from the mine site is discharged into Inverbrackie Creek, as well as at the gauging station. Details of which course learning objectives and graduate attributes are addressed by this assessment task are given in Sections 16 and 17, respectively.

Tasks

1. RORB model development (calibration and validation):
 - (i) Division of catchment into appropriate sub-areas and identification of nodes
 - (ii) Development of RORB catchment file for calibration (fit) runs
 - (iii) Choice of appropriate storm events (rainfall and corresponding runoff data) for calibration and validation
 - (iv) Development of RORB storm files for all calibration and validation events
 - (v) Determination of “best” RORB model parameters (i.e. model calibration)
 - (vi) Testing (validation) of calibrated RORB model
2. Determination of 1:10 and 1:100 year design flows at gauging station
 - (i) Appropriate alteration of RORB catchment file
 - (ii) Input of appropriate IFD data for Inverbrackie Creek catchment
 - (iii) RORB design runs for 10 and 100 year return periods for a range of design durations
 - (iv) Choice of 1:10 and 1:100 year design hydrographs and peak flows
3. Determination of impact of mine site on 1:100 year design hydrograph at discharge point and gauging station
 - (i) Appropriate alteration of RORB catchment file
 - (iii) RORB design runs for 100 year return period for a range of design durations
 - (iv) Comparison with results from Task 2

Assessment Criteria

The assessment criteria for the submission are as follows:

Goals/Grade	F < 50	P 50-64	C 65-74	D 75-84	HD >85
RORB Model Development (Calibration and Validation)	Major errors and/or omissions in catchment sub-division and development of catchment and storm files,	Minor errors and/or omissions in catchment sub-division and development of catchment and storm files, limited calibration and validation runs, limited discussion of process / results for choosing appropriate RORB model parameters	Catchment sub-division appropriate, Catchment file developed correctly, Storm files developed correctly for a limited number of calibration and validation events, limited discussion of process / results for choosing appropriate RORB model parameters	Catchment sub-division appropriate, Catchment file developed correctly, Storm files developed correctly for a number of calibration and validation events, detailed discussion of process / results for choosing appropriate RORB model parameters	Catchment sub-division appropriate, Catchment file developed correctly, Storm files developed correctly for a number of calibration and validation events, advanced / innovative process for choosing appropriate RORB model parameters, detailed discussion of results obtained and assumptions / limitations of resulting model
RORB Design Runs	Major errors and / or omissions in making alterations to RORB catchment files, performance of appropriate design runs and choice of design values	Minor errors and / or omissions in making alterations to RORB catchment files, performance of appropriate design runs and choice of design values	Appropriate alterations to RORB catchment files, performance of appropriate design runs, correct choice of design values	Appropriate alterations to RORB catchment files, performance of appropriate design runs, correct choice of design values, in-depth, critical discussion of results obtained	Appropriate alterations to RORB catchment files, Advanced / innovative process for obtaining design values (e.g. Monte Carlo Simulation), correct choice of design values, in-depth, critical discussion of results obtained,
Report <ul style="list-style-type: none"> ▪ Spelling and grammar ▪ Structure and organisation ▪ Completeness ▪ Clarity and readability 	Inadequate	O.K.	Good		

Submission

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