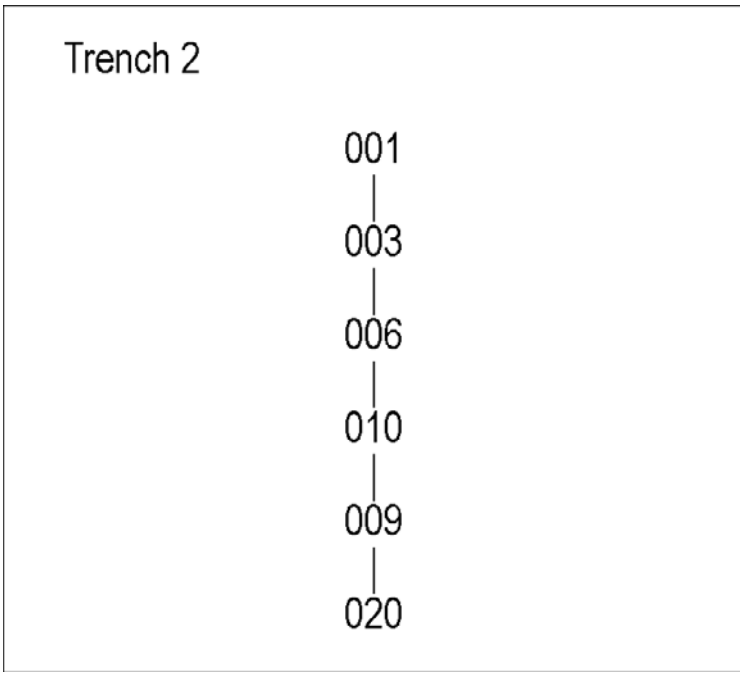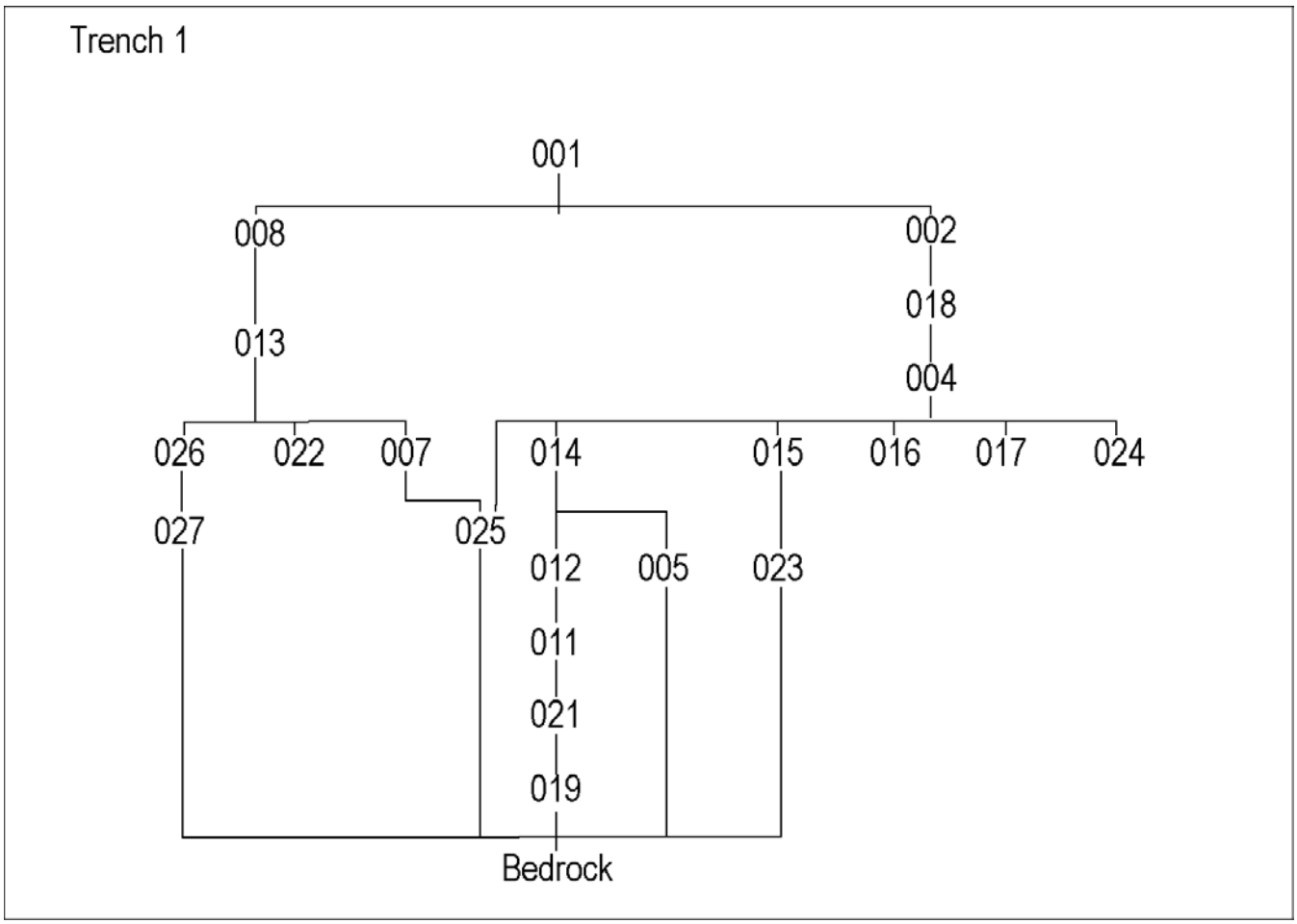APPENDIX 2: MATRICES